CRESTVIEW ELEMENTARY
MODERNIZATION AND IMPROVEMENTS

Judson Independent School District

RFCSP NO: 21-05

October 9, 2020

Project Manual

Volume 2 of 2

Judson Independent School District
Facilities and Operations
8012 Shin Oak
Live Oak, Texas 78233
210-945-5538

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RFCSP NO. 21-05

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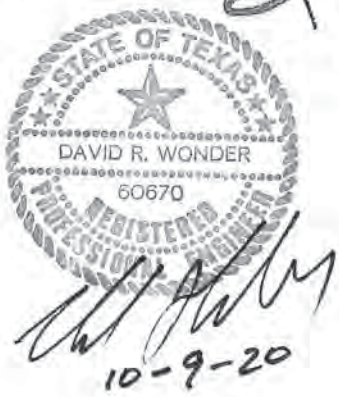

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SECTION 08 12 00

STANDARD STEEL FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Standard and fire rated pressed steel hollow metal door frames.

B. Double egress fire rated pressed steel hollow metal door frames.

C. Interior glazed lite frames.

1.2 RELATED SECTIONS

A. Section 08 13 00 – Standard Steel Doors.

B. Section 08 14 16 – Flush Wood Doors.

C. Section 08 71 00 – Finish Hardware.

D. Section 08 81 00 – Glass and Glazing.

E. Section 09 91 00 – Painting: Field painting of frames.

F. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCE STANDARDS

A. SDI-100 - Recommended Specifications-Standard Steel Doors and Frames of Steel Door Institute.

B. Underwriters' Laboratories Inc. (UL), and Factory Mutual (FM), as applicable to fire rated hollow metal door frames.

C. ASTM A591 - Steel Sheet, Cold-Rolled, Electrolyte Zinc Coated.

D. ASTM A366 - Steel, Carbon, Cold-rolled Sheet, Commercial Quality.

E. NFPA - Standard for fire doors and windows.

1.4 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings and product data in accordance with Section 01 33 00.

B. Indicate general construction, configurations, jointing methods, reinforcements, anchorage methods, hardware locations and installation details.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products under provisions of Section 01 60 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer and Type: SQ profiles as manufactured by The Ceco Corporation.

B. Other Acceptable Manufacturers:
   1. Curries Co.
   2. Deansteel Manufacturing Co.
   3. Steelcraft.

C. Substitutions: Under provisions of Section 01 60 00.

2.2 FRAMES

A. Exterior Frames: Steel, 14 gauge thick material, base metal thickness; zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653, A60 coating designation.

B. Interior Frames: 16 gauge thick material, base metal thickness. Galvannealed sheet in accordance with ASTM A653, A60 coating designation.

C. Types: Welded frames.

D. Mortar Guard Boxes: Minimum 22 gauge thick; welded in place.

E. Door Silencers: As specified in Section 08 71 00.

2.3 FIRE RATED FRAMES

A. Fabricate fire rated hollow metal frames of materials in accordance with requirements of Underwriters' Laboratories Inc. (UL) and Factory Mutual (FM). Place UL labels where visible when frames are installed in position. Refer to drawings for class requirements.

2.4 FABRICATION

A. Accurately form and cut mitered corners of welded type frames. Weld on inside surfaces. Grind welded joints to smooth uniform finish.

B. Reinforce frames wider than 4 feet with 12 gage rolled formed steel channels welded in place, flush with top of frames.

C. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.

D. Reinforce and prepare frames to receive hardware. Refer to Section 08 71 00 for hardware requirements.

E. Prepare frame for silencers where indicated on hardware schedule. Place minimum of 3 single silencer locations on single door frames. Space equally along strike jambs. Place minimum of 2 single silencer locations on double door frames. Place on frame heads.

F. Provide jamb anchors for hollow metal frames: SDI-100. Weld floor jamb anchors in place.

G. Fill surface depressions of hollow metal frames with metallic paste filler and grind to smooth finish.

H. Touch up areas on hollow metal where galvanized coating has been damaged by welding or handling.

I. Chemically treat surfaces and apply one coat of primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install door frames in accordance with SDI-100 except as amended in this Section.

B. Coordinate with masonry and wallboard wall construction for anchor placement; provide not less than 4 anchors per jamb or upright.

C. Coordinate installation of glass and glazing.

D. Install hollow metal frames plumb and square, in correct locations indicated on drawings. Insure frames are securely and rigidly anchored to adjacent construction.

E. Coordinate installation of frames with installation of hardware specified in Section 08 71 00 and doors in Sections 08 13 00, 08 14 16, and 08 31 13.

F. After installation, touch-up scratched or damaged surfaces. Use type of primer identical to that used for shop coat and zinc rich coating on galvanized surfaces.

3.2 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.3 SCHEDULE

A. Refer to Door and Frame Schedule in the Drawings.

END OF SECTION

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SECTION 08 13 00

STANDARD STEEL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes non-rated, fire rated, and thermally insulated steel doors.

B. Related Sections:
1. Section 08 12 00 – Standard Steel Frames.
2. Section 08 14 16 – Flush Wood Doors.
3. Section 08 71 00 – Door Hardware.
4. Section 08 81 00 – Glass and Glazing: Glass for doors.
5. Section 09 91 00 – Painting: Field painting of doors.
6. Section 09 99 50 – Finish / Color Schedule.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.

B. ASTM International:
1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM C236 – Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
3. ASTM E413 – Standard Classification for Rating Sound Insulation.

C. Hollow Metal Manufacturers Association:
1. HMMA 810 – Hollow Metal Doors.

D. National Fire Protection Association:
1. NFPA 80 – Standard for Fire Doors, Fire Windows.
2. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.

E. Steel Door Institute:
1. SDI 108 – Recommended Selection and Usage Guide for Standard Steel Doors.

F. Underwriters Laboratories Inc.:
1. UL 10B – Fire Tests of Door Assemblies.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing and finishes.

C. Product Data: Submit door configurations, location of cut-outs for hardware reinforcement.

D. Manufacturer's Installation Instructions: Submit special installation instructions.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A250.8.

B. Fire Rated Door Construction: Conform to UL 10B.

C. Installed Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Material and Equipment: Requirements for transporting, handling, storing, and protecting products.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Break seal on site to permit ventilation.

1.7 COORDINATION

A. Section 01 30 00 – Submittals: Requirements for coordination.

B. Coordinate Work with door opening construction, door frame, and door hardware installation.

C. Coordinate installation to accommodate door hardware, door contacts, power transfers and electric wire connections.

PART 2 - PRODUCTS

2.1 STANDARD STEEL DOORS

A. Manufacturers:
   1. Ceco Door Products.
   2. Curries Company.
   3. Deansteel Manufacturing Co.
   4. Steelcraft.
   5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:
   1. Exterior Doors (Insulated): SDI 108, 1-3/4 inch thick.
      a. Level 3 - Extra heavy Duty, Model 2, seamless face and edge design.
   2. Interior Doors (Non-Rated): SDI 108, 1-3/4 inch thick.
      a. Level 3 - Extra heavy Duty, Model 2, seamless face and edge design.
   3. Interior Doors (Fire Rated): SDI 108, 1-3/4 inch thick.
      a. Level 3 - Extra heavy Duty, Model 2, seamless face and edge design.

2.2 COMPONENTS

A. Face: Steel sheet 0.053 inch thick minimum.

B. End Closure: Channel, 0.048 inches thick, flush.

C. Core (Interior): Cardboard honeycomb; provide mineral fiber core where required for fire rating.

D. Thermal Insulated Door: Polyurethane; total insulation R-Value of 10, measured in accordance with ASTM C236.

2.3 ACCESSORIES

A. Removable Stops: Rolled steel, channel shape, butted corners; prepared for countersink style screws.

B. Astragals for Double Doors: Steel, shaped specifically for double doors.

C. Body Filler: Heavy-duty filler; Bondo Corporation, 3700 Atlanta Industrial Parkway, NW Atlanta, GA 30331

D. Primer: ANSI A250.10 rust inhibitive type.

2.4 FABRICATION

A. Mechanically interlock longitudinal seams of doors; weld, fill and grind smooth.

B. Fabricate doors with hardware reinforcement welded in place.

C. Close top of exterior door with metal closure piece. Apply uniform layer of heavy-duty body filler across entire top surface to prohibit water accumulation and to seal joints watertight.

D. Attach astragal to inactive leaf of pairs of fire rated doors.

E. Attach fire rating label to each fire rated door.

2.5 SHOP FINISHING

A. Steel Sheet (Interior Locations): Zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653A653M, A60 coating designation.

B. Steel Sheet (Exterior Locations): Zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653A653M, A60 coating designation.

C. Primer: Oven dried baked-on.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 33 00 - Submittals: Verification of existing conditions before starting work.

B. Verify opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install doors in accordance with ANSI A250.8.

B. Install door louvers, plumb and level.

C. Coordinate installation of glass and glazing specified in Section 08 81 00.

D. Coordinate installation of doors with installation of frames specified in Section 08 12 00 and hardware specified in Section 08 71 00.

E. Touch-up damaged shop finishes.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Controls: Tolerances.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Section 01 77 00 – Closeout Procedures: Requirements for adjusting.

B. Adjust door for smooth and balanced door movement. Comply with provisions of the Texas Accessible Standards for allowable door opening force.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule in Drawings.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes flush wood doors; flush and flush glazed configuration; fire rated and non-rated.

B. Related Sections:
1. Section 08 12 00 – Standard Steel Frames.
2. Section 08 71 00 – Door Hardware.
3. Section 08 81 00 – Glazing.
4. Section 09 99 50 – Finish / Color Schedule.

1.2 REFERENCES

A. ASTM International:
1. ASTM E413 – Standard Classification for Rating Sound Insulation.

B. Architectural Woodwork Institute:
1. AWI – Quality Standards Illustrated.

C. Hardwood Plywood and Veneer Association:
1. HPVA HP-1 – American National Standard for Hardwood and Decorative Plywood.

D. National Fire Protection Association:
1. NFPA 80 – Standard for Fire Doors, Fire Windows.
2. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.

E. Underwriters Laboratories Inc.:
1. UL 10B – Fire Tests of Door Assemblies.
2. UL – Building Materials Directory.

F. Uniform Building Code:
1. UBC Standard 7-2 – Fire Tests of Door Assemblies, 1994.

G. Warnock Hersey:
1. WH – Certification Listings.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.

C. Product Data: Submit information on door core materials and construction, and on veneer species, type and characteristics.

D. Samples:
   1. Submit two samples of door veneer, 8 by 8 inches in size illustrating wood grain, stain color, and sheen.

E. Manufacturer's Installation Instructions: Submit special installation instructions.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AWI Quality Standard Section 1300, Premium grades identified in section.

B. Finish doors in accordance with AWI Quality Standard Section 1500, grades identified in section.

C. Fire Door Construction: Conform to UBC Standard 7-2, 1994.

D. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Package, deliver and store doors in accordance with AWI Section 1300.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer when stored more than one week.
   1. Break seal on site to permit ventilation.

1.7 COORDINATION

A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with door opening construction, door frame and door hardware installation.

1.8 WARRANTY

A. Section 01 77 00 – Execution Requirements: Product warranties and product bonds.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

C. Furnish manufacturer’s “Life of Installation” warranty for interior doors.

PART 2 - PRODUCTS

2.1 FLUSH WOOD DOORS

A. Manufacturers:
   1. Algoma Hardwoods Inc.
   2. Buell Door Company.
   3. Eggers Industries.
   4. Marshfield Door systems.
   5. VT Industries.
   6. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Solid core flush wood doors; wood veneer facing material; fire rated and non-rated types; flush and flush glazed design; factory pre-fit; shop finished.
   1. Sound rated wood doors where indicated.
   2. Flush Interior Doors: 1-3/4 inches thick; solid core, five ply construction, fire rated, non-rated, and acoustic rated as indicated on Drawings.

2.2 COMPONENTS

A. Solid Core, Non-Rated: AWI Section 1300, Type PC5 - Particleboard.

B. Solid Core, Fire Rated: AWI Section 1300, Type as required for fire rating.

C. Solid Core, Special Function: AWI Section 1300, Type SR - Sound Retardant (Acoustical).

D. Interior Veneer Facing: AWI Premium quality wood, rotary sliced, with balanced match book matched grain, for transparent finish. Pair match multiple door leaves in single opening.
   1. Wood: Match Existing.

E. Facing Adhesive: Type I - waterproof.

2.3 ACCESSORIES

A. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.

2.4 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.

B. Fabricate fire rated doors in accordance with AWI Quality Standards and to UL requirements. Attach fire rating label to door.

C. Stiles shall be minimum 1-1/2 by 1-1/2 inch hardwood stained, bonded to core.

D. Rails shall be minimum 1-1/8 inch, bonded to core.

E. Sound Rating For Single Door Leaf and Frame Assembly: ASTM E413, Minimum STC 31.
   1. Sound Retardant Doors at Conference Room and Office: STC 42.

F. Furnish lock blocks at lock edge and top of door for closer for hardware reinforcement.

G. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Furnish solid blocking for through bolted hardware.

H. Factory fit doors for frame opening dimensions identified on shop drawings.

I. Cut and configure exterior door edge to receive recessed weather stripping devices.

J. Provide edge clearances in accordance with AWI 1300.

2.5 SHOP FINISHING

A. Factory finish doors in accordance with AWI Quality Standard Section 1500 to the following finish designations; color as selected:
   1. Transparent Finish TR-6: Catalyzed polyurethane, Custom quality, satin sheen. Seal door top edge with clear sealer to match door facing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.

B. Verify opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install fire rated and non-rated doors in accordance with AWI Quality Standard, NFPA 80, and to requirements for fire rating label by UL or Warnock Hersey.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to maximum of 3/4 inch.
   1. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

D. Machine cut doors for hardware installation.

E. Coordinate installation of doors with installation of frames specified in Section 08 12 00 and hardware specified in Section 08 71 00.

F. Coordinate installation of glass and glazing specified in Section 08 81 00.

3.3 INSTALLATION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Conform to AWI requirements for fit and clearance tolerances.

C. Conform to AWI Section 1300 requirements for maximum diagonal distortion.

3.4 ADJUSTING

A. Section 01 77 00 - Execution Requirements: Testing, adjusting, and balancing.

B. Adjust door for smooth and balanced door movement.

C. Adjust closer for full closure in compliance with TAS Guidelines.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule on Drawings.

END OF SECTION

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SECTION 08 31 13

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes non-rated access doors and panels with frames.
   1. Provide for access to controls, valves, traps, dampers, cleanouts, and similar items requiring operation behind inaccessible finished surfaces.
   2. Coordinate exact locations with various trades in Division 22, 23, and 26 to assure proper placement of access doors and panels.

B. Related Sections:
   1. Section 03 10 00 – Concrete Forms and Accessories: Placement of access frame unit anchors in concrete.
   2. Section 04 20 00 – Unit Masonry Assemblies.
   3. Section 09 21 16 – Gypsum Board Systems.
   4. Section 09 22 16 – Non-Structural Metal Framing.
   5. Section 09 51 10 – Suspended Acoustical Ceilings.
   6. Section 09 91 00 – Painting: Field paint finish.
   7. Section 09 99 50 – Finish / Color Schedule.
   8. Section 23 33 00 – Duct Accessories: Access doors in ductwork.

1.2 REFERENCES

A. National Fire Protection Association: NFPA 80 - Standard for Fire Doors, Fire Windows.

B. Underwriters Laboratories Inc.: UL - Building Materials Directory.

C. Warnock Hersey: WH - Certification Listings.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate exact position of access door units.

C. Product Data: Submit literature indicating sizes, types, finishes, hardware, scheduled locations, fire resistance listings, and details of adjoining Work.

D. Manufacturer's Installation Instructions: Submit installation requirements and rough-in dimensions.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access units.

1.5 QUALITY ASSURANCE

A. Fire Resistance Ratings: Where indicated as fire rated, provide assemblies from manufacturers listed in UL Directory or Warnock Hersey Directory.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified with minimum three years documented experience.

1.7 COORDINATION

A. Coordinate Work under provisions of Section 01 26 00 – Contract Coordination.

B. Coordinate Work with work requiring controls, valves, traps, dampers, cleanouts, and similar items requiring operation being located behind finished surfaces.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND PANELS

A. Manufacturers:
   1. Bilco, Inc.
   2. J. L. Industries.
   3. Karp Associates, Inc.
   4. Nystrom Products Co.
   5. Milcor LTD, Partnership.
   6. Substitutions: Section 01 60 00 - Product Requirements.

B. Non-Rated Flush Access Doors:
   1. Door: 14-gauge cold rolled sheet steel.
   2. Frame: 16-gauge cold rolled sheet steel. Provide 1/4” mounting holes.
      a. Provide 1 inch flange (NT) at all surfaces except gypsum wallboard.
      b. Provide 22-gauge galvanized drywall bead at perimeter (NW) at gypsum wallboard surfaces.
   3. Size: 10 by 10 minimum size, except where otherwise indicated.
      a. Provide 24 by 24 inch minimum size where full access is required.
   4. Hinge: Concealed pin type, spring loaded to allow for door removal, set to open 175 degrees.
   5. Latching/Locking Device:
      a. Screwdriver cam latch at all doors except toilet rooms.
      b. Key operated cylinder lock at toilet room access doors.
      c. (2) keys per lock.
      d. Key lock with cylinder to match cylinders specified in Section 08 71 00.
   6. Finish: Phosphate dipped with factory applied prime coat except as otherwise noted. Paint in accordance with Section 09 91 00.
      a. Stainless steel, No. 4 finish at toilet room access doors.
   7. Model: N Series as manufactured by Nystrom, or approved equal.

C. Floor Access Doors:
   1. Manufacturers:
      a. Babcock Davis: BFDNPA
      b. Bilco, Inc: Type J-3AL.

c. Nystrom: FDNPA
d. Substitutions: In accordance with Section 01 60 00.

2. Construction:
a. Single leaf, aluminum.
b. Size: 30 by 36 inches.
c. Door Leaves: 1/4 inch aluminum diamond pattern plate to withstand 300 lbs./sq. ft. live load.
d. Frame: Extruded aluminum channel frame with bent down anchor tabs around perimeter.
e. Hardware: Heavy forged aluminum hinges with Type 316 stainless steel pins, spring operators for easy operation, automatic hold-open arms with release handles. Provide snap locks with removable handles. Provide engineered composite compression spring tubes; steel compression springs with electrocoated acrylic finish. All other components of door shall be aluminum or Type 316 stainless steel.

3. Accessories:
a. Access Safety Post: Bilco "Ladder-up" Model 1 - black painted finish with stainless steel balancing spring.

2.2 FABRICATION

A. Fabricate units of continuous welded construction; weld, fill, and grind joints to assure flush and square unit.

B. Wall and Ceiling Access Door and Panel Hardware:
1. Hinge: Standard continuous or concealed spring pin type, 175 degree steel hinges.
2. Lock: Self-latching lock. Screw driver slot for quarter turn cam lock Removable wrench lift handle.

C. Size Variations: Obtain acceptance of manufacturer’s standard size units which vary slightly from sizes shown or scheduled.

2.3 SHOP FINISHING

A. Base Metal Protection: Bituminous coating applied to the exterior of frame.

B. Aluminum: Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify rough openings for access doors and panels are correctly sized and located.

3.2 INSTALLATION

A. Secure frames rigidly in place, plumb and level in opening, with plane of door and panel face aligned with adjacent finished surfaces.
1. Set concealed frame type units flush with adjacent finished surfaces.

B. Position unit to provide convenient access to concealed work requiring access.

END OF SECTION

SECTION 08 33 36

SIDE COILING GRILLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide side folding grilles with curtains, tracks, lock and miscellaneous items for a complete function installation.

1.2 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrications.

B. Section 06 10 00 – Rough Carpentry.

C. Section 08 71 00 – Door Hardware: Cylinder core and keys.

D. Section 09 21 16 – Gypsum Board Systems.

E. Section 09 51 10 – Suspended Acoustical Ceilings.

F. Section 09 99 50 – Finish / Color Schedule.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, including installation instructions and operation maintenance data.

B. Shop Drawings: Submit shop drawings including plan layouts, elevations and large scale details.

1.4 DELIVERY, STORAGE AND HANDLING

A. Immediately upon delivery to job site, place materials in area protected from weather.

B. Store materials in accordance with manufacturer's written instructions and in accordance with Section 01 60 00.

1.5 QUALITY ASSURANCE

A. Manufacturer shall supply a certificate stating that all materials and finishes comply with the Specifications requirements.

B. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. MobilFlex, Inc.: Model “System S-12” folding aluminum grille

B. Cornell Iron Works: Vision Glide Model ESG-30

C. Substitutions in accordance with Section 01 60 00.

2.2 CURTAIN

A. Top and bottom of each section shall be fitted with an aluminum panel 4 inches high. This panel shall consist of an aluminum extrusion 1/16 inch thick and composed of modules with a 15 degree angle between them to facilitate the operation of the closure. The curtain shall be made of vertical rods of 5/16 inch diameter. Each rod shall be contained in an aluminum tube ½ inch diameter. Rods shall be spaced a 3 inches o.c. and linked by two series of horizontal modules 2 inches high which are spaced every 12 inches.

B. Operation is manual push/pull.

2.3 TRACK

A. Curtain shall be hung from an overhead track 1-5/16” wide by 1-9/16” high. Track shall be aluminum 6351 alloy tempered to T6.

B. Curves shall be 14 inch standard radius.

2.4 LOCKING

A. Bi-Parting Lead post shall be equipped with a drop bolt lock with cylinder lock and hook bolt on other meeting side.

B. Trailing post shall be self-locking at the top and bottom inside the storage pocket.

C. Free floating intermediate posts shall be located at all curves and at intervals not exceeding 10 feet. Intermediate posts shall be equipped with self-adjusting spring leaded drop bolts activated from the interior side only. Drop bolts shall engage dust proof stainless steel receptacles.

2.5 FINISH

A. Finish shall be clear anodized aluminum.

2.6 POCKET CLOSURE

A. Furnish and install hinged pocket closure panel to enclose pocket opening when grille is retracted and store within the pocket. Finish shall be clear anodized aluminum.

2.7 STACKING

A. Stacking shall not exceed a depth of 1/16” per foot of closure width plus 3” for each post (lead, end or intermediate).

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that all preparation Work has been completed by other trades.

B. Verify dimensions of opening match shop drawings prior to installation.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install folding grilles in strict accordance with manufacturer's printed instructions.

3.3 ADJUSTING

A. Adjust folding grilles, in according with manufacturer's written instructions, to ensure smooth operation.

3.4 CLEANING

A. Clean folding grilles in according manufacturer's written instructions.

END OF SECTION

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SECTION 08 41 13

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents: Conditions of the Contract, Division 1 - General Requirements, and Drawings apply to Work of this Section.

B. Section Includes:
1. Exterior and interior storefront systems, entrance doors, door frames, complete with reinforcing, fasteners, anchors, and attachment devices.
2. Exterior windows, complete with reinforcing, fasteners, anchors and attachment devices.
3. Accessories necessary to complete work.

C. Products Furnished But Not Installed Under This Section:
1. Anchoring devices which are built into masonry.
2. Anchoring devices which are cast in concrete.
3. Rough-ins for door contacts and power transfer hinges.

D. Related Sections:
1. Section 05 50 00 – Metal Fabrications.
2. Section 06 10 00 – Rough Carpentry.
3. Section 07 92 00 – Joint Sealers.
4. Section 08 71 00 – Finish Hardware.
5. Section 08 81 00 – Glass and Glazing.
6. Section 09 99 50 – Finish / Color Schedule.

1.2 REFERENCES

A. Aluminum Association (AA):
1. DAF-45 Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association (AAMA):
1. 501.2 Field Check of Metal Curtain Walls for Water Leakage.
2. 607.1 Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
3. 701.2 Specifications for Pile Weatherstripping.
4. SFM-1 Aluminum Storefront and Entrance Manual.

C. American National Standards Institute (ANSI):
1. A117.1 Safety Standards for the Handicapped.

D. ASTM International:
1. ASTM A36 - Structural Steel.
2. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM B209 - Aluminum and Aluminum - Alloy Sheet and Plate.
4. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
5. ASTM B308 - Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.

6. ASTM E283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
7. ASTM E330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
8. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

E. Federal Specifications (FS):
1. TT-P-641G(1) Primer Coating, Zinc Dust-Zinc Oxide (For Galvanized Surfaces).
2. TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.

F. Steel Structures Painting Council (SSPC):
1. Paint 12 Cold-Applied Asphalt Mastic (Extra Thick Film).

1.3 SYSTEM REQUIREMENTS

A. Design Requirements:
1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage, or moisture disposal.
2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
3. Provide concealed fastening.
4. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
5. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
6. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
7. Provide for expansion and contraction due to structural movement without detriment to appearance or performance.

B. Performance Requirements:
1. Air infiltration: Air leakage through fixed light areas of storefront shall not exceed 0.02 cfm per square foot of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf.
2. Water infiltration: No uncontrolled leakage when tested in accordance with ASTM E331 at test pressure of 10 psf.

C. Thermal Requirements:
1. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
2. Ensure doors function normally within limits of specified temperature range.

D. Structural Requirements, as measured in accordance with ANSI/ASTM E330:
1. Basic Wind loads for exterior assemblies:
   a. 20 lb/sq ft acting inward.
   b. 20 lb/sq ft acting outward.
2. Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures for spans up to and including 13 feet 6 inches shall be limited to 1/175 of its clear span and for spans

greater than 13 feet 6 inches deflection shall be limited to 1/240 + 1/4 inch of its clear span, except that maximum deflection of members supporting plaster surfaces shall not exceed 1/360 of its span.

E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.4 SUBMITTALS

A. General: Submit in accordance with Section 01 33 00.

B. Product Data:
1. Submit manufacturer's descriptive literature and product specifications.
2. Include information for factory finishes, hardware, accessories, and other required components.

C. Shop Drawings:
1. Submit shop drawings covering fabrication, installation and finish of specified systems. Include following:
   a. Fully dimensioned plans and elevations with detail coordination keys.
   b. Locations of exposed fasteners and joints.
2. Provide detailed drawings of:
   a. Composite members.
   b. Joint connections for framing systems and for entrance doors.
   c. Anchorage.
   d. System reinforcements.
   e. System expansion and contraction provisions.
   f. Glazing methods and accessories.
   g. Internal sealant requirements.
   h. Thermal improvements.
3. Schedule of finishes.

D. Samples:
1. Submit manufacturer’s standard samples indicating quality of finish.
2. Submit samples 2 by 3 inches indicating actual aluminum finish.
3. Where normal texture or color variations are expected, include additional samples illustrating range of variation.

E. Test Reports: Submit certified copies of previous test reports substantiating performance of system in lieu of retesting. Include other supportive data as necessary.

F. Qualification Data: Submit installer qualifications verifying years of experience.

G. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain materials for systems from either a single manufacturer or from manufacturer approved by systems manufacturer.

B. Installer Qualifications: Certified in writing by system manufacturer as qualified for installation of specified systems.

C. Perform Work in accordance with AAMA SFM-1 and manufacturer's written instructions.

D. Conform to requirements of ANSI A117.1 and TAS.

E. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

F. Mock-Ups (Field Constructed): Install at project site, in conjunction with the building envelope mock up, a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, and workmanship standard.
   1. Mock-Up Size: 24 by 24 inches.
   2. Indicate all components necessary to install work, including but not limited to, perimeter angles, backplates sill receptors, etc.
   3. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
   4. Incorporation: Mock-up may not be incorporated into final construction upon Owner's approval.

G. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.6 PROJECT CONDITIONS / SITE CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 60 00.

B. Protect finished surfaces as necessary to prevent damage.

C. Do not use adhesive papers or sprayed coatings which become firmly bonded when exposed to sun.

D. Do not leave coating residue on any surfaces.

E. Replace damaged units.

1.8 WARRANTY

A. Provide warranties in accordance with Section 01 77 00.

B. Provide written warranty in form acceptable to Owner jointly signed by manufacturer, installer and Contractor warranting work to be watertight, free from deflective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within 1 year from date of Substantial Completion.

C. Warranty shall cover following:
   1. Complete watertight and airtight system installation within specified tolerances.
   2. System is structurally sound and free from distortion.

PART 2 - PRODUCTS

2.1 EXTERIOR STOREFRONT FRAMING SYSTEM AND PRODUCTS

A. Storefront Framing System: 1 inch glass thickness, 2 by 6 inch mullion profile. Center set, exterior flush glazed; jambs and vertical mullions shall be continuous. Head, sill, and intermediate horizontal members are attached by screw spline joinery or shear block attachment. Subject to compliance with requirements indicated, provide products by one of the following:
   1. YKK AP America Inc; YES 60 TU Storefront System for Insulated Glazing (Basis of Design).
   2. Kawneer Company Inc.
   3. Tubelite, Inc.
   4. United States Aluminum.
   5. Substitutions: Submit under provisions of Section 01 60 00.

B. Window Sill: Two-piece aluminum 0.050 inch thick; as indicated on Drawings. Match framing finish.

C. Entrance Doors: Wide stile; 5 inch minimum vertical stiles, cross rail, and top rail, 10 inch minimum bottom rail.
   1. YKK AP; Series 50D Wide Style Entrance.
   2. Kawneer Company Inc; 500 Wide Style.
   3. Tubelite, Inc.
   4. United States Aluminum; Series 550 Wide Style.
   5. Substitutions: Submit under provisions of Section 01 60 00.

D. Components: Manufacturer's standard extruded aluminum expansion mullions, framing, sills, backplates, anchoring angles and indicated shapes.

2.2 INTERIOR STOREFRONT FRAMING SYSTEM AND PRODUCTS

A. Interior Storefront System: 1/4 inch glass thickness, 1-3/4 by 4 inch mullion profile, center rabbet, flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal shall be attached by screw spline joinery. Subject to compliance with requirements indicated, provide products by one of the following:
   1. YKK AP America Inc; YES 40 FS Storefront System for single pane glazing (Basis of design).
   2. Kawneer Company Inc.
   3. Tubelite, Inc.
   4. United States Aluminum.
   5. Substitutions: Submit under provisions of Section 01 60 00.

B. Interior Aluminum Doors: Wide Style Entrance; same as exterior entrance doors, except with 1/4 inch glazing.

2.3 FRAMING MATERIALS AND ACCESSORIES

A. Extrusions: ASTM B221, 6063-T5 Aluminum Alloy.

B. Aluminum Sheet:
   1. Anodized Finish: ASTM B 209 (ASTM B 209M), 5005-H14 Aluminum Alloy, 0.050 inch minimum thickness.

C. Internal Reinforcing:
   1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
   2. Shapes and sizes to suit installation.
   3. Steel components factory coated with alkyd type zinc chromate primer complying with FS TT-P-645.

D. Anchorage Devices:
   1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.
   2. Hot-dip galvanize steel assemblies after fabrication, comply with ASTM A123, 2.0 ounce minimum coating.

E. Fasteners:
   1. Aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened.
   2. Provide concealed fasteners wherever possible.
   3. For exposed locations, provide Phillips flathead screws with finish matching item fastened.
   4. For concealed locations, provide manufacturer's standard fasteners.

F. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

G. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

H. Touch-Up Primer for Galvanized Components: Zinc oxide conforming with FS TT-P-641.

I. Glazing Gaskets:
   1. Compression type design, replaceable, molded or extruded, of neoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
   2. Profile and hardness as required to maintain uniform pressure for watertight seal.

J. Weatherstripping:
   1. Wool pile conforming to AAMA 701.2.
   2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

K. Internal Sealants and Baffles.

2.4 GLASS AND GLAZING ACCESSORIES

A. Refer to Section 08 81 00.

2.5 FABRICATION

A. Coordination of Fabrication:
   1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
   2. Fabricate units to withstand loads which will be applied when system is in place.

B. General
1. Conceal fasteners wherever possible.
2. Reinforce work as necessary for performance requirements, and for support to structure.
3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators which will prevent contact and corrosion.
4. Comply with Section 08 81 00 for glazing requirements.

C. Aluminum Framing:
1. Provide members of size, shape and profile indicated, designed to provide for glazing from exterior or interior.
2. Provide manufacturer's standard thermal break between exterior and interior aluminum surfaces.
3. Fabricate frame assemblies with joints straight and tight fitting.
4. Reinforce internally with structural members as necessary to support design loads.
5. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
6. Seal horizontals and direct moisture accumulation to exterior.
7. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
8. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without detrimental to appearance or performance.
9. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.

D. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

E. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil canning".

2.6 FINISHES

A. Anodized Finish: Clear, with clear protective composite coating.

B. Anodized Finishing: Prepare aluminum surfaces for specified finish; apply shop finish in accordance with the following:
1. Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612-02. Aluminum extrusions shall be produced from quality controlled billets meeting AA-6063-T5.
a. Exposed surfaces shall be free of scratches and other serious blemishes.
b. Extrusions shall be given a caustic etch followed by an anodic oxide treatment and then sealed with an organic coating applied with an electrodeposition process.
c. The anodized coating shall comply with all of the requirements of AAMA 612-02: Voluntary Specifications, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent

Organic Coatings on Architectural Aluminum. Testing shall demonstrate the ability of the finish to resist damage from mortar, salt spray, and chemicals commonly found on construction sites, and to resist the loss of color and gloss.

d. Overall coating thickness for finishes shall be a minimum of 0.7 mils.

e. CASS Corrosion Resistance Test, CASS 240/ASTM B368 Test Method. Other AAMA 2605 Performance Tests specified in these specifications, such as: 7.3 Dry Film Hardness; 7.8.2 Salt Spray Resistance; 7.9.1.2 Color Retention, South Florida; 7.9.1.4 Gloss Retention, South Florida.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with Work in accordance with Section 01 40 00.

3.2 INSTALLATION

A. Erection Tolerances:
   1. Limit variations from plumb and level:
      a. 1/8 inch in 10 feet vertically.
      b. 1/8 inch in 20 feet horizontally.
   2. Limit variations from theoretical locations: 1/4 inch for any member at any location.
   3. Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch from flush surfaces not more than 2 inches apart or out-of-flush by more than 1/4 inch.

B. Install doors and hardware in accordance with manufacturer's printed instructions.

C. Set units plumb, level and true to line, without warp or rack of frame.

D. Anchor securely in place, allowing for required movement, including expansion and contraction.

E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or preformed separators to prevent contact and corrosion.

F. Set sill members in bed of sealant. Set other members with internal sealants and baffles to provide weathertight construction.

G. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 07 92 00.

H. Glazing: Refer to requirements of Section 08 81 00.

3.3 ADJUSTING

A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

3.4 CLEANING

A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.

B. Clean metal surfaces exercising care to avoid damage.

END OF SECTION

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SECTION 08 71 00

FINISH HARDWARE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section comprises of furnishing and installing hardware specified herein and noted on drawings for a complete and operational system, including any electrified hardware components, systems, controls and hardware for aluminum entrance doors. Any door shown on the drawing and not specifically referenced in the hardware sets shall be provided with identical hardware as specified on other similar openings and shall be included in the general contractor and finish hardware suppliers bid. All doors that are fire rated shall be provided with fire rated hardware to comply with the local code requirements weather specified that way or not as a part of the general contractor and hardware supplier's base bid. The general contractor and hardware supplier shall coordinate cylinder types with all door manufacturers prior to submittal of finish hardware. There will be no additional change orders issued due to the general contractor or hardware supplier's failure to include any hardware item required by local code or required for functional and/or proper installation of hardware items due to failure to coordinate with other trades and/or related products as listed in 1.03 of this specification.

B. The General Contractor shall notify the Architect in writing of any discrepancies (five (5) days prior to bid date) that could and/or would result in hardware being supplied that is none functional, hardware specified and/or hardware that has not been specified that will result in any code violations and any door that is not covered in this specification. Failure of the general contractor to address any such issue shall be considered acceptance of the hardware specified and all discrepancies shall be corrected at the general contractor's expense and considered a part of their base bid. Change orders shall not be issued if deemed by the Architect and/or Judson ISD to fall under and/or be covered as a part of the General Contractor's base bid, due to failure to comply with this instruction notification.

C. Items include but are not limited to the following:
1. Hinges - Pivots
2. Flush Bolts
3. Exit Devices
4. Locksets and Cylinders
5. Push Plates - Pulls
6. Coordinators
7. Closers
8. Kick, Mop and Protection Plates
9. Stops, Wall Bumpers, Overhead Controls
10. Electrified Hold Open Devices
11. Thresholds, Seals and Door Bottoms
12. Silencers
13. Miscellaneous Trim and Accessories
14. Electrified Hardware Items, Controls and Power Supplies
15. Wiring diagrams
16. Training of Judson ISD staff as specified.

1.02 RELATED DOCUMENTS, drawings and general provisions of contract, including General and Supplementary Conditions, and Division 1 Specification sections, apply to this section.

1.03 RELATED WORK specified elsewhere that should be examined for its effect upon this section:

A. Section 06 20 00 - Finish Carpentry
B. Section 08 12 00 & 08 13 00 – Steel Doors and Frames
C. Section 08 14 16 – Flush Wood Doors
D. Sections within 08 31 13 – Access Doors
E. Section within 08 41 13 – Aluminum Entrances, Storefront and Window Framing
F. Sections within 08 81 00 – Glass and Glazing
G. Sections within 09 91 00 - Painting
H. Division 26 – Electrical
I. Division 28 - Access Control

1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:

A. NFPA-80 - Standard for Fire Doors and Windows
B. NFPA-101 - Life Safety Code
C. ADA - The Americans with Disabilities Act - Title III - Public Accommodations
D. ANSI-A 117.1 - American National Standards Institute - Accessible and Usable Buildings and Facilities
E. ANSI-A 156.5 - American National Standards institute -Auxiliary Locks and Associated Products
F. UFAS - Uniform Federal Accessibility Standards
G. UL - Underwriter's Laboratories
H. WHI - Warnock Hersey International, Testing Services
I. State and Local Codes including Authority Having Jurisdiction
J. UL10C – Positive Pressure
K. IBC-2018 – International Building Code
L. NFPA-70 – International Electrical Code

1.05 SUBMITTALS

A. HARDWARE SCHEDULES submit copies of schedule in accordance with Division 1, General Requirements. Schedule to be in vertical format, listing each door opening, including: handing of opening, all hardware scheduled for opening or otherwise required to allow for proper function of door opening as intended, and finish of hardware. At doors with door closers or door controls include degree of door opening. Supply the schedules all Finish Hardware within two (2) weeks from date purchase order is received by the hardware supplier.

B. Submit manufacturer's cut/catalog sheets on all hardware items and any required special mounting instructions with the hardware schedule. All key cabinet training information and letter requesting scheduled date for the three (3) month hardware installation site survey information shall be referenced in the hardware submittal. Hardware submittals which are submitted for approval with said information shall be rejected and marked, "Revise & Resubmit".

C. Certification of Compliance:
1. Submit any information necessary to indicate compliance to these specifications as required.
2. Submit a statement from the manufacturer that electronic hardware and systems being supplied comply with the operational descriptions exactly as specified.
3. Submit a factory letter as proof of factory certification as trained and qualified installers of electrified hardware (if requested) for the installation of all electrified door and/or card access hardware products in addition to being License by the state of Texas (No Exception).

D. Submit any samples necessary as required by the Architect.

E. Templates for finish hardware items to be sent to related door and frame suppliers within three (3) working days of receipt of approved hardware schedule.

F. Electronic Security Hardware: Coordinate installation of the electronic security with the Architect and provide installation and technical data to the Architect and other related sub-contractor(s). Upon completion of the electronic security hardware installation, verify that all components are working properly and state in the required guarantee that this inspection has been performed.

G. Wiring Diagrams: Provide complete wiring diagrams for each opening requiring electrified hardware, except openings where only magnetic hold-opens are specified. Provide a copy with each hardware schedule submitted after approval. Supply a copy with delivery of hardware to job site and another copy to owner at time of job completion.

H. Doors and Frames used in positive pressure opening assemblies shall meet UL10C in areas where this specification includes Seals for smoke door.

1.06 QUALITY ASSURANCE

A. Hardware supplier to be a qualified, Factory Authorized, direct distributor of the products to be furnished. In addition, the supplier to have in their regular employment an A.H.C. or person of equivalent experience who will be made available at reasonable times to consult with the Architect/Contractor and/or Judson ISD regarding any matters affecting the finish hardware on this project.

B. All hardware used in labeled fire or smoke rated openings to be listed for those types of openings and bear the identifying label or mark indicating UL. (Underwriter's Laboratories) approved for fire. Exit devices in non-labeled openings to be listed for panic.

C. The general contractor, hardware installer, Judson ISD representative (if needed) and manufactures representatives of the Locksets, Closers and Exit Devices after three (3) months of Judson I. S. D. acceptance of the facility shall do an on-site survey of hardware installation. Any item of hardware that is found to be defective shall be replaced at the manufacture expense. Any item of hardware found to be installed incorrectly shall, be repaired at the general contractor's expense. All hardware found to be loose or out of proper adjustment shall be adjusted for proper function and operation at the hardware installer's expense. After this survey has been completed the manufactures representatives of the Locksets, Closers and Exit Devices shall submit a written report of all findings to Judson ISD and the Architect.

1.07 DELIVERY, HANDLING AND PACKAGING

A. Furnish all hardware with each unit clearly marked and numbered in accordance with the hardware schedule. Include door and item number for each.

B. Pack each item of hardware completes with all necessary parts and fasteners.

C. Properly wrap and cushion each item to prevent scratches and dents during delivery and storage.

1.08 SEQUENCING AND SCHEDULING

A. Any part of the finish hardware required by the frame or door manufacturers or other suppliers that is needed to produce doors or frames is to be sent to those suppliers in a timely manner, so as not to interrupt job progress.

1.09 WARRANTY

All finish hardware shall be supplied with a Two- (2) year warranty against defects in materials and workmanship, commencing with substantial completion of the project except as follows:

1. All Closers to have a thirty- (30) year written warranty.
2. All Exit Devices to have a five- (5) year written warranty.
3. All Locksets to have a ten- (10) year written warranty.
4. All Continuous Hinges to have a life of installation written warranty.

PART 2 – PRODUCTS

2.01 FASTENERS

A. Furnish with finish hardware all necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for a long life under hard use.

B. Furnish fastenings where necessary with expansion shields, toggle bolts and other anchors designated by the Architect according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer. All closers and exit devices on labeled and none labeled wood doors shall be through-bolted with through-bolts and/or sex nut bolts as supplier by the hardware manufacturer. All thresholds shall be fastened with machine screws and anchors. Where specified in the hardware sets, security type fasteners of the type called for are to be supplied.

C. Design of all fastenings shall harmonize with the hardware as to material and finish.

2.02 ENVIRONMENTAL CONCERN FOR PACKAGING

Hardware shipped to the jobsite and/or project site shall be packaged in biodegradable packs such as paper or cardboard boxes and wrapping.

2.03 HINGES

A. All hinges to be of one manufacturer as hereafter listed for continuity and consideration of warranty. Provide one of the following manufacturers Select, Ives or Stanley.

B. Unless otherwise specified provide five-knuckle, heavy-duty, button tip, full mortise template type hinges with non-rising loose pins. Provide non-removable pins for out swinging doors at secured areas or as called for in this specification.

C. Provide exterior out-swinging door hinges of solid bronze, steel, aluminum or stainless-steel base metal with non-removable pins or security studs as called for in this specification (Reference 3.02 hardware sets).

D. Provide interior door hinges of wrought steel, polished and plated to match specified finish. Furnish three (3) hinges up to 90 inches high and one (1) additional hinge for every 30 inches or fraction thereof unless otherwise specified in 3.02 Hardware Sets.

E. Provide size 4½" x 4½" for all exterior and interior 1¾" thick doors up to and including 36 inches wide. Doors over 1¾" through 2¼" thick, use 5" x 5" hinges. Doors over 36 inches use 5" x 4½" unless otherwise specified in 3.02 Hardware Sets.

F. Were required to clear the trim and/or to permit the doors to swing 180 degrees furnish exterior and interior hinges of sufficient throw.

G. Provide heavy weight hinges on all exterior and interior doors over 36 inches in width.

H. At labeled exterior and interior door's steel or stainless steel, bearing-type hinges shall be provided. For all doors equipped with closers provide bearing-type hinges.

I. Finishes
1. At wood doors, hinges are to be plated to match adjacent hardware or as called for in 3.02 Hardware Sets.
2. At hollow metal doors, hinges are to be aluminum or stainless steel at exterior out-swinging doors, unless otherwise specified in 3.02 Hardware Sets.

J. Continuous hinges shall be Ives 112HD Full Mortise Geared Hinges or equal products manufactured by Stanley, Select or ABH shall be acceptable. Prep continuous hinges as required to receive electric power transfers as specified. Hinges shall be fire rated up to 90 minutes and shall have been tested to carry a maximum door weight of 450 plus pounds.

2.04 LOCK AND LOCK TRIM

A. All the locksets, latch sets, and trim to be of one manufacturer as hereafter listed for continuity of design and consideration of warranty. Locks, passage and privacy sets are to be Best 93K series with 15D lever (NO SUBSTITUTION). All locks, passage and privacy sets are to be provided in a dull chrome (626) finish.

B. Provide metal wrought box strike boxes and curved lip strikes with proper lip length to protect trim of the frame, but not to project more than 1/8 inch beyond frame trim or the inactive leaf of a pair of doors. All pairs of doors shall have a ¾" latch projection.

C. Mechanical Locks shall meet ANSI Operational Grade 1, Series 4000 as specified.
1. Hand of lock is to be easily reversible in the field or non-handed.
2. All lever trim is to be through-bolted through the door.
3. All pairs of doors shall be provided with ¾" latch throw or projection.
4. Provide 3-3/4" backset for doors specified with sound seal that would in any way conflict with the lock installation and/or closing of the door.

2.05 CYLINDERS AND KEYING

A. Provide locks and Exit devices requiring cylinders with small format interchangeable core 7 pin key system and comply with performance requirements of ANSI A156.5. All keys shall be manufactured of nickel silver material only. All interior locks are to be factory keyed to the existing Best Master key system as directed by Judson I. S. D. (NO SUBSTITUTION).

B Furnish all locks and Exit devices (Interior and Exterior) with temporary keyed construction cores for the duration of construction. Provide ten (10) construction keys and two (2) construction control keys total.

C. Permanent Cores shall be ordered and purchased by the Contractor. Shipped directly to Judson ISD for installation of permanent cores.

2.06 EXIT DEVICES

A. All exit devices and trim, including electrified items, to be of one manufacturer as hereafter listed and in the hardware sets for continuity of design and consideration of warranty; electrified devices and trim to be the same series and design as mechanical devices and trim.

B. Exit Devices to be “UL” listed for life safety. All exit devices for labeled doors shall have “UL” label for “Fire Exit Hardware”. All devices mounted on labeled wood doors are to be through-bolted or per the manufacturer’s listing requirements. All devices shall conform to NFPA 80 and NFPA 101 requirements.

C. All exit devices to be of a heavy duty, chassis mounted design, with one-piece removable covers, eliminating necessity of removing the device from the door for standard maintenance and keying requirements.

D. All trims to be through-bolted to the lock stile case. Lever design shall be the same as specified with the lock sets. All none fire rated exit devices shall be mounted with factory supplied through bolts, No Exceptions.

E. Exit Devices to be the modern push rail design. Finish shall be satin aluminum (628). Provide all none fire rated and none electrified Panic Exit Devices with keyed cylinder dogging feature.

C. All devices shall carry a five- (5) year warranty against manufacturing defects and workmanship.

D. Exit Devices shall be convertible in the field to accept electrified operations without purchasing completely new exit devices.

E. Exit Devices shall be Von Duprin 99 series or Apex 2100 series manufactured by Precision Hardware (NO SUBSTITUTION).

2.07 SURFACE MOUNTED DOOR CLOSERS

A. All closers for this project shall be the products of a single manufacturer for continuity of design and consideration of warranty. All door closers shall be mounted as to achieve the maximum degree of opening (trim permitting). Closers shall be mounted with factory supplier sex-nut-bolts, No Exception.

B. All closers to be heavy duty, surface-mounted, fully hydraulic, rack and pinion action with high strength cast iron cylinder to provide control throughout the entire door opening cycle.

C. Size all closers in accordance with the manufacturer’s recommendations at the factory.

D. All closers to have adjustable spring power sizes 1 through 4 or 6 as specified and separate tampers resistant, brass, non-critical regulating screw valves for closing speed, latching speed and back-check control as a standard feature unless specified otherwise.

E. All closer covers to be rectangular, full cover type of non-ferrous, non-corrosive material painted to match closer.

F. Closer to have heavy-duty arms. All closer arms shall be of sufficient length to accommodate the reveal depth and to insure proper installation

G. Supply appropriate arm assembly for each closer so that closer body and arm are mounted on non-public side of door opening and on the interior side of exterior openings, except where required otherwise in the hardware sets.
   1. All parallel arm mounted closers to be factory indexed to insure proper installation.
   2. Furnish heavy-duty cold forged parallel arms for all parallel arm mounted closers.

H. Provide closers with special application and heavy-duty arms as specified in the hardware sets or as otherwise called for to insure a proper operating, long lasting opening.

I. Finish: Sprayed enamel finish shall match other hardware.

J. Closers shall be LCN 4040XP (Exterior) & 1461HD/HDPA FC (Interior) or Stanley QDC100 (Exterior & Interior) series (NO SUBSTITUTION).

2.08 DOOR STOPS AND HOLDERS

A. Door stops are to be furnished for every door leaf. Every door is to have a floor, wall, or an overhead stop.

B. Place doorstops in such a position that they permit maximum door swing, but do not present a hazard of obstruction. Furnish floor strikes for floor holders of proper height to engage holders of doors. The contractor shall place wood blocking in all stud walls specified and scheduled to receive wall stops.

C. Where overhead stops and holders are specified, or otherwise required for proper door operation, they are to be heavy duty and of extruded brass, bronze or stainless steel with no plastic parts as specified.

D. Finish: Same as other hardware where available.

E. Acceptable Products
   1. Floor and wall stops as listed in hardware sets. Equivalent products as manufactured by Ives, Rockwood and Trimco are acceptable.

2.09 PUSH PLATES, DOOR PULLS, AND KICKPLATES

A. All push plates, door pulls, kick plates and other miscellaneous hardware as listed in hardware sets. Equivalent products as manufactured by Ives, Rockwood and Trimco are acceptable.

B. Kick plates to be 10 inches high and Mop plates to be 6 inches high, both by 2 inches or 1 inch less than door width (LDW) as specified. They are to be of 16 gauge (.050 inches) thick stainless steel. For door with louvers or narrow bottom rails, kick plate height to be 1 inch less dimension shown from the bottom of the door to the bottom of the louver or glass.

C. Where required armor plates, edge guards and other protective hardware shall be supplied in sizes as scheduled in the hardware sets.

D. Finish: Same as other hardware where available.

2.10 FLUSH BOLTS AND COORDINATORS

A. Provide Flush bolts with Dust Proof Strikes as indicated in the individual hardware sets by Ives, Rockwood and Trimco are acceptable. Finish shall match adjacent hardware.

2.11 THRESHOLDS AND SEALS

A. Provide materials and finishes as listed in hardware sets. Equivalent product by National Guard Products, Reese and Zero are acceptable. All thresholds must be in accordance with the requirements of the ADA and ANSI A117.1.

B. Provide thresholds with wood screws and plastic anchors. Supply all necessary anchoring devices for weather strip and sound seal.

C. Seals shall comply with requirements of UL10C. All thresholds, door bottoms and weather stripping shall be provided with silicone inserts as specified in 3.02 Hardware Sets.

D. Seals shall comply with the requirements of the Wood Door Manufacturer's certification requirements.

2.12 FINISHES

A. Finishes for all hardware are as required in this specification and the hardware sets.

B. Special care is to be taken to make uniform the finish of all various manufactured items.

2.13 DOOR SILENCERS

A. Provide door silencers at all openings without gasket. Provide two- (2) each at each pair of doors and three (3) or four- (4) each for each single door (coordinate with the frame manufacturer).

2.14 KEY CABINET

A. Provide a key cabinet Lund 1203 for installation by the contractor as instructed by the Architect and Judson I. S. D. (VERIFY IF REQUIRED WITH JUDSON ISD).

2.15 PROPRIETARY PRODUCTS

A. References to specific products are used to establish quality standards of utility and performance. Unless otherwise approved provide only the specified product.

B. All other materials, not specifically described, but required for a complete and proper finish hardware installation, are to be selected by the Contractor, subject to the approval of the Architect and Judson ISD.

C. Architect and Judson ISD reserve the right to approve all the substitutions proposed for this specification. All requests for substitution to be made prior to bid in accordance with Division 1, General Requirements, and are to be in writing, hand delivered to the Architect. Two (2) copies of the manufacturer's brochures and a physical sample of each item in the appropriate design and finish shall accompany requests for substitution.

PART 3 - EXECUTION

3.01 INSTALLATION OF FINISH HARDWARE

A. Hardware is to be installed by experienced finish hardware installers with a minimum of ten (10) years of experience in the installation of finish hardware after a pre-installation meeting between the hardware supplier, hardware Manufacturers representative, electrical contractor, security contractor, hollow metal supplier, wood door supplier and installer. Factory certification of qualified installers shall be required for the installation of all electrified door and/or card access hardware products in addition to being License by the state of Texas (No Exception).

B. Check hardware against the reviewed hardware schedule upon delivery. Store the hardware in a dry and secure location to protect against loss and damage.

C. Install finish hardware in accordance with approved hardware schedule and manufacturers' printed instructions. Pre-fit hardware before finish is applied to door; remove and reinstall after finish is complete and dry. Install and adjust hardware so that parts operate smoothly, close tightly, and do not rattle.

D. Mortise and cutting to be done neatly, and evidence of cutting to be concealed in the completed and finished work. Protect all Finish hardware from scratching or other damage.

3.02 HARDWARE SETS

Allegion Id: OPT0182732
Hardware Group No. 002

For use on Door #(s):
A144

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
6	EA	CYLINDER	AS REQUIRED	626	BES
		BALANCE HARDWARE	BY DOOR MANUFACTURER		

-COORDINATE HARDWARE WITH DOOR MFR. VERIFY AND SUPPLY CYLINDER TYPE & QUANITY AS REQUIRED

Hardware Group No. 201 – STOREROOM FUNCTION

For use on Door #(s):
A142

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D 15D S3	626	BES
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	SURFACE CLOSER	1461 HD FC TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 203 – STOREROOM FUNCTION

For use on Door #(s):
A150 A149

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D 15D S3	626	BES
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 205 – STOREROOM FUNCTION

For use on Door #(s):
A152

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	9K37D15D S3	626	BES
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH ST-1595 TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328-2 PCS JAMB HEIGHT	AA	ZER
1	EA	GASKETING	429-1 PC HEADER WIDTH	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	65A-V3 FRAME WIDTH	A	ZER

Hardware Group No. 343 – PASSAGE WITH INDICATOR DEADLOCK FUNCTION

For use on Door #(s):
A128 A130 C118 A143 A151

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE	9K3ON 15D S3	626	BES
1	EA	DOOR BOLT OCC IND	B571 X (6) 61-509	626	SCH
1	EA	SURFACE CLOSERS	1461 HD FC TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	COAT HOOK	582M	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 343A – PRIVACY LOCK FUNCTION

For use on Door #(s):
A109 A110 A111 A112 A256 A260

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	9K3OL 15D S3	626	BES
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	COAT HOOK	582M	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 503 – CLASSROOM FUNCTION

For use on Door #(s):
A117 A127 A129 A133 A146

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	9K37R15D S3	626	BES
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 710AM

For use on Door #(s):
A126

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY-DOOR HEIGHT	628	IVE
1	EA	KEYED MULLION	KR4954-154-MT54	689	VON
1	EA	PANIC HARDWARE	CD-99-DT-SNB	628	VON
1	EA	PANIC HARDWARE	CD-99-NL-SNB	628	VON
4	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
4	EA	CYLINDER	AS REQUIRED	626	BES
2	EA	SURFACE CLOSER	1461 SCUSH FC TBSRT	689	LCN
1	EA	MULLION SEAL	8780N-MULLION HEIGHT	BK	ZER
		PERIMETER SEAL	BY FRAME MANUFACTURER		

Hardware Group No. 714AM

For use on Door #(s):
A126B

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY-DOOR HEIGHT	628	IVE
1	EA	KEYED MULLION	KR4954-154-MT54	689	VON
1	EA	PANIC HARDWARE	CD-99-DT	628	VON
1	EA	PANIC HARDWARE	CD-99-NL	628	VON
4	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
4	EA	CYLINDER	AS REQUIRED	626	BES
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-V3-FRAME WIDTH	A	ZER
1	EA	MULLION SEAL	8780N-MULLION HEIGHT	BK	ZER
		PERIMETER SEAL	BY FRAME MANUFACTURER		
		MEETING STILE SEAL	BY DOOR MANUFACTURER		

Hardware Group No. 715

For use on Door #(s):
A153

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CD-99-NL-SNB	628	VON
2	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
2	EA	CYLINDER	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH ST-1595 TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328-2 PCS JAMB HEIGHT	AA	ZER
1	EA	GASKETING	429-1 PC HEADER WIDTH	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-V3-FRAME WIDTH	A	ZER

Hardware Group No. C201 - ACCESS CONTROLLED

For use on Door #(s):
A134

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC STRIKE	8300C-2001M-2004M-2006M	630	HES
1	EA	STOREROOM LOCK	9K37D 15D LESS STRIKE	626	BES
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	SURFACE CLOSER	1461 HD/HDPA FC TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
		POE POWER	BY SECURITY CONTRACTOR		
		CARD READER	BY SECURITY CONTRACTOR		

Hardware Group No. C201A - ACCESS CONTROLLED

For use on Door #(s):
A125 A125A A122

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC STRIKE	8300C-2001M-2004M-2006M	630	HES
1	EA	COMMUNICATION LOCK	9K37S 15D LESS STRIKE	626	BES
2	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	SURFACE CLOSER	1461 HD/HDPA FC TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
		PERIMETER SEAL	BY FRAME MANUFACTURER		
		POE POWER	BY SECURITY CONTRACTOR		
		CARD READER	BY SECURITY CONTRACTOR		

Hardware Group No. C714M-EX – ACCESS CONTROLLED

For use on Door #(s):
X104 X105 X108

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONTINUOUS HINGE	A110HD R EA12-EZ CON-DR HEIGHT	628	ABH
1	EA	KEYED MULLION	KR4954-154-MT54	689	VON
1	EA	ELEC PANIC HARDWARE	RX-99-DT-SNB 24 VDC CON	628	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL-SNB-24VDC CON	628	VON
2	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
2	EA	CYLINDER	AS REQUIRED	626	BES
2	EA	SURFACE CLOSER	4040XP SCUSH ST-1595 TBSRT	689	LCN
2	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328-2 PCS JAMB HEIGHT	AA	ZER
1	EA	GASKETING	429-1 PC HEADER WIDTH	AA	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-V3-FRAME WIDTH	A	ZER
1	EA	MULLION SEAL	8780N-MULLION HEIGHT	BK	ZER
1	EA	POWER SUPPLY	PS902 900-4R (VERIFY IF REQUIRED)	LGR	SCE
		CARD READER	BY SECURITY CONTRACTOR		

Hardware Group No. C715 – ACCESS CONTROLLED

For use on Door #(s):
A145

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	A110HD R EA12-EZ CON-DR HEIGHT	628	ABH
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL 24 VDC CON	628	VON
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	CYLINDER	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH ST-1595 TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328-2 PCS JAMB HEIGHT	AA	ZER
1	EA	GASKETING	429-1 PC HEADER WIDTH	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-V3-FRAME WIDTH	A	ZER
1	EA	POWER SUPPLY	PS902 900-4R (VERIFY IF REQUIRED)	LGR	SCE
		CARD READER	BY SECURITY CONTRACTOR		

Hardware Group No. C715A – ACCESS CONTROLLED

For use on Door #(s):
A126A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	A110HD R EA12-EZ CON-DR HEIGHT	628	ABH
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL 24 VDC CON	628	VON
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	CYLINDER	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-V3-FRAME WIDTH	A	ZER
1	EA	POWER SUPPLY	PS902 900-4R (VERIFY IF REQUIRED)	LGR	SCE
		PERIMETER SEAL	BY FRAME MANUFACTURER		
		CARD READER	BY SECURITY CONTRACTOR		

Hardware Group No. C715-EX – ACCESS CONTROLLED

For use on Door #(s):
X100 X101 X103 X106 X107 X109

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	A110HD R EA12-EZ CON-DR HEIGHT	628	ABH
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL 24 VDC CON	628	VON
1	EA	PERMANENT CORE	MATCH EXISTING KEY SYSTEM	626	BES
1	EA	CYLINDER	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH ST-1595 TBSRT	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328-2 PCS JAMB HEIGHT	AA	ZER
1	EA	GASKETING	429-1 PC HEADER WIDTH	AA	ZER
1	EA	DOOR SWEEP	39A LENGTH AS REQ	A	ZER
1	EA	THRESHOLD	655A-V3-FRAME WIDTH	A	ZER
1	EA	POWER SUPPLY	PS902 900-4R (VERIFY IF REQUIRED)	LGR	SCE
		CARD READER	BY SECURITY CONTRACTOR		B/O

END OF **SECTION**

SECTION 08 81 00

GLASS AND GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide glazing of the types, sizes and locations indicated on Drawings and specified herein. The work includes glass and glazing for:
   1. Window wall/storefront construction.
   2. Entrances and other doors, sidelights, transoms, and borrowed lights.
   3. Interior Translucent Glazing.

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 06 41 00 – Custom Casework: Casework mirrors, framed glass doors and glass shelving.

B. Section 07 92 00 – Joint Sealants: Sealant and backer rods.

C. Section 08 13 00 – Standard Steel Doors.

D. Section 08 14 16 – Flush Wood Doors.

E. Section 08 41 13 – Aluminum Entrances and Storefront: Storefront and entrance door framing.

F. Section 09 99 50 – Finish / Color Schedule.

G. DEFINITIONS: "Glass" includes prime glass, processed glass, and fabricated glass products, including glazing plastics. "Glazing" includes glass installation and materials used to install glass.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 252: Fire Tests of Door Assemblies.

B. Underwriters Laboratories, Inc. (UL):
   1. UL 10 B: Standard for Safety of Fire Tests of Door Assemblies.
   2. UL 10 C: Standard for Safety of Positive Pressure Tests of Door Assemblies.

C. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

D. Glass Association of North America (GANA)
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

E. The International Building Code – 2018 edition.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: At locations where fire rating is required, provide fire rating glazing manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.
   1. Fire Rating: 90 minutes with hose stream.
   2. Fire protective, safety rated clear glazing tested in accordance with NFPA 80, NFPA 252, UL 10B and UL 10C.
   3. Testing Laboratory: Fire test shall be conducted by a nationally recognized independent testing laboratory.

B. Listings and Labels:
   1. Fire rated glazing shall be under current follow-up service by a nationally recognized independent testing laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

B. Samples: Submit 12 inch square samples of each type of glass indicated except for clear single-pane units.

C. Certificate: Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
   1. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
   1. Safety Glass Standard: CPSC 16 CFR 1201 and ANSI Z97.1.
   2. Prime Glass Standard: FS DD-G-451.
   3. Heat-Treated Glass Standard: FS DD-G-1403.
   4. Fire Resistance Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E 163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Thermal and Solar Optical Performance: Measured or calculated in accordance with the following:
   1. Maximum U-Values: Comply with ICC IEEC for climate zone in which project is located. Measure in accordance with NFRC 200.
   2. Maximum SHGC: Comply with ICC IEEC for climate zone in which project is located. Measure in accordance with NFRC 200.
   3. Solar Optical Properties: NFRC 300.

C. Labels: Install glass with factory or shop applied identification labels indicating manufacturer and glass quality. Leave labels in place until removal and final cleaning is approved by the Architect.

D. Adhesives and sealants shall be low emitting in accordance with the current VOC content limits of South Coast Air Quality Mgt. District (SCAQMD) Rule #1168.

E. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.8 JOB CONDITIONS

A. Pre-Installation: Meet with Glazier and other trades affected by glass installations, prior to beginning of installation.

B. Do not perform work under adverse weather or job conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommended by manufacturer.

1.9 PRODUCT WARRANTY

A. Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. General Warranty: Provide a two year guarantee signed by the Installer that materials and workmanship are free of defects. Installations having water leakage, dust penetration or obvious air loss or infiltration shall be considered defective and shall be corrected at no additional cost to the Contract.
   1. The use of surface applied sealant shall not be an acceptable remedy under this Warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Primary Glass Products:
   1. Guardian Industries, Inc.
   2. Binswanger Glass Co.
   3. Old Castle
   4. AGC
   5. TruLite Glass and Aluminum Solutions
   6. PPG Industries, Inc.

B. Substitutions: In accordance with Section 01 60 00.

2.2 GLASS PRODUCTS, GENERAL

A. Primary Glass Standard: Provide primary glass which complies with ASTM C1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern. Glass manufacturer shall be responsible for providing heat-treated panes of kind as follows:
   1. Kind HS, heat-strengthened panes where determined by manufacturer to satisfy wind loading or thermal stress requirements.
   2. Kind FT, tempered panes where indicated on drawings, or if not indicated, where safety glass is required to satisfy safety glazing requirements.

C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.3 PRIMARY GLASS PRODUCTS

A. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), 1/4 inch (6.0 mm) thickness unless otherwise indicated.

B. Tinted Float Glass: Type I (transparent glass, flat), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select); 1/4 inch (6.0 mm) thick. Color of tint as follows:
   1. Manufacturer's standard tint, with visible light transmittance of 44 percent and shading coefficient of 0.67 for 1/4 inch thick glass. PPG Solargray as manufactured by PPG Industries, Inc.; or approved equal.

2.4 **HEAT-TREATED GLASS PRODUCTS:** Manufacture heat-treated glass by using horizontal (roller hearth) manufacturing process as required to produce "tongless" or "free of tong marks" appearance.

A. Uncoated Clear Heat-Treated Float Glass: Condition A uncoated surfaces, Type I transparent glass, flat, Class 1 clear, Quality q3 (glazing select), kind as indicated below:
   1. Clear Heat Strengthen Glass: Kind HS; 1/4 inch thickness.
   2. Clear Tempered Glass: Kind FT; fully tempered prime glass which has been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength; 1/4 inch thickness.

B. Uncoated Tinted Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select), with tint color and performance characteristics for 1/4" thick glass matching those indicated for non-heat-treated tinted float glass; Kind HS (heat strengthened) or FT (fully tempered).

2.5 SEALED INSULATING GLASS UNITS

A. General: Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for

performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.

1. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds, and conditions of glass products indicated.
2. Performance Classification per ASTM E774: Class A.
3. Total thickness of each Pane: 1/4 inch.
4. Air Space Thickness: 1/2 inch.
5. Sealing System: Manufacturer's standard.
6. Spacer Material: Manufacturer's standard.
7. Desiccant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.

B. Clear Insulating Glass Units: Manufacturer's standard Low E units complying with the following requirements:

1. Exterior Pane: Clear float glass with low E, PPG Solarban 60(2) Clear, safety, tempered.
2. Interior Pane: Clear safety, tempered float glass.
3. Use at exterior doors as scheduled.

C. Tinted Insulating Glass Units: Manufacturer's standard Low E units complying with the following requirements:

1. Exterior Pane: PPG Solarban 60(2) Solar Gray, or approved equal.
2. Interior Pane: Clear float glass.
3. Performance Characteristics:
   a. Visible light transmittance: 35 percent minimum.
   b. Winter nighttime U-value: 0.29.
   c. Solar Heat Gain Coefficient (SHGC): 0.24
   d. Shading coefficient: 0.28.
   e. Outdoor visible reflectance: 6 percent.

2.6 GLAZING SEALANTS AND COMPONENTS

A. Provide color of exposed sealant/compound indicated or if not otherwise indicated, as selected by Architect from manufacturer's standard colors, or black if no color is so selected. Comply with manufacturer's recommendations for selection of hardness, depending upon the location of each application, conditions at time of installation, and performance requirements as indicated. Select materials, and variations or modifications, carefully for compatibility with surfaces contacted in the installation.

B. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and Uses.

4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

C. 2-Part Polysulfide Glazing Sealant: Elastomeric polysulfide sealant complying with FS TT-S-227, Class A, Type 2; specially compounded and tested to show a minimum of 20 years resistance to deterioration in normal glazing applications.

D. 1-Part Non-Acid-Curing Silicone Glazing Sealant: Elastomeric silicone sealant complying with FS TT-S-001543, Class A, nonsag. Provide acid type recommended by manufacturer where only nonporous bond surfaces are contacted; provide nonacid type recommended by manufacturer where one or more porous bond surfaces are contacted.

E. 1-Part Polysulfide Glazing Sealant: Polysulfide elastomeric sealant complying with FS TT-S-00230, Class A, Type II; compounded specifically for exterior exposed glazing.

F. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

2.7 TRANSLUCENT GLASS

A. Interior, 1/4 inch satin laminated with white PVB interlayer, color/pattern to be selected, fully tempered safety glass.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

B. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.

C. Spacers: Neoprene or EPDM, 40-50 durometer hardness with proven compatibility with sealants used.

D. Compressible Filler (Rod): Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

C. Cure Glazing: Cure glazing compounds in compliance with the manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

3.2 PREPARATION FOR GLAZING

A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

B. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.3 GLAZING

A. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

B. Install all items in accordance with recommendations of the manufacturer and to conform to the drawings. Assure that openings are square and without twist. Measure each opening in the field and cut glass to fit the actual openings with required clearances and bite on all sides. Place movable items such as operating sash in closed and locked position until glazing compound has thoroughly set. Inspect rebates and repair any condition detrimental to the final appearance or performance of the glass. Set glass with equal bearing along the entire perimeter, in full beds of glazing putty or compound or with other full perimeter seal, with proper clearances and setting blocks. Set so as to prevent displacement.

C. Setting Blocks: Install setting blocks of proper size in sill rabbet, located a distance of one fourth of the overall glass width from each corner. Set blocks in thin course of heel-bead compound, if any.

D. Spacers: Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or pre-shimmed tapes are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

E. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in channel at heel of jambs and head (do not leave voids in sill channels), except as otherwise indicated and depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.

Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

F. Sealants: Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to the glass and channel surfaces.

1. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
2. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.
3. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that

gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.

G. Gasket Glazing: Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in glazing system.

3.4 CURE, PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealants for high early strength and durability.

B. Damaged Glazing: Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Washing Glass: Wash and polish glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

END OF SECTION

SECTION 08 87 23

SAFETY AND SECURITY FILM

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SECTION INCLUDES

A. Safety and security films.

1.3 RELATED SECTIONS

A. Section 08 81 00 - Glazing: Substrate for application of safety and security film.

B. Section 09 99 50 – Finish / Color Schedule.

1.4 REFERENCES

A. American National Standards Institute (ANSI):
1. ANSI Z97.1 - Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

B. ASTM International (ASTM):
1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
2. ASTM D1044 - Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
3. ASTM D3330 - Standard Test Methods for Peel-Adhesion at 180 Degree Angle.
a. ASTM D4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing. Section 7: Puncture Strength.
4. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
5. ASTM E903 - Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.

C. Consumer Products Safety Commission (CPSC):
1. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

1.5 DEFINITIONS

A. Emissivity: The ability of a surface to absorb far-infrared heat and to reflect it. The lower the emissivity, the lower the far-infrared heat absorption and the greater the far-infrared heat reflectance.

B. Far-Infrared Heat: Heat radiated from objects at temperatures below 1300 degrees F such as heat radiated from: room objects, objects heated by the sun, or a home heating system. Far-infrared heat is different from near-infrared heat that is heat radiated from objects at highly elevated temperatures such as the sun.

C. Neutral Solar Films: Films that allow visible light to pass without distortion of color and that have equal visible light transmission properties at all wavelengths in the visible range from 380 to 780 nanometers.

D. Light to Solar Heat Gain Ratio: Ratio of visible light transmission to Solar Heat Gain Coefficient for a glazing system.

E. Solar Heat Gain Coefficient (SHGC): The fraction of incident solar radiation that actually passes through that window, including solar energy that is both directly transmitted and that which is absorbed and subsequently released inwardly by re-radiation and conduction. SHGC is expressed as a number between 0 and 1. The lower a window's SHGC, the less solar heat it transmits. This number is the mathematical complement of the Total Solar Energy Rejection (TSER) value: The sum of the TSER (in decimal form) of a glazing system and its SHGC value is 1; therefore, 1 - TSER = SHGC.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Submit for each product specified indicating:
1. Performance properties.
2. Preparation and installation instructions and recommendations.
3. Storage and handling recommendations.

C. Samples: For each type of safety and security film specified, two (2) samples, 12 inches square.

D. Qualification Data: Submit documentation indicating qualifications of safety and security film manufacturer.

E. Operation and Maintenance Data: Submit for safety and security film to include in maintenance manuals.

F. Warranty: Submit sample special warranty specified in this section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that has documented experience manufacturing safety and security films similar to that used for this project.

B. Installer Qualifications: A firm that is authorized by safety and security film manufacturer to install film in accordance with guidelines set forth by the manufacturer.

C. Source Limitations: Obtain each type of safety and security film from same manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to evaluate surface preparation techniques and application workmanship.
1. Construct mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at project site to discuss methods and procedures relating to installation of the safety and security films.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials in manufacturer's protective packaging.

B. Store and protect materials according to manufacturer's written recommendations to prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 SITE CONDITIONS

A. Ambient Conditions: Maintain temperature, humidity, and ventilation within limits recommended by manufacturer.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace films that fail within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Llumar, SCL SR PS15.

B. 3M Corporation, S140 Series

C. Substitutions: Will not be considered.

2.2 SAFETY AND SECURITY FILMS

A. Safety and Security Film:
1. Total Solar Transmittance: 76 percent.
2. Total Solar Reflectance: 10 percent.
3. Total Solar Absorptance: 14 percent.
4. Visible Light Transmission: 83 percent.
5. Visible Light Reflection - Exterior: 11 percent.
6. Visible Light Reflection - Interior: 11 percent.
7. Winter U-Value: 1.03.

8. Shading Coefficient: 0.92.
9. Total Solar Energy Rejected (TSER): 20 percent.
10. Emissivity: 0.84.
11. Solar Heat Gain Coefficient (SHGC): 0.80.
12. Ultraviolet Rejection: 99 percent.
13. Light-to-Solar Heat Gain Ratio (LSG): 1.04.
14. Summer Solar Heat Gain Reduction: 8 percent.
15. Winter Heat Loss Reduction: 0 percent.
16. Glare Reduction: 8 percent.
17. Film Thickness: 0.015 inches.
18. Film Color: Clear.

2.3 ACCESSORIES

A. General: Provide accessories either manufactured by or acceptable to safety and security film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Adhesive: Weatherable, acrylic pressure-sensitive acrylic type as recommended by safety and security film manufacturer. Protect adhesive from contamination by applying a release liner that will be removed and discarded at installation.

C. Cleaners, Primers, and Sealers: Types recommended by safety and security film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements and for conditions affecting performance of safety and security film including glass that is broken, chipped, cracked, abraded, or damaged in any way.

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

3.2 PREPARATION

A. Comply with manufacturer’s written instructions for surface preparation.

B. Clean substrates thoroughly prior to installation.

C. Prepare substrates using methods recommended by film manufacturer to achieve the best results for the substrate under project conditions.

D. Protect window frames and surrounding surfaces to prevent damage during installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Install film continuously, but not necessarily in one (1) continuous length. Install with no gaps or overlaps.
   1. If seamed, make seams non-overlapping.

C. Do not remove release liner from film until just before each piece of film is cut and ready for installation.

D. Install film with mounting solution and custom cut to the glass with neat, square corners and edges to within 1/8-inch of window frame.

E. Remove air bubbles, blisters, and other defects. Be careful to remove "fingers" to eliminate any contamination or excess water pockets. It is crucial to remove as much water as possible during installation.

F. A final squeegee pass over the entire pane using a Blue Max Blade with an extended handle design (or Thor's Hammer) is recommended.

3.4 FIELD QUALITY CONTROL

A. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, wrinkles, banding, thin spots or pinholes.

B. If installed film does not meet these criteria, remove and replace with new film.

3.5 CLEANING AND PROTECTION

A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended by safety and security film manufacturer.

C. Replace films that cannot be cleaned.

D. Protect installed products until completion of project.

E. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 09 05 61

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:
   1. Carpets and Carpet Tile.
   2. Resilient Tile Flooring.
   3. Ceramic Floor Tile and Quarry Tile

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and pH.

E. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.2 RELATED REQUIREMENTS

A. Section 01 22 00 – Unit Prices: If required, provide unit pricing (per square foot) for remediation treatment.

1.3 REFERENCES

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2012.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2009).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.5 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and pH limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report: Include:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and pH test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Submit report to Owner.
   7. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.6 QUALITY ASSURANCE

A. Moisture and pH testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Owner when specified ambient conditions have been achieved and when testing will start.

1.7 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, and suitable for adhesion of flooring without further treatment.
1. Thickness: 1/8 inch (3 mm), maximum.
2. If testing agency recommends any particular products, use one of those.

PART 3 - EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
   a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
   b. Removal of existing floor covering.
2. Preliminary cleaning.
3. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. pH tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
6. Specified remediation, if required.
7. Patching, smoothing, and leveling, as required.
8. Other preparation specified.
9. Adhesive bond and compatibility test.
10. Protection.

B. Remediation’s:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.

3. Excessive pH: If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.4 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.5 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity. F. Report: Report the information required by the test method.

3.6 PH TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Note: This procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range pH paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the pH paper into the water, remove it, and compare immediately to chart to determine pH reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value is over 10.

3.7 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.8 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.9 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

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SECTION 09 21 16

GYPSUM BOARD SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Gypsum board and joint treatment including:
   1. Glass mat faced gypsum board.

B. Gypsum sheathing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry: Wood blocking.

B. Section 06 41 00 – Custom Casework; gypsum board used in millwork.

C. Section 07 21 11 – Batt Insulation: Thermal insulation.

D. Section 08 12 00 – Standard Steel Frames.

E. Section 08 31 13 – Access Doors: Metal access panels.

F. Section 09 22 16 – Non-Structural Metal Framing.

G. Section 09 91 00 – Painting.

H. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCES

A. ASTM International:
   1. ASTM C36 – Standard Specification for Gypsum Wallboard.
   2. ASTM C79 – Standard Specification for Gypsum Sheathing Board.
   3. ASTM C442 – Standard Specification for Gypsum Backing Board and Coreboard.
   4. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
   5. ASTM C630 – Standard Specification for Water-Resistant Gypsum Backing Board.
   6. ASTM C645 – Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
   7. ASTM C665 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   8. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
   9. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.

10. ASTM C1002 – Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
11. ASTM C1178 – Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2008.
12. ASTM C1280 – Standard Specification for Application of Gypsum Sheathing; 2009.
13. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions.
14. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

B. Gypsum Association:
1. GA-201 - Using Gypsum Board for Walls and Ceilings.
2. GA-214 - Recommended Specification: Levels of Gypsum Board Finish.
3. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

C. SCAQMD – Rule 1168 for Adhesive and Sealant Applications (current edition).

D. UL - Fire Resistance Directory.

1.4 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals: Procedures for submittals.

B. Shop Drawings: Indicate special details associated with horizontal separations and acoustic seals.

C. Product Data: Provide data on gypsum board, acoustical insulation, and accessories.

D. Samples: Submit two samples of each corner and edge reinforcement.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C754, GA-201, GA-214, and GA-216.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

C. Gypsum wallboard construction materials, including wallboard, accessories, fasteners and finishing materials shall be produced by one manufacturer.

D. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.6 REGULATORY REQUIREMENTS

A. Conform to UL - Fire Resistance Directory for fire rated assemblies in conjunction with Section 09 22 16.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Gypsum Board System:
   1. Georgia Pacific Corporation.
   2. National Gypsum Co. (Gold Bond)
   3. Temple-Inland Inc.
   4. United States Gypsum (USG) Co.

B. Gypsum Sheathing:
   1. Georgia Pacific Corporation.

C. Substitutions: Refer to Section 01 60 00 - Material and Equipment.

2.2 FRAMING MATERIALS

A. Studs and Tracks:
   1. Refer to Section 05 40 00 - Cold-Formed Metal Framing for exterior stud walls.
   2. Refer to Section 09 22 16 – Non-Structural Metal Framing for interior stud partitions.

B. Resilient Channels: Formed steel; minimum 25 gage thick; size and length as required, serrated face, flattened 'Z' profile.

C. Hangers: Galvanized annealed steel, 8 gage minimum, type to suit application, to rigidly support ceiling components in place, to deflection limits as indicated.

D. Fasteners: ASTM C1002 and GA-216.

E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

F. Adhesive: ASTM C557 and GA-216.

2.3 GYPSUM BOARD MATERIALS

A. Gypsum Board: ASTM C1396, fire resistive type, UL rated; 5/8 inch thick, maximum available length in place; ends square cut, tapered edges. Use fire rated type for all construction.
   1. Application: Use for non-exterior vertical surfaces and ceilings, except as otherwise noted.

B. Fire-Rated Mold-Resistant Gypsum Board: ASTM C 36 and C 1396; fire resistive, moisture/mold/mildew resistant paper on front, back and long edges; Gold Bond Brand XP Fire-Shield Wallboard, Type X.
   1. Thickness: 5/8 inch.
   2. Width: 4 feet.
   3. Length: 8 feet through 12 feet.
   4. Edges: Tapered.
   5. Mold and Mildew Resistance: Panel score of 8, when tested in accordance with ASTM D 3273.
   6. Application: For use at inside face of exterior walls.

C. Glass Mat Faced Gypsum Board: ASTM D 3273; gypsum panels with moisture-resistant core and coated inorganic fiberglass mat back surface designed to resist growth of mold and mildew.
   1. Interior Wall and Base Board:
      a. Thickness: 5/8 inch.
      b. Width: 4 feet.
      c. Edges: Tapered.
      d. Core: Type X; UL listed.
      e. Mold and Mildew Resistance: Panel score of 10, when tested in accordance with ASTM D3273.
      f. Surface Burning Characteristics: ASTM E84; zero flame spread.
      g. Product: Dens-Armor Plus Fireguard as manufactured by Georgia Pacific, or approved equal.
   2. Locations:
      a. First 3-1/2 inches above finish floor at all interior gypsum board partitions.
      b. Base of all millwork and cabinetry.
      c. As a substitution to fire-rated mold-resistant gypsum board at inside face of exterior walls.
   3. Exterior Sheathing Board; ASTM 1177, water repellent glass mat both sides, tapered long edges as follows:
      a. Standard Type: 1/2 inch thick; maximum available size in place.
      b. Surface Burning Characteristics: ASTM E84; zero flame spread, zero smoke.
      c. Mold Resistance: ASTM D3273; Panel score of 10.
      d. Dens-Glass Gold, as manufactured by Georgia-Pacific Corporation.

2.4 ACCESSORIES

A. Interior:
   1. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced, 3-1/2 inch thick; Noise Barrier or Sonobatts Sound Attenuation Blankets manufactured by Owens-Corning Fiberglass.
   2. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board; gunnable type as recommended by the gypsum manufacturer. Comply with the VOC content requirements in the applicable category of SCAQMD Rule 1168.
   3. Corner Beads: Galvanized metal; smooth rigid nose, perforated and knurled metal flanges; CB-114 by 114.
   4. Edge Trim: GA-201 and GA-216; Type L and U exposed reveal bead.
   5. Control Joint: Extruded vinyl formed with V shaped slot covered with removable flexible vinyl strip and complying with ASTM C1047.
   6. Joint Materials: GA-201 and GA-216; reinforcing tape, joint compound, adhesive, and water.
   7. Fasteners: ASTM C1002, Type S12 and GA-216.

B. Exterior:
   1. Elastomeric Joint Sealer at Gypsum Sheathing: Polyether base, moisture curing:
      a. Elongation: ASTM D412; 200 percent.
      b. VOC's: Zero percent.
      c. Solids: 100 percent.
      d. No solvents permitted.
      e. Product: GreatSeal LT-100 Liquid Tape.
   2. Tape: Two inches wide by 25 mils thick, non-reinforced.
      a. Product: Wall Guardian Universal Tape, StopAQ EZ Wrap Tape, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 – Administrative Requirements: Verification of existing conditions before starting work.

B. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

3.2 METAL STUD INSTALLATION

A. Install metal studs in accordance with Sections 05 42 00 and 09 21 16.

3.3 WALL FURRING INSTALLATION

A. Erect wall furring for direct attachment to concrete masonry and concrete walls.

B. Erect furring channels vertically; space maximum 16 inches on center, not more than 4 inches from floor and ceiling lines or abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

C. Install thermal insulation in conjunction with Section 07 21 00.

3.4 CEILING FRAMING INSTALLATION

A. Install in accordance with ASTM C754, GA-201 and GA-216.

B. Coordinate location of hangers with other work.

C. Install ceiling framing independent of walls, columns, and above ceiling work.

D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.

E. Laterally brace entire suspension system.

3.5 ACOUSTIC ACCESSORIES INSTALLATION

A. Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

B. Where scheduled on Drawings, place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

C. Install acoustic sealant at gypsum board perimeter at:
   1. Base layer of double layer gypsum board.
   2. Face layer of single layer gypsum board.

D. Caulk all penetrations of partitions by conduit, pipe, ductwork and rough-in boxes.

3.6 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA-201 and GA-216.

B. Erect single layer gypsum board vertically, with ends and edges occurring over firm bearing.

C. Provide abuse-resistant gypsum board at all classrooms (if applicable) extending from floor to 8 ft minimum above finish floor where gypsum partitions are scheduled.

D. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.

E. Use screws when fastening gypsum board to metal furring or framing.

F. Double Layer Applications: Place first layer perpendicular to framing or furring members. Place second layer perpendicular to first layer. Insure joints of second layer do not occur over joints of first layer.

G. Treat cut edges and holes in exterior gypsum soffit board with sealant.

H. Place control joints consistent with lines of building spaces and as directed by Architect. Coordinate to match with tile control joint where applicable.

I. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials and at other locations where detailed. Install reinforcing tape at internal corners.

3.7 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.

C. Tape and fill at concealed parts of partitions extending above ceiling, but sanding is not required.

D. Fill dimples at fastener heads and marred spots on face of board with one coat of joint compound and two coats finishing compound, in same manner as at joints.

E. Provide a Level 4 finish in accordance with GA-214. Coordinate with provisions of Section 09 91 00 - Painting.

F. Provide a level 5 finish where wall graphics are installed in accordance with GA-216.

Remove and re-install defective work.

END OF SECTION

SECTION 09 22 00

PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Portland cement plaster system.

1.2 RELATED SECTIONS

A. Section 09 21 16 – Gypsum Board Systems.

B. Section 09 22 13 – Metal Furring and Lathing.

C. Section 09 91 00 – Painting.

D. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCES

A. ASTM C91 - Masonry Cement.

B. ASTM C150 - Portland Cement.

C. ASTM C206 - Finishing Hydrated Lime.

D. ASTM C207 - Hydrated Lime for Masonry Purposes.

E. ASTM C897 - Aggregate for Job-Mixed Portland Cement Based Plasters.

F. ASTM C926 - Application of Portland Cement Based Plaster.

G. ASTM E119 - Methods for Fire Tests of Building Construction and Materials.

H. PCA (Portland Cement Association) - Plaster (Stucco) Manual.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide data on plaster materials, characteristics and limitations of products specified.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with PCA Plaster (Stucco) Manual.

B. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued.

Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum five years documented experience.

1.7 MOCKUP

A. Provide mockup of plaster system with accessories under provisions of Section 01 43 39.

B. Construct mockup, three feet long by three feet wide, illustrating surface finish and texture.

C. Mockup may not remain as part of the Work.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply plaster when substrate or ambient air temperature is less than 50 degrees F or more than 80 degrees F.

B. Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until cured.

PART 2 - PRODUCTS

2.1 PLASTER MATERIALS

A. Cement: ASTM C150, Type I Portland; gray.

B. Masonry Cement: ASTM C91, Type N

C. Lime: ASTM C206, Type S.

D. Aggregate:

1. Sand: ASTM C-144, natural sand and graded within the following limits:

a. Base Coat:

Percent Retained	Sieve Size
0	No. 4
0 to 10	No. 8
10 to 40	No. 16
30 to 65	No. 30
70 to 90	No. 50
95 to 100	No. 100

or locally available sand as approved such as "torpedo" sand.

b. Finish Coat: Same as base coat gradation, except all sand to pass No. 8 sieve, or Georgia Marble XO marble sand.

c. Bedding Coat: Same as base coat gradation, except all sand to pass through No. 16 sieve.

E. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

F. Bonding Agent: ASTM C631; type recommended for bonding plaster to concrete masonry surfaces.

G. Liquid Bonding Agent Admixtures: Acrylic polymer type; Acryl 60, or Thorobond as appropriate for substrate, manufactured by Thoro System Products.

H. Fiber: Fiberglass strands, 1/2 inch, alkaline resistant.

I. Air Barrier: Commercial underlayment conforming to the following properties:
1. Air Penetration: ASTM E1677, Type 1; 0.004 cfm/sf@75 Pa.
2. Water Vapor Transmission: ASTM E-96, Method B; 350 g/m2-24 hrs.
3. Water Penetration Resistance: AATCC-127; 210 cm.
4. Basis Weight; TAPPIT-41D; 2.1 oz/yd2.
5. Tear Resistance: ASTM D1117; 7-9 lbs.
6. Surface Burning Characteristics: ASTM E-84; Class A for Flame Spread and Smoke Developed.
7. Product: Tyvek StuccoWrap, as manufactured by DuPont, or approved equal.

2.2 CEMENT PLASTER MIXES

A. Mix and proportion cement plaster in accordance with PCA Plaster (Stucco) Manual and as indicated.

B. Mix Proportions:
1. Exterior Galvanized Metal Lath:
Scratch Coat to be:

1 part	Portland Cement, white.
2 parts	Masonry Cement.
2 1/2 to 4 parts	Sand
2 lb.	Fiber

Brown Coat to be:

1 part	Portland Cement, white.
2 parts	Masonry Cement.
3 to 5 parts	Sand
2 lb.	Fiber

2. Exterior Concrete or Masonry Surfaces:
a. Bond Coat: Bonding agent and Portland cement mortar.
b. Bedding Coat:
1 part White Portland Cement.
2 1/2 parts Sand.
1/2 part Hydrated Lime.

3. Finish Coat: Premix as approved or job mix as follows:
1 part Portland Cement, white.
2 parts Hydrated Lime.
3 parts Sand.

C. Protect mixtures from freezing, frost, contamination, and evaporation.

D. Do not retemper mixes after initial set has occurred.

E. Do not retemper finish coat plaster.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and site conditions under provisions of Section 01 40 00.

B. Masonry: Verify joints are cut flush and surface is ready to receive work of this Section. Verify no coatings exist on masonry surface other than those specified.

3.2 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

B. Clean concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.

C. Roughen smooth concrete surfaces and apply bonding agent. Apply in accordance with manufacturer's instructions.

3.3 PLASTERING

A. Preparation:
1. Clean masonry and concrete surfaces to receive direct application of plaster.
2. Remove loose particles and dust by brushing, compressed air, or other methods approved by the Architect.
3. Install lath in accordance with Section 09 22 13.

B. Plaster Application:
1. Thickness: Except where otherwise noted or required to member flush with adjoining work, provide plaster over metal lath in 3/4 inch thickness, measured from back of lath. Scratch and brown coats on soffit must be less than total thickness of 1 inch.
2. Apply scratch coat to a nominal thickness of 3/8 inch, brown coat to a nominal thickness of 3/8 inch, and a finish coat to a nominal thickness of 1/8 inch over metal lathed and self-furring reinforcement surfaces.
3. Moist cure scratch and brown coats. Apply brown coat immediately following initial set of scratch coat.
4. After curing, dampen base coat prior to applying finish coat.
5. Apply finish coat and wood float to a sand finish.

3.4 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 22 13

METAL FURRING AND LATHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall, ceiling, and furred space framing for plaster applications.

B. Metal lathing for wet plaster finish.

1.2 RELATED SECTIONS

A. Section 08 31 13 - Access Doors: Access panels.

B. Section 09 21 16 - Gypsum Board Systems.

C. Section 09 22 00 - Portland Cement Plaster.

D. Section 09 22 16 – Non-Structural Metal Framing.

E. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCES

A. ASTM C841 - Installation of Interior Lathing and Furring.

B. ASTM C847 - Metal Lath.

C. ASTM C1063 - Installation of Lathing and Furring for Portland Cement Plaster.

D. GA-600 - Fire Resistance Design Manual.

E. ML/SFA (Metal Lath/Steel Framing Association) - Specifications for Metal Lathing and Furring.

F. TLPCA/TBLP (Texas Lathing and Plastering Contractors Association and Texas Bureau for Lathing and Plastering - Manual for "Lath & Plaster Selection Data & Assemblies", current edition.

1.4 SYSTEM DESCRIPTION

A. Fabricate vertical wall and furred space framing to limit finish surface deflection to 1/180 under lateral point load of 100 lbs.

B. Fabricate horizontal ceiling and soffit framing to limit finish surface to 1/360 deflection under superimposed dead loads and wind uplift.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations and finish.

C. Samples: Submit two samples in size illustrating component design, material, and finish.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C841, GA-600, ML/SFA, ASTM C1063 and TLPCA/TBLP Manual.

B. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.7 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dale/Incor Industries.

B. National Gypsum Co., Gold Bond Building Products.

C. United States Gypsum.

D. Unimast Incorporated.

E. Substitutions: Under provisions of Section 01 60 00.

2.2 FRAMING MATERIALS

A. Furring Channels: Cold-rolled steel; 300 lbs./1000 lin. ft. or 16 gage thick, 1/2 inch deep x 3/4 inch high; length as required.

B. Furring Channels: Minimum 20 gage sheet steel; 7/8 inch deep; standard 1-3/8 to 2-3/4 inch width; lengths as required.

C. Main Ceiling Channels: Cold-rolled steel; 475 lbs./1000 lin. ft., or 16 gage thick, 3/4 inch deep x 1-1/2 inch high; length as required.

D. Hangers: Galvanized annealed steel, 8 gage minimum, type to suit application, to rigidly support ceiling components in place, to deflection limits as indicated.

E. Lateral Bracing: Formed steel; minimum 16 gage thick; size and length as required.

F. Casing Bead: Formed sheet steel; minimum 26 gage thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges.

G. Corner Bead: Formed sheet steel; minimum 26 gage thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with radiused edge.

H. Base Screed: Formed sheet steel; minimum 26 gage thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with bevelled edge.

I. Control and Expansion Joint Accessories: Formed sheet steel; minimum 26 gage thick; accordion profile, 2 inch expanded metal flanges each side.

2.3 LATHING MATERIALS

A. Metal Lath: ASTM C847; flat expanded diamond mesh; 3.4 lb/sq ft.

B. Corner Mesh: Formed sheet steel; minimum 26 gage thick; expanded flanges shaped to permit complete embedding in plaster; minimum 2 inch size.

2.4 ACCESSORIES

A. Anchorage: Tie wire, nails, screws and other metal supports, of type and size to suit application; to rigidly secure materials in place.

B. Polyethylene Sheet: Clear, 6 mil (0.15 mm) thick.

C. Tie Wire: Annealed galvanized steel, 18 gage for lath, 16 gage for channels.

2.5 FINISHES

A. Framing Materials: Galvanized at exterior applications, rust inhibitive primer at interior applications.

B. Hangers, Anchors, and Fastening Devices: Galvanized.

C. Lath Materials: Galvanized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 30 00.

B. Verify that surfaces conditions are ready to receive work.

3.2 WALL AND FURRED SPACE FRAMING

A. Install lathing and furring for Portland cement plaster work in accordance with ASTM C1063.

B. Erect wall furring by directly attaching to masonry or concrete walls.

C. Erect furring channels vertically; secure with fasteners on alternate channel flanges at maximum 24 inches oc.

D. Spacing furring channels maximum 16 inches on center, not more than 4 inches from floor and ceiling lines or abutting walls.

E. Where indicated on drawings, space resilient channels at maximum 24 inches on center. Place joints over framing members.

3.3 CEILING AND SOFFIT FRAMING

A. Install furring to height indicated. Erect after above ceiling or soffit work is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above ceiling work.

C. Securely anchor hangers to structural members or embed in structural slab. Space hangers to achieve deflection limits indicated.

D. Space main carrying channels at maximum 48 inch centers; not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Space furring channels perpendicular to carrying channels at maximum 16 inch centers, not more than 2 inches from perimeter walls, and rigidly secure. Lap splice securely.

G. Reinforce openings in suspension system which interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

H. Laterally brace suspension system.

3.4 CONTROL AND EXPANSION JOINTS

A. Position and install control and expansion joints.

B. Control Joint Spacing: Where indicated on drawings.

C. Expansion Joint Spacing: Where indicated on drawings.

3.5 ACCESS PANELS

A. Coordinate work with installation of metal access panels. Refer to Section 08 31 13.

3.6 LATHING

A. Apply metal lath taut, with long dimension perpendicular to supports.

B. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.

C. Lap sides of diamond mesh lath minimum 1-1/2 inches at walls and 1/2 inch at ceiling. Wire tie side laps between channels at 9 inches or less on center.

D. Attach metal lath to metal supports using tie wire at maximum 6 inches on center.

E. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

F. Place corner bead at external wall corners; fasten at outer edges of lath only.

G. Place base screeds at termination of plaster areas; secure rigidly in place.

H. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

I. Place lath vertically above each top corner and each side of door or glazed frame to 6 inches above ceiling line.

J. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

K. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.7 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

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SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Formed metal stud framing at interior locations.

B. Framing accessories.

1.2 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry Assemblies: Veneer masonry at metal stud back up walls.

B. Section 05 42 00 – Cold-Formed Metal Framing: Exterior metal stud framing.

C. Section 05 50 00 – Metal Fabrications: Metal fabrications attached to stud framing.

D. Section 06 10 00 – Rough Carpentry: Rough wood blocking within stud framing and wall sheathing.

E. Section 07 21 11 – Batt Insulation: Insulation between framing members.

F. Section 07 60 00 – Sheet Metal Flashing and Trim: Head and sill flashings.

G. Section 08 12 00 – Steel Frames: Door openings within stud framing.

H. Section 08 31 13 – Access Doors.

I. Section 09 21 16– Gypsum Board Systems: Wall board partitioning and sheathing.

1.3 REFERENCES

A. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A525 – Standard Specification for General Requirements For Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

C. ASTM A591/A591M – Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.

D. ASTM C645 – Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

E. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.

F. ASTM C1002 – Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.

G. ML/SFA 540 – (Metal Lath/Steel Framing Association, Division of National Association of Architectural Metal Manufacturers) - Lightweight Steel Framing Manual.

H. SSPC Paint 20 (Steel Structures Painting Council) - Zinc Rich Primers.

1.4 SYSTEM DESCRIPTION

A. Exterior Wall Dead and Live Loads: Design and size components to withstand loads caused by positive and negative pressure of wind acting normal to plane of wall in accordance with 2015 International Building Code to a design pressure of 20 lb/sq ft.

B. Interior Walls: Metal stud framing system with batt type acoustic insulation where scheduled on Drawings and specified in Section 09 21 16.

C. Maximum Allowable Deflection:
1. 1:240 span at exterior metal wall panels.
2. 1:600 span at exterior masonry veneer systems.

D. Wall System:
1. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
2. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.5 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals: Procedures for submittals.

B. Shop Drawings:
1. Indicate prefabricated work, component details and accessories or items required of other related work.
2. Describe method for securing studs to tracks, and for blocking and reinforcement to framing connections.
3. Reference Section 05 42 00: Provide calculations for loadings and stresses of exterior walls under a Professional Structural Engineer's seal in the State of Texas.

C. Product Data: Provide data describing standard framing member materials and finish, product criteria, load charts and limitations.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C754 and ML/SFA 540.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

C. Form, fabricate, install, and connect components in accordance with ML/SFA 540.

D. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos-free Certification will be returned to the Contractor with no action taken until such Certification is provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dietrich Industries, Inc.

B. California Expanded Metal Company (Cemco).

C. Delta Metal Products, Inc.

D. Substitutions: In accordance with Section 01 60 00.

2.2 STUD FRAMING MATERIALS

A. Studs: ASTM A525 Coating Class C, non-load bearing rolled steel, channel shaped, containing 30 to 35 percent recycled steel; punched for utility access as follows:
   1. Depth: As indicated on Drawings.
   2. Thickness: 20 gauge thick minimum, except as otherwise indicated, or required to comply with allowable deflection limitations.
      a. Exterior walls: 18 gauge minimum.

B. Tracks and Headers: Same material and thickness as studs, bent leg retainer notched to receive studs.

C. Ceiling Runners: With extended leg retainer.

D. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.

E. Fasteners: ASTM C1002, self drilling, self tapping screws.

F. Sheet Metal Backing: 0.036 inch galvanized steel.

G. Anchorage Devices: Power actuated, drilled expansion bolts, screws with sleeves as required to suit application.

H. Acoustic Sealant: As specified in Section 09 21 16.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I Inorganic or Type II Organic zinc rich.

2.3 FABRICATION

A. Fabricate components of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

B. Fit and assemble in largest practical sections for delivery to site, ready for installation.

2.4 FINISHES

A. Studs, Tracks and Headers: Galvanize to G60 coating class.

B. Accessories: Same finish as framing members.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Coordination and Meetings: Verification of existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.2 ERECTION

A. Align and secure top and bottom runners at 16 inches on center.

B. Achieve an air tight seal between runners and substrate with acoustic sealant in conjunction with Section 07 92 00.

C. Achieve an air tight seal between studs and adjacent vertical surfaces with acoustic sealant in conjunction with Section 07 92 00.

D. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

E. Install studs vertically at 16 inches, except as otherwise indicated on Drawings.

F. Align stud web openings horizontally.

G. Secure studs to tracks using fastener method. Do not weld.

H. Stud splicing not permissible except where stud height exceed maximum fabrication lengths. Splice studs with 8 inch nested lap, secure each stud flange with flush head screw.

I. Fabricate corners using a minimum of three studs.

J. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.

K. Brace stud framing system rigid.

L. Coordinate erection of studs with requirements of door frames, window frames, and other openings; install supports and attachments.

M. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing.

N. Blocking:
1. Secure wood blocking to studs.
2. Secure steel backing to studs using three number 10 screws.
3. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, opening frames, and other locations indicated on Drawings.

O. Refer to Drawings for indication of partitions extending stud framing through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.

P. At partitions which extend and terminate 6 inches above finished ceiling, provide sway bracing at 48 inches on center.

Q. Coordinate placement of insulation in stud spaces after stud frame erection.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Control: Tolerances.

B. Maximum Variation From True Position: 1/8 inch in 10 feet.

C. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

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SECTION 09 30 00

TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ceramic and quarry tile for floor and wall applications.

B. Wall adhesives and grouted joints.

C. Related Sections:
1. Section 03 35 00.1 – Architectural Concrete Finishing: Troweling of floor slab for tile application.
2. Section 04 20 00 – Unit Masonry Assemblies: Wall substrate.
3. Section 07 92 00 – Joint Sealants: Expansion and control joint components.
4. Section 09 21 16 – Gypsum Wallboard Systems: Wall substrate.
5. Section 09 65 00 – Resilient Flooring.
6. Section 09 99 50 – Finish / Color Schedule.
7. Division 22 – Plumbing Fixtures.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI A108.1 - Installation of Ceramic Tile, A collection.
2. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
3. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
4. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
5. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
6. ANSI A118.4 - Latex-Portland Cement Mortar.
7. ANSI A118.6 - Ceramic Tile Grouts.
8. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.
9. ANSI A137.1 - Ceramic Tile.

B. American Society for Testing and Materials: ASTM C847 - Standard Specification for Metal Lath.

C. Tile Council of America: TCA - Handbook for Ceramic Tile Installation.

D. CDHS Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 addenda.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal procedures.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, ceramic accessories, and setting details.

C. Product Data: Submit instructions for using grouts and adhesives.

D. Samples: Submit tile and grout to illustrate color, pattern, and color variations.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.

B. All adhesives and sealants installed in the building interior (defined as inside of the weatherproofing system and applied on-site) shall meet 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, including 2004 Addenda.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience and approved by tile manufacturer.

1.7 MOCKUP

A. Section 01 40 00 - Quality Requirements: Requirements for mockup.

B. Construct mock-up, 6 feet long by 6 feet wide, with waterproofing, finish grout, and specified accessories.

C. Locate where directed by Architect/Engineer.

D. Incorporate accepted mockup as part of Work.

1.8 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Material and Equipment: Product storage and handling requirements.

B. Protect adhesives and grouts from freezing or overheating.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 – Material and Equipment.

B. Do not install adhesives and grouts in unventilated environment.

C. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.11 EXTRA MATERIALS

A. Section 01 77 00 - Execution Requirements: Spare parts and maintenance products.

B. Supply 10 sq ft of each size, color, and surface finish of tile specified.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturers:
1. American Olean Tile Co.
2. Dal-Tile International.
3. Interceramic
4. Substitutions: In accordance with Section 01 25 00 Substitution Request and Section 01 60 00 – Material and Equipment.

B. Hard Surface Flooring shall be certified as compliant with the FloorScore. Indoor Advantage Gold, GREENGUARD Children & Schools, or Collaborative for High Performance Schools product list standard by an independent third-party.

2.2 TILE

A. Ceramic Floor Tile: ANSI A137.1, conforming to the following:
1. Moisture Absorption: 0 to 0.5 percent.
2. Size: 4 x 4 x 5/16 inch.
3. Shape: Square.
4. Edge: Cushioned.
5. Surface Finish: Matte glazed.
6. Color: As indicated in Section 09 99 50 – Room Finish/Color Schedule.

B. Ceramic Wall Tile: ANSI A137.1, conforming to the following:
1. Moisture Absorption: 0 to 0.5 percent.
2. Size: 4 x 4 x 5/16 inch.
3. Shape: Square.
4. Edge: Cushioned.
5. Surface Finish: Matte glazed.
6. Color: indicated in Section 09 99 50 – Room Finish/Color Schedule.

C. Quarry Tile: ANSI A137.1, conforming to the following:
1. Moisture Absorption: 0.5 to 3.0 percent.
2. Size: 8 x 8 x 1/2 inch.
3. Shape: Square.
4. Edge: Square.

5. Surface Finish: Unglazed.
   a. Provide abrasive grain at Freezer and Cooler floors.
6. Color: indicated in Section 09 99 50 – Room Finish/Color Schedule.
7. Base: Match floor tile for moisture absorption, surface finish, and color:
   a. Length: Tile length inch.
   b. Height: 6 inch.
   c. Top Edge: Bull nosed.
   d. Internal Corner: Coved.
8. External Corner: Bullnosed.

2.3 SETTING MATERIALS

A. Manufacturers:
1. Laticrete International.
2. Bonsal American, Inc.
3. Custom Building Products.
4. Tex-Rite, Texas Cement Products.
5. Substitutions: In accordance with Section 01 25 00.

B. Adhesive Materials:
1. ANSI A136.1, Type 1, thin set bond type; solvent-free, low VOCs.
2. Products:
   a. Mapei Ultramastic ECO High-Performance Floor and Wall Tile Adhesive.
   b. Custom Building Products “VersaBond Flex” thin-set mortar or approved equal.
   c. Substitutions: In accordance with Section 01 25 00.

C. Grout Materials:
1. Standard Grout: Latex-Portland cement type as specified in ANSI A118.6.
   a. Color Admixture: Custom Building Products, Laticrete, or approved equal.
   b. Color: Refer to Section 09 99 50 – Room Finish/Color Schedule.
2. Epoxy Grout: Epoxy based, sanded, resistant to shrinkage, with latex additive admix; bacteria and mildew resistant; ANSI A118.3.
   a. Laticrete “SpectraLOCK PRO” grout, or approved equal.
   b. Use for food service applications.

D. Thresholds: Transition strips and feature strips to be same material as base. Edge (end) strips to be extruded aluminum strip at railings and similar end conditions.
1. Johnsonite
2. Schulter Systems – Reno AU or equal extruded aluminum.
3. Substitutions in accordance with Section 01 25 00.
4. Product:
   a. Ceramic Tile to VCT: Schluter Reno-U, Brushed Stainless Steel.
   b. Ceramic Tile to Quarry tile: Schluter Reno-U, Brushed Stainless Steel.
   c. Quarry Tile to VCT: Schluter Systems – Reno-T T9/14AT, Brushed Stainless Steel.
   d. Carpet to VCT: Johnsonite Transition CTA-XX-D, color : 71 storm cloud CG.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify surfaces are ready to receive work.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances. Prepare substrate surfaces for adhesive installation.

3.3 INSTALLATION

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Place edge strips at exposed tile edges.

D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base and wall joints.

E. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
   1. Quarry Tile: 1/4 inch joint width; set mortar flush with tile.

F. Form internal angles coved and external angles bullnosed.

G. Install ceramic accessories rigidly in prepared openings.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep expansion and control joints free of adhesive or grout. Apply sealant to joints.

J. Allow tile to set for a minimum of 48 hours prior to grouting.

K. Grout tile joints. Use standard colored grout unless otherwise indicated.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

M. Installation - Floors - Thin-Set Method: Over concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.

N. Installation - Wall Tile, General:
   1. Over gypsum wallboard on metal studs install in accordance with TCA Handbook Method W223, thin-set with inorganic adhesive, unless otherwise indicated.
   2. Over concrete and masonry install in accordance with TCA Handbook Method W223, thin-set with inorganic adhesive cement bond coat.

3.4 CLEANING

A. Section 01 77 00 - Execution Requirements: Final cleaning.

B. Clean tile and grout surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 77 00 - Execution Requirements: Protecting installed construction.

B. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 51 10

SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system and perimeter trim.

B. Acoustical units.

C. Wood Plank acoustical, wood ceiling system

1.2 RELATED SECTIONS

A. Section 09 21 16 – Gypsum Board Assemblies: partition system.

B. Section 09 99 50 – Finish / Color Schedule.

C. Division 23 - Air Outlets and Inlets: Air diffusion devices in ceiling system.

D. Division 26 - Interior Luminaries: Light fixtures in ceiling system.

E. Division 28 – Fire Alarm and Smoke Detection Systems: Fire alarm components in ceiling system.

1.3 REFERENCES

A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

C. ASTM E1264 - Classification of Acoustical Ceiling Products.

D. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice.

E. UL - Fire Resistance Directory and Building Material Directory.

1.4 QUALITY ASSURANCE

A. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos-free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide data on metal grid system components and acoustical units including pre-consumer and post-consumer recycled content.

C. Samples: Submit two samples 12 by 12 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner and edge trim.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 QUALIFICATIONS

A. Qualification of Installer: Minimum of three years documented experience in installations of similar scope.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for combustibility requirements for materials.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F degrees C, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.9 SEQUENCING

A. Sequence Work under the provisions of Section 01 11 00.

B. Sequence Work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead Work is completed, tested, and approved.

C. Install acoustical units after interior wet work is dry.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 01 77 00.

B. Provide two (2) percent of total acoustical unit area of extra panels to Owner.

C. Provide one (1) unopened box of suspension material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong World Industries, Inc; Prelude 15/16 inch Exposed Tee

B. USG Interiors, Donn Suspension Systems.

C. Chicago Metallic.

D. Substitutions: Under provisions of Section 01 60 00.

2.2 SUSPENSION SYSTEM MATERIALS

A. Non-Fire Rated Grid: ASTM C635, intermediate duty; exposed Tee; components die cut and interlocking.

B. Grid Materials: Double-web steel construction; commercial quality cold rolled steel with galvanized coating.

C. Exposed Grid Surface Width: 15/16 inch.

D. Grid Finish: Baked polyester finish; Color as selected by Architect.

E. Accessories: Specifically designed as an integral part of grid system as per manufacturer's recommendations.

F. Support Channels and Hangers: Primed steel; size and type to suit application and ceiling system flatness requirement specified.

G. Total Recycled Content: 30 percent.

2.3 MANUFACTURERS - ACOUSTICAL UNITS

A. Armstrong World Industries, Inc.

B. Owens-Corning – Conwed Designscape Corporation.

C. USG Interiors, Inc.

D. Substitutions: Under provisions of Section 01 60 00.

2.4 ACOUSTICAL UNIT MATERIALS

A. Acoustical Tile (AT-1): ASTM E1264, conforming to the following:
1. Size: 24 by 24 inches.
2. Thickness: 5/8 inch.
3. Composition: Wet form mineral fiber.
4. Light Reflectance: Actual LR 0.80.
5. NRC Range: 0.55.
6. Ceiling Attenuation Class (CAC Range): Minimum 35.
7. Fire Hazard Classification: Class A.
8. Edge: Square-cut.
9. Surface Color: White.
10. Surface Finish: Factory applied vinyl latex paint.
11. Recycled Content: 26 percent.
12. Manufacturer: Armstrong Fissured #755, or approved equal.

2.5 ACCESSORIES

A. Touch-up Paint: Latex; type and color to match acoustical and grid units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 40 00.

B. Verify that layout of hangers will not interfere with other Work.

3.2 INSTALLATION – LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with manufacturer's instructions and as supplemented in this Section.

B. Install suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

C. Locate system on room axis according to Reflected Ceiling Plan.

D. Install after major above ceiling Work is complete. Coordinate the location of hangers with other Work.

E. Hang suspension system from steel joists and supplemental carrying members spaced in between joists.

F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

I. Do not eccentrically load system, or produce rotation of runners.

J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units in pattern directed by Architect. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling Work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

F. Cut panels to fit irregular grid and perimeter edge trim.

G. Where round obstructions occur, provide preformed closers to match edge molding.

H. Install hold-down clips to retain panels tight to grid system within 20 feet of any exterior door.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

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SECTION 09 65 00

RESILIENT FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes resilient tile flooring; resilient base; and resilient stair accessories.

B. Resilient moldings, transition strips and reducers.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 09 68 00 – Carpet.

C. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCES

A. ASTM International:
   1. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
   2. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
   3. ASTM F1344 - Standard Specification for Rubber Floor Tile.
   4. ASTM F1861 - Standard Specification for Resilient Wall Base.

B. GREENGUARD Environmental Institute:
   1. GREENGUARD Gold.

C. Federal Specification Unit:
   1. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant.

D. National Fire Protection Association: NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.

E. NSF/ANSI Standard 332 – Sustainability Assessment for Resilient Floor Coverings

F. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.4 QUALITY ASSURANCE

A. Installer shall have no less than three years documented experience in applications of similar material and quantity.

B. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

C. Products shall contain a FloorScore Certification; Tested and Certified by RFCI and SCS. Re: www.RFCI.com and www.scscertified.com.

D. Adhesives and sealants shall be low emitting in accordance with the current VOC content limits of South Coast Air Quality Mgt. District (SCAQMD) Rule #1168.

1.5 SUBMITTALS

A. Submit samples in accordance with Section 01 30 00.
   1. Include duplicate 3 by 3 inch sized samples of each flooring material, color and pattern selected.
   2. Include duplicate samples of base and edge strips selected.

B. Submit manufacturer’s product data, including recycle content, certifications, and environmental data.

C. Submit manufacturer's installation instructions under provisions of Section 01 30 00. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products under provisions of Section 01 60 00.

1.7 EXTRA MATERIAL

A. Deliver additional 2 percent of total area installed for each color and pattern of floor material required for project, in manufacturer's box, for maintenance use.

B. Clearly identify each box.

1.8 WARRANTY

A. Provide Manufacturer’s limited wear warranty for five years for heavy traffic.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Vinyl Composition Tile:
   1. Armstrong Commercial Flooring. (Basis of Design)
   2. Azrock Industries, Inc.

B. Rubber Base:
   1. Tarkett Commercial – Johnsonite (Basis of Design)
   2. Armstrong Commercial Flooring.
   3. Roppe Rubber Corporation.
   4. Burke Flooring, a subsidiary of Burke Industries (Mannington Mills).

C. Rubber Stair Treads and Risers:
   1. Roppe Corporation.
   2. Burke Flooring.
   3. Marley Floors-Flexco.

D. Accessories:
1. Roppe Rubber Corporation.
2. Mercer Plastics Co., Inc.
3. Flexco Company.

E. Substitutions: Under provisions of Section 01 60 00.

2.2 MATERIALS - TILE FLOORING

A. Vinyl Composition Tile (General): ASTM F1066, Class 2:
1. Construction: Through-pattern composition tile.
2. Size: 12 by 12 inch.
3. Thickness: 0.125 inch.
4. FloorScore Indoor Air Quality: SCS Certified.
5. NSF/ANSI-332 Certification: Gold.
6. Warranty: Limited 5 year commercial warranty.
7. Product: Armstrong Standard Excelon Imperial Texture, or approved equal.
8. Color: As indicated in Section 09 99 50 – Finish/Color Schedule.

2.3 MATERIALS - BASE

A. Base: FS SS-W-40, Type 1 rubber; top set coved; premolded corners:
1. Height: 4 inch.
2. Thickness: 1/8 inch.
3. Length: 4 foot sections.
4. Color: As indicated in Section 09 99 50 - Finish/Color Schedule.

2.4 MATERIALS – RAMP FLOOR COVERING

A. Raised Design Rubber Tile: ASTM F 1344, Class I, Type A & B, Grade 1. Tiles shall be homogeneously constructed of first-quality resilient rubber compound and molded with a design profile and beveled disks.
1. Style: #92 low profile raised circular design as manufactured by Roppe, or approved equal.

2.5 ACCESSORIES/ADHESIVES/SEALERS

A. Moldings and Edge Strips: Beveled edge type; smooth finish; 1/8 by 1 inch color selected by Architect.

B. Sub-Floor filler: Cementitious; type recommended by adhesive material manufacturer.

C. Adhesive: Thin-spread, solvent-free, asphalt emulsion/latex-based adhesive; low emitting in accordance with the current VOC content limits of South Coast Air Quality Mgt. District (SCAQMD) Rule #1168:
1. Henry 130 Thin Spread Floor Tile Adhesive.
2. Substitutions: In accordance with Section 01 60 00.

D. Sealer and Wax: By School District.

PART 3 - EXECUTION

3.1 SITE AND SUBSTRATE CONDITIONS

A. Ensure floor surfaces are smooth and flat with maximum variation of 1/8 inch in 10 feet.

B. Ensure concrete floors are dry (maximum 7 percent moisture content) and exhibit negative alkalinity, carbonization or dusting.

C. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

D. Maintain minimum 70 degrees F. air temperature at flooring installation area for 3 days prior to, during, and for 24 hours after installation.

E. Store flooring materials in area of application. Allow 3 days for material to each equal temperature as area; allow 8 days for rubber flooring.

3.2 LEVELING

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

B. Clean floor and apply, trowel and float filler to leave smooth, flat hard surface. Prohibit traffic until filler is cured.

3.3 INSTALLATION - FLOORING

A. Open floor tile cartons, enough to cover each area, and mix tile to ensure shade variations do not occur within any one area.

B. Clean substrate. Spread cement evenly in quantity recommended by manufacturer to ensure adhesion over entire area of installation. Spread only enough adhesive to permit installation of flooring before initial set.

C. Set flooring in place; press with heavy roller to ensure full adhesion.

D. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

E. Install tile with minimum tile width 1/2 full size at room or area perimeter, to square grid pattern with all joints aligned, with pattern grain alternating with adjacent unit to produce basket weave pattern.

F. Scribe flooring to walls, columns, cabinets, floor outlets and other appurtenances to produce tight joints.

G. Terminate resilient flooring at centerline of door opening(s) where adjacent floor finish is dissimilar.

H. Install edge strips at unprotected or exposed edges where flooring terminates.

I. At movable partitions or accordion doors, install flooring under partitions without interrupting floor pattern.

J. Install feature strips and floor markings where indicated. Fit joints tightly.

3.4 INSTALLATION - BASE

A. Fit joints tight and vertical. Install in maximum practical lengths. Maintain minimum measurement of 18 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. Use pre-molded sections for exposed ends.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.5 CLEANING

A. Section 01 77 00 – Contract Closeout: Cleaning installed work.

B. Remove excess adhesive from floor, base, and wall surfaces without damage.

C. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.6 PROTECTION

A. Prohibit traffic from floor finish for 48 hours after installation.

END OF SECTION

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SECTION 09 68 00

CARPET

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Carpet.

B. Accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 09 30 00 – Tile.

C. Section 09 65 00 – Resilient Flooring: Base.

D. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCE STANDARDS

A. Carpet and Rug Institute (CRI) – 2009; Carpet Installation Standard.

B. NSF/ANSI Standard 140 – Sustainability Carpet Assessment – Gold.

1.4 QUALITY ASSURANCE

A. All carpet shall be CRI Green Label Plus certified.

B. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

C. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.

D. Installer Qualifications: Company specializing in installing carpet with minimum three years documented experience.

1.5 SUBMITTALS

A. Product Data: Manufacturer's printed product data, specifications, certifications and test data.
   1. Submit CRI Indoor Air Quality Control Green Label Plus ID.

B. Samples:
   1. Carpet: Minimum 18 inch by 36 inch sample for color and type verification.
   2. Edging: Minimum 6 inch length of each type and color.

1.6 PROJECT CONDITIONS

A. Do not begin installation until painting and finishing Work have been completed.

B. Do not install if temperature of spaces and subfloor is below 50 degrees F.

1.7 MAINTENANCE STOCK

A. Provide 100 sq. ft. of carpeting for each type and color specified for Owners future use.

B. Architect or Owner Representative will also view carpet scraps and retain any chosen for future repairs before they are moved from Project Site.

1.8 WARRANTY

A. Contractor shall guarantee material and workmanship for five (5) years. Guarantee shall include glue down.
   1. Wrinkles, bubbles or edge release shall be considered defects in workmanship. Such defects shall be repaired by removal and reinstallation of carpet as required.
   2. Any carpet destroyed shall be replaced.
   3. In no case will cutting or carpet be permitted in repairing.

B. Manufacturer Warranties: Lifetime of carpet for wear, static, moisture barrier, edge ravel, delamination, backing and tuft bind.
   1. Wear Guarantee: No more than 10 percent face yarn loss by weight normal use lifetime of carpet.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturer – Modular:
   1. Mannington Commercial: Urban Patina Collection – Infinity Modular. Architect to provide color board with samples for Owner approval.
   2. Substitutions: In accordance with Section 01 60 00.

B. Carpet Construction:
   1. Color and Style: As indicated in Section 09 99 50 – Finish/Color Schedule.
   2. Construction Type: Tip-sheared pattern loop.
   3. Gage: 5/64 inch minimum.
   4. Stitches per inch: 10.33 minimum.
   5. Dye Method: Solution/Yarn.
   6. Face Fiber: Branded fiber; Invista Antron Type 6.6 Legacy or Lumena.
      a. Substitutions not permitted.
   7. Fiber Technology: “Dura Tech”, “SSP” Soils Resistance or equal; Permanent Stain Protection Technology. Must pass requirements for permanent stain resistance.
   8. Face Weight: 24 oz./sq. yd. minimum.
   9. Pile Thickness: 0.152 inch minimum.
   10. Primary Back: 100 percent woven synthetic.
   11. Secondary Back: Infinity Modular Reinforced Composite Closed Cell.
   12. Standard Size: 24 x 24 inch modular tiles. Architect to provide color board with samples for Owner approval.
   13. Density: Average Density = 5,684 oz/cy; Weight Density = 136,421.
   14. Weight Density: 136,421

15. Flammability: Must pass flammability standards for both face and backing per Dept. of Commerce Test #FF 1-70, Pill Test.
16. Carpet shall be impervious to water damage.
17. Static Control: 3.0 KV at 70 degrees F, 20 percent relative humidity. When tested under the Standard Shuffle Test.

2.2 ACCESSORIES

A. Subfloor Filler: Cementitious; type as recommended by carpet manufacturer. Gypsum type not permitted.

B. Adhesive: Non-toxic, waterproof, high content white latex base cement formulated particularly for wet installation of carpet; recommended by carpet manufacturer.
1. If the manufacturer does not recommend adhesive for wet installation, the adhesive shall not be approved.
2. Adhesive shall be low odor and solvent free with no alcohol, glycol, ammonia, or formaldehyde.
3. Adhesive shall be antimicrobial with no hazardous vapors and contain no carcinogenic materials per OSHA Regulation 29 CFR 1910-1200.

C. Metal Edge Guard (Transition Strip): Aluminum equal to 1/2 by 1-1/2 inch aluminum divider strip, as manufactured by Reese Enterprises, Inc; type as required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove dust, dirt, grease, oil, solvents, paint and other foreign matter detrimental to proper performance of adhesive and carpet from subfloor. Allow floor to dry thoroughly.

B. Grind ridges and high spots in subfloor smooth. Fill cracks and voids with an approved cementitious leveling compound.

C. Ensure concrete subfloor is free from scaling and irregularities and is neutral relative to acidity and alkalinity.

D. Thoroughly clean subfloor using commercial vacuum cleaner and damp mop.

E. If concrete subfloor is excessively dusty or powdery, treat with sealer compatible with adhesive. Layout:
1. Lay out carpet so that seams will be minimized and as inconspicuous as possible.
2. Where width of room or space is less than width of carpet, longitudinal seams will not be permitted.
3. Run "grain" of all pieces in same direction.

3.2 INSTALLATION

A. General: Perform installation using qualified, experienced professionals.

B. Check matching of carpet before cutting and ensure there is no visible variation between dye lots.

C. Cut carpet, where required, to allow proper seam and pattern match. Ensure cuts are straight, true and unfrayed.

D. Where possible and practical, locate seams in areas of least amount of traffic or change in direction of traffic.

E. Join seams in recommended manner so as not to detract from the appearance of the carpet installation and decrease its life expectancy. Ensure seams are straight, not overlapped or peaked and free of gaps.

F. Vacuum clean substrate. Spread adhesive in quantity recommended by manufacturer (after primer application) to ensure proper adhesion over full area of installation. Apply only enough adhesive to permit proper adhesion of carpet before initial set.

G. Lay carpet on floors with the run of the pile in same direction of anticipated traffic. Use care to prevent adhesive contact with carpet pile or yarn.

H. Do not change run of pile in any one room or from one room to next where continuous through a wall opening.

I. Cut and fit carpet neatly around projections through floor and to walls and other vertical surfaces.

J. Fit carpet snugly to walls or other vertical surfaces where no base is scheduled, leaving no gaps.

K. Do not place heavy objects such as furniture on carpeted surfaces for minimum of 24 hours or until adhesive is set.

L. Carpet and base shall be installed under and behind casework and other equipment unless they are permanently anchored to building.

M. Entire carpet installation is to be laid tight and flat to subfloor, well fastened at edges, and present a uniform pleasing appearance. Ensure monolithic color, pattern, and texture match within any one area.

N. Install edging strips where carpet terminates at other floor coverings and at all floor mounted, flush, carpet penetrations by other trades. Use full length pieces only. Butt tight to vertical surfaces. Where splicing cannot be avoided, butt ends tight and flush. Secure to floor, using method and materials recommended by manufacturer. No plastic or vinyl edging shall be permitted.

3.3 CLEANING

A. After installation is complete, remove dirt and debris and clean carpet of spots with proper spot remover. Remove loose threads with sharp scissors, then clean with vacuum cleaner.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Extent of Work: The extent of work to be painted or finished include the following:
1. All surfaces of materials, either on the exterior or interior of the building, except where painting or finishing are excluded as listed herein below.
2. Paint or finish all surfaces left unfinished by other trades.
3. Touchup all damaged, defaced, or scratched areas. Touchup all screwheads, boltheads, etc. as required.
4. All new exposed mechanical piping, ductwork, plumbing and electrical associated with air conditioning of Gymnasiums.

B. Surfaces Not To Be Painted, Unless Specifically Specified, Noted, or Scheduled Otherwise:
1. Any drywall or CMU permanently concealed from view.
2. Complete factory applied finish.
3. Finish hardware except where primed for paint finish.
4. Aluminum.
5. Plumbing fixtures and toilet room accessories.
6. Lighting fixtures.
7. Acoustical surfaces, except as scheduled to be field painted.
8. Any glass, plastics, floor and wall tiles, rubber bases, face bricks, and vinyl wall coverings.
9. Steel deck and joist in concealed locations.
10. Concrete floor.

C. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections.

D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.2 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry Assemblies.

B. Section 05 50 00 – Metal Fabrications

C. Section 06 20 00 – Finish Carpentry

D. Section 08 12 00 – Steel Doors

E. Section 08 13 00 – Steel Frames

F. Section 08 14 16 – Wood Doors.

G. Section 09 21 16 – Gypsum Board Systems

H. Section 09 99 50 – Finish/Color Schedule

I. Section 32 17 23 – Paving Markings: Traffic paint.

1.3 REFERENCES

A. SSPC-SP 1 - Solvent Cleaning

B. SSPC-SP 2 - Hand Tool Cleaning

C. SSPC-SP 3 - Power Tool Cleaning

D. SSPC-SP 13 / Nace No. 6 Surface Preparation for Concrete

E. EPA-Method 24

F. GreenGuard

G. CDHS - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 addenda.

H. South Coast Air Quality Management District (SCAQMD): Standard 1113 - for architectural coatings.

1.4 VOLATILE ORGANIC COMPOUNDS (VOC) COMPLIANCE

A. Products provided under this Section shall meet VOC requirements of the South Coast Air Quality Management District Standard 1113 for architectural coatings, www.scaqmd.gov and CDHS Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 addenda.

1.5 QUALITY ASSURANCE

A. Include on label of containers:
   1. Manufacturer's name
   2. Type of paint
   3. Manufacturer's stock number
   4. Color
   5. Instructions for reducing, where applicable; Note that improper reducing may negatively affect the VOC rating of the product. Products found to have VOC emissions in excess of those specified herein, or by the manufacturer, shall be considered to be defective and shall be removed and replaced with conforming products at the Contractor's expense.
   6. Label Analysis: (Federal Specification Number)

B. Sampling of Materials, when requested by the Architect:
   1. Obtain test samples from material stored at project site or source of supply.
   2. Furnish from materials designated by the Architect/Engineer as follows: 1 quart from batches of 50 gal. or less.
   3. Select samples at random from sealed containers.

C. Fungus Control for Mildew Resistant Materials: Organic coating shall show no fungus growth when tested as specified in Federal Test Method Standard No. 141, Method 6271.1.

D. Field Quality Control:
   1. Request review of first finished room, space, or item of each color scheme required by Architect for color, texture, and workmanship.

E. Contractor shall be required to remove and replace all substrates whose moisture content exceeded those recommended by the paint manufacturer or the substrate manufacturer at the time painting was performed.

F. The building must be under full climatic control prior to painting.

G. Notify Architect at least 24 hours prior to painting.

H. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.6 SUBMITTALS

A. Color Samples:
   1. Size shall be at least 8-1/2 by 11 inches.
   2. Colors shall be in accordance with furnished schedules. Provide samples of every color and finish required.
   3. Prepare at project site on a material similar in texture to that to which it is to be applied.
   4. Submit in duplicate for approval by the Architect.
   5. Manufacturer's printed VOC data.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Deliver sealed containers with labels legible and intact.

B. Storage of Materials:
   1. Store only acceptable project materials on project site.
   2. Store in a suitable location.
   3. Restrict storage to paint materials and related equipment.
   4. Comply with health and fire regulations.

C. Deliver and store in accordance with Section 01 60 00.

1.8 JOB CONDITIONS

A. Environmental Requirements:
   1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
   2. Do not apply finish in areas where dust is generated.

B. Protection:
   1. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Except as otherwise specified, materials shall be VOC compliant materials as manufactured by:
   1. Sherwin-Williams Co. (Basis of Design)
   2. Benjamin Moore.
   3. Glidden Professional.
   4. PPG.
   5. Flame Control Coatings, LLC, 4120 Hyde Park Blvd., Niagara Falls, NY 14305 (Intumescent Fire Retardant Paint).
   6. Substitutions in accordance with Section 01 25 00 and 01 60 00.

B. Materials selected for coating systems for each type surface shall be the product of a single manufacturer.

2.2 SUBSTITUTIONS

A. Comply with Conditions of the Contract and Division 1.

B. Submit substitute paint schedule listing all surfaces and proposed products. VOC numbers may not exceed those listed in paragraphs 2.4 and 2.5.

C. Obtain review prior to purchase and delivery.

2.3 MATERIALS

A. Secondary products not specified by name and required for the job such as thinners and putty shall be "best grade" or "first line", lowest commercially available VOC products of a reputable manufacturer.

B. All interior paint shall be semi-gloss enamel unless specifically noted otherwise.

2.4 INTERIOR PAINTING - ENAMEL FINISH

			Film Thickness Mils dft/coat	VOC g/L
A.	Gypsum Board (Enamel Finish)			
	1. Texture:	Match Existing		
	2. Primer:	ProMar 200 Zero VOC Interior Latex Primer B28W02600	1.5	0
	3. Finish:	ProMar 200 Zero VOC Interior Latex Semi-gloss B31-2600 (2 coats)	1.7	0
B.	CMU (Enamel Finish)			
	1.	Block Fill: PrepRite Block Filler B25W25 (two coats)	8.0	45
	2.	Finish: ProMar 200 Zero VOC Interior Latex Semi-gloss B31-2600 (2 coats)	1.7	0
C.	Interior Galvanized Metal			
	1. Primer:	Pro Industrial Pro-Cryl Universal Acrylic Primer B66-310	4.0	<100

2. Finish: Pro Industrial 0 VOC Semi-Gloss Acrylic B66-650 (two coats)	3.0	0

D. Interior Ferrous Metal (primed and unprimed)

1. Primer: Pro Industrial Pro-Cryl Universal Acrylic Primer B66-310	4.0	<100
2. Finish: Pro Classic Interior WB Acrylic-Alkyd B31 Semi-gloss B34-850 (two coats)	1.6	49

E. Interior Wood (Enamel)

1. Primer: Premium Wall & Wood Primer B28W08111	1.8	41
2. Finish: Pro Industrial 0 VOC Semi-Gloss Acrylic B66-650 (two coats)	1.6	0

F. Interior Wood (Transparent/Clear Finish)

1. Finish: Minwax Polycrylic Protective Finish (two coats)	.6	275

G. Intumescent Fire Retardant Paint (Water Base, Flat Latex)

1. Primer: Premium Wall & Wood Primer B28W08111	1.8	41
2. Finish: Flame Control No. 20-20A Flat Latex (two coats)	4.7	60

2.5 EXTERIOR PAINTING

A. Exterior Masonry/Concrete:

1. Block Fill: PrepRite Block Filler B25000W25 (two coats)	8.0	45
2. Finish: SW A-100 Exterior Latex Satin		
3. A82 Series (two coats)	1.5	49

B. Exterior Plaster:

1. Finish: Loxon XP Zero VOC Waterproofing System		
2. A24 Series (two coats)	3.7	0

C. Exterior Galvanized Metal:

1. Primer: ProCryl Universal Water Based Primer B66-310	3.0	<10
2. Finish: Sher-Cryl HPA Acrylic, B66-300 Semi-gloss (two coats)	3.0	<200

D. Exterior Ferrous Metal:

1. Primer: ProCryl Universal Water Based Primer B66-310	3.0	<100
2. Finish: Sher-Cryl HPA Acrylic, B66-300 Semi-gloss (two coats)	3.0	<200
3. Topcoat: Sher-Clear 1K Acrylic Clear Coat B66C380	2.0	<100

2.6 COLORS

A. Interior/Exterior Finish Colors are scheduled in Section 09 99 50. Colors of paints (including stains) shall match control samples.

B. Traffic Paint
1. Parking Stall Stripes: White

2. Crosswalks: State of Texas Reflective Yellow
3. Painted Medians: State of Texas Reflective Yellow
4. Handicap Curb Ramps: State of Texas Reflective Yellow
5. Fire Lane Curbs: Red

2.7 MIXING AND TINTING

A. Deliver paints and enamels ready-mixed to Project Site.

B. Accomplish job mixing and job tinting only when acceptable to the Architect/Engineer. No mixing or tinting shall be allowed inside the building.

C. Mix only in mixing pails placed in suitably sized non-ferrous or oxide resistant metal pans.

D. Use tinting colors recommended by manufacturer for the specific type of finish.

E. Fungicidal agent shall be incorporated into the paint by the manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work as included in Paragraph 3.2, PREPARATION OF SURFACES.

B. Do not proceed with surface preparation or coating application until conditions are suitable.

3.2 PREPARATION OF SURFACES

A. General:
1. Perform all preparation and cleaning procedures in strict accordance with paint manufacturer's instructions and as herein specified for each substrate.
2. Remove or provide suitable masking of all hardware, hardware accessories, machined surfaces, labels, nameplates, etc. prior to surface preparation and painting. Reinstall the removed items by workmen skilled in the trades involved.
3. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.
   a. Test with moisture meter.
4. Priming coats on woodwork shall be applied as required and as soon as possible after woodwork is delivered to the building.
5. Top and bottom edges of all wood doors shall be stained and given one good coat of varnish after fitting and before final hanging.
6. All interior wood trim and finish, etc., set over or on masonry shall be backprimed before erection with a good coat of shellac.

B. Woods:
1. Clean soiled surfaces in accordance with manufacturer's instructions.
2. Sand to smooth and even surface, then dust off.
3. Fill nail holes, cracks, open joints and other defect with putty after priming coat has dried. Color to match finish color.

C. Gypsum Board Surfaces exposed to view, not scheduled to receive wall covering:
   1. Fill narrow, shallow cracks and small holes with spackling compound.
   2. Rake deep, wide cracks and deep holes.
      a. Dampen with clear water.
      b. Fill with thin layers of drywall joint cement.
   3. Allow to dry.
   4. Sand smooth. Do not raise nap of paper on wallboard.
   5. Finish: GA-214, Level 4.
   6. Finish: GA-214, Level 5 – Walls scheduled to receive wall coverings or graphics.
   7. Texture: Match Existing.

D. Ferrous Metal Surfaces:
   1. Prepare surface in accordance with recommendations of directions of manufacturer of rust-inhibitive primer.
   2. Feather edges of sound paint by grinding, if necessary.

E. Galvanized Metal:
   1. Clean surface with mineral spirits to remove oil residue.
   2. Dry with clean cloth.

3.3 WORKMANSHIP - MINIMUM REQUIREMENTS

A. Application of materials shall be by skilled mechanics. Spread paint evenly and brush out thoroughly. Flow-on lacquer, varnish and enamel evenly and smoothly, and free from brush marks. Workmanship shall be in accordance with the best practices recognized for class of work, grade, type and kinds of materials specified.

3.4 APPLICATION

A. General Requirements:
   1. Oil finish shall be used as it comes from manufacturer's containers without thinning or adulterating.
   2. Apply paint enamel and epoxy finish with suitable brushes or rollers.
      a. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved less ten percent allowance for losses.
      b. Keep brushes and rollers clean, dry, free from contaminates and suitable for the finish required.
   3. Comply with recommendation of product manufacturer for drying time between succeeding coats.
   4. Vary slightly the color of successive coats.
   5. Sand and dust between each coat to remove defects visible from a distance of 5 feet.
   6. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas.
      a. Finished metal surfaces shall be free of skips, voids or pinholes in any coat when tested with a low voltage detector.
   7. Inspection:
      a. Do not apply additional coats until completed coat has been inspected by the Architect.
      b. Only inspected coats of paint will be considered in determining number of coats applied.
      c. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.

d. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
e. Apply primer on all work before glazing.
f. Change colors at corner of stop where colors differ between adjoining spaces or rooms and where door frames match wall colors.
g. Refinish whole wall where portion of finish has been damaged or is not acceptable.
h. Minimum Total Dry Film Thickness:
   1) Apply material at not less than manufacturer's recommended spreading rate.
   2) Provide not less than 5 mils thickness for the entire coating system of prime and finish coats for 3-coat system.
i. Provide not less than 3.5 mils thickness for the entire coating system of prime and finish coats for 2-coat system.
j. Do not paint over U.L. labels on doors and frames.
k. Environmental conditions such as temperature and humidity shall be within ranges recommended by product manufacturer.
l. Finish materials shall be compatible with the surface to which it is applied. Prepare wood surfaces as recommended by manufacturer prior to any finish application.

B. Mechanical and Electrical Equipment:
1. General:
   a. This subcontractor shall paint all mechanical and electrical equipment, piping, conduit, insulation, ductwork, hangers, accessories, etc., that are exposed to view.
   b. All Mechanical/Electrical equipment delivered to job with suitable factory prime or baked enamel protective finishes shall be painted after installation as hereinafter specified.
   c. Factory prime coat finish shall receive two field coats of alkyd enamel. Factory baked enamel finishes shall be field painted by touching up abraded surfaces and applying a final coat of alkyd enamel.
   d. All machinery and equipment not finished at the factory shall be cleaned, primed and then finish painted two coats of alkyd enamel.
   e. Internal surfaces of ducts or surfaces above ceiling where exposed to view behind grilles or registers shall be painted with one or more coats to cover of flat black.
   f. Electrical panelboards shall be given one coat of alkyd enamel unless approved as being with a satisfactory finish when ready for acceptance.
   g. Emergency panel covers and doors shall be painted red.
   h. Nameplates, instruments, gauges, etc., shall not be painted and suitable protection shall be afforded to these items to prevent their being rendered illegible during the painting operations. Following the paintwork, all masking, etc., shall be removed, leaving these items in "as new" condition.

3.5 CLEANING

A. Touch up and restore finish where damaged.

B. Remove spilled, splashed, or splattered paint from all surfaces.

C. Do not mar surface finish of item being cleaned.

D. Leave storage space clean and in condition required for equivalent spaces in project.

E. During the progress of the work, remove from the project site at the end of each day, all discarded paint materials, rubbish, cans and rags.

END OF SECTION

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SECTION 09 95 50

FINISH / COLOR SCHEDULE

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Selection of interior and exterior colors and finishes.

1.2 RELATED REQUIREMENTS

A. As specified in Sections references.

1.3 SUBMITTALS

A. The submittals for products identified in this Section must be made at the same time for the purpose of color coordination. The Architect reserves the right to hold any and all submittals for products listed in this section until all submittals for products identified below have been received.

PART 2 - COLOR SELECTIONS (Refer sheet IF 1.2 for Finish/Color Schedule)

2.1 GENERAL

A. Color selections referenced to specific products are for the purposes of identifying color only. Other products exhibiting the same color, finish, and texture are acceptable if they conform to the requirements of the Specification for that product.

2.2 SECTION 05 52 00 – HANDRAILS AND RAILINGS

A. Interior Handrails: Aluminum, satin finish.

2.3 SECTION 06 41 00 – CUSTOM CASEWORK

A. Hardwood Veneer: Select White Birch, clear finish.

B. Plastic Laminate Countertops (post-formed):
1. PL-1 – Wilsonart, D354-60 “Designer White”.
2. PL-2- Wilsonart, D307-60 “Hollyberry”.
3. Shall be selected by the Architect from one of the manufacturers listed in Section 06 41 00 from manufacturer’s complete range of solids, wood grains, matrix and patterns. Architect to provide color board with samples for Owner approval.

2.4 SECTION 07 92 00 – JOINT SEALANTS

A. Match adjacent surfaces

B. Where used in conjunction with running bond masonry, match color of masonry.

C. Where used in conjunction with stack bond masonry, match color of mortar.

D. Where used in conjunction with ceramic tile, match grout.

E. Submit for approval colors for all locations including those not noted herein.

2.5 SECTION 08 12 00 – STANDARD STEEL FRAMES

A. Doors: Paint to match existing.
   1. Clear topcoat at exterior locations.

2.6 SECTION 08 13 00 – STANDARD STEEL DOORS

A. Frames: Paint to match existing.
   1. Clear topcoat at exterior locations.

2.7 SECTION 08 14 16 – FLUSH WOOD DOORS

A. Doors: match existing wood, finish to match existing.

2.8 SECTION 08 71 00 – FINISH HARDWARE

A. As scheduled in Section 08 71 00

2.9 SECTION 09 21 16 – GYPSUM BOARD ASSEMBLIES

A. Refer to Color Schedule at the end of this Section.

2.10 SECTION 09 22 00 – PORTLAND CEMENT PLASTER

A. Plaster: Finish and Paint color to match existing.

2.11 SECTION 09 30 00 – TILING

A. Quarry Floor Tile (QT):
   1. QT: Dal-tile, 6 inch by 6 inch, Red Blaze 0Q40, Matte finish

B. Ceramic Wall Tile (CWT):
   1. CWT-1: Interceramic USA, Wall Tile Collection, 4 ¼ inch by 4 ¼ inch, White Brite
   2. CWT-2 Interceramic USA, Wall Tile Collection, 4 ¼ inch by 4 ¼ inch, Bombshell Red, Lipstick
   3. CWT-3 Interceramic USA, Wall Tile Collection, 4 ¼ inch by 4 ¼ inch, Pure Cobalt, Bold Tones

C. Ceramic Floor Tile (CFT):
   1. CFT: Interceramic USA, Concrete, 12 inch by 12 inch (2 inch by 2 inch) Silver Mosaic Ceramic Floor Tile

D. Tile cove base: to match CFT

2.12 SECTION 09 51 10 – SUSPENDED ACOUSTICAL CEILINGS

A. Ceiling Panels
   1. AT-1 - Armstrong, Fine Fissured #755; 24 inch by 24 inch by 5/8 inch White, 15/16 inch Grid.
   2. AT-2 – Armstrong “Kitchen Zone”, Smooth Texture #672; 24 inch by 24 inch by 5/8 inch White, 15/16 inch Grid.

2.13 SECTION 09 65 00 – RESILIENT FLOORING

A. Flooring (Colors noted are intended as the basis for pricing only. Actual colors will be selected by Architect as part of the submittal process.)
   1. VCT-1 (Field): Armstrong – 51933 ‘Blue Cloud
   2. VCT-2 (Accent): Armstrong – 51 946 ‘Gentian Blue’
   3. VCT-3 (Accent): Armstrong – 57534 ‘Ruby Red’

B. Rubber Base (RB): Tarkett/Johnsonite “83 Midnight” .

C. Rubber Treads, Risers, and Ramp Surfaces (RBF-1): Roppe “S161 Snow”

2.14 SECTION 09 68 00 – CARPET

A. Carpet:
   1. CPT: Mannington Commercial, Urban Patina Collection, 18 inch by 36 inch Infinity Modular, Borough 15217. Architect to provide color board with samples for owner approval.

2.15 SECTION 09 91 00 – PAINTING

A. Paint, color, finish and texture. Architect to provide color board with samples for Owner approval.
   1. Color: P-1 Sherwin Williams, SW6539 “Soothing White” (Field Color).
   2. Color: P-2 Sherwin Williams, SW7587 “Antique Red” (Accent Color).
   3. Color: P-3 Sherwin Williams, SW6531 “Indigo Blue” (Accent Color).
   4. Color: P-4 Sherwin Williams, SW7664 “Steely Gray” (Accent Color).
   5. Texture: “Match Existing”
   6. Finish: “Match Existing”

2.16 SECTION 10 11 00 – VISUAL DISPLAY BOARDS

A. Markerboards: White.

B. Tackboards:
   1. TB-1 - To be selected by Architect from manufacturer’s available colors.

2.17 SECTION 10 14 00 - SIGNAGE

A. Room Number and Room Description Signage
   1. Face – Match Existing.
   2. Core – Match Existing.

2.18 SECTION 12 21 13 – HORIZONTAL LOUVER BLINDS

A. Horizontal Blinds:
   1. Finish: Brushed Aluminum Metallic. Architect to provide color board with samples for Owner approval.

END OF SECTION

SECTION 10 11 00

VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Markerboards, tackboards and accessories.

1.2 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry Assemblies.

B. Section 06 10 00 – Rough Carpentry: Wood Blocking.

C. Section 09 22 16 - Non-Structural Metal Framing.

D. Section 09 21 16 – Gypsum Wallboard Systems.

E. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCES

A. American National Standards Institute:
   1. ANSI A135.4 - Basic Hardboard.

B. ASTM International:
   1. ASTM A424 - Standard Specification for Steel, Sheet, for Porcelain Enameling.
   2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   4. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM)

D. Federal Specification Unit:
   1. FS CCC-W-408 - Wall Covering, Vinyl-Coated.
   2. FS L-P-1040 - Plastic Sheets and Strips (Polyvinyl Fluoride).

E. PEI (Porcelain Enamel Institute):
   1. Performance Specifications for Porcelain Enamel Chalkboards.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate wall elevations, dimensions, and joint locations, and special anchor details.

C. Product Data and Certifications: Submit data on markerboards, tackboards, tackboard surface covering, and trim and accessories.

D. Samples: Submit two inch in size illustrating materials and finish, color and texture of markerboard, chalkboard and trim, tackboard, and tackboard surfacing.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Conform to applicable code for flame/smoke rating of for vinyl fabric covered tackboards in accordance with ASTM E84.

B. All products shall be formaldehyde-free.

C. Wood products in this section shall be made from FCS or SFI – certified lumber and materials.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Section 01 77 00 - Execution Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for visual display boards.

C. Warranty: Include coverage of chalkboard and markerboard surface from discoloration due to cleaning, crazing or cracking, staining.

PART 2 - PRODUCTS

2.1 VISUAL DISPLAY BOARDS

A. Manufacturers:
1. Claridge Products and Equipment – Basis of Design.
2. AArco Products, Inc.
3. BestRite Visual Display Boards.
4. Information Display Technology, Inc.; Carolina Chalkboards.
5. Polyvision
6. Substitutions: Section 01 60 00 - Product Requirements

2.2 COMPONENTS

A. Sheet Steel: ASTM A424, Type I, commercial quality.

B. Cork: Fine grain natural cork, homogeneous composition.

C. Tackboard Covering: FS CCC-W-408; Type II - medium; Class 2 - mildew resistant; color as selected.

D. Medium Density Fiberboard (MDF): 7/16 inch composed of 90 percent post-industrial waste; moisture resistant, formaldehyde-free.

E. Duracore: 7/16 inch thick; manufactured from 100 percent reclaimed or recycled wood fiber, including 3% post-consumer wood fiber; moisture resisant shall not contain added resins.

F. Hardboard: ANSI A135.4, tempered, smooth face; formaldehyde free.

G. Particle Board: NOT PERMITTED.

H. Foil Backing: Aluminum foil sheet, 0.015 inch thick.

I. Frame and Chalkrail: Aluminum extrusions, ASTM B221, 6061 alloy, temper.

2.3 ACCESSORIES

A. Adhesives: Type used by manufacturer; low VOCs.

B. Map Supports: Formed aluminum sliding hooks to fit map rail.

C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

D. Flag Holders: Cast aluminum bored to receive flag staff, bracketed to fit top rail of markerboard. Provide two flag holders per markerboard.

E. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on metal plate fastened to perimeter frame near chalkrail.

2.4 FABRICATION

A. Markerboards:
   1. Outer Face Sheet: Steel, 24 gauge thick.
   2. Core: Plywood or dual layer hardboard, 1/2 inch thick.
   3. Backing Surface: Aluminum sheet, 0.015 inch thick.
   4. Splice Joint: Concealed spline of sheet steel.

B. Tackboards:
   1. Outer Facing: Claridge “Fabricork” vinyl fabric on, or approved equal.
   2. Core: 1/4 inch thick cork on 1/4 inch thick hardboard.
   3. Backing Surface: Aluminum sheet, 0.015 inch thick.

C. Aluminum Frame: Series 3 profile, 1-1/4 inch perimeter trim; concealed fasteners, map rail with cork insert over markerboard surfaces.

D. Aluminum Chalkrail: Manufacturer's standard continuous, hollow type with ribbed section and metal end closures; one piece full length of chalkboard, concealed fasteners.

2.5 FACTORY FINISHING

A. Porcelain Enamel: Glass fibered enamel, baked to vitreous surfaces; Porcelain Enamel Institute Type A; color as selected by Architect from full range of manufacturer's available colors.

B. Tackboard Surface: Vinyl fabric; color as selected by Architect from manufacturer's standard range.

C. Aluminum Frame, Chalkrail, and Accessories: Anodized to clear satin finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify internal wall blocking is ready to receive Work and positioning dimensions are as instructed by manufacturer.

C. Verify flat wall surface for frameless adhesive applied type.

3.2 INSTALLATION

A. Establish top of chalk rail at height indicated on Drawings.

B. Secure units level and plumb.

3.3 CLEANING

A. Section 01 77 00 - Execution Requirements: Final cleaning.

B. Cover chalkboard surfaces with protective cover, taped to frame.

C. Remove temporary protective cover at date of Substantial Completion.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Dedicatory Plaque.

B. Metal Letter Signage.

C. Room identification signs.

D. Exterior acrylic signs.

1.2 RELATED SECTIONS

A. Section 09 99 50 – Finish / Color Schedule.

B. Section 22 05 29 – Identification for Plumbing Piping and Equipment: colors for piping indicating piping type.

C. Section 23 05 29 – Identification for HVAC Piping and Equipment: colors for piping indicating piping type.

D. Section 26 05 53 – Identification for Electrical Systems: colors for conduit indicating type.

1.3 ALLOWANCES

A. Section 01 21 00 - Allowances: Cash allowance affecting this section.

B. Allow the sum of Ten thousand dollars ($15,000.00) for the purchase, delivery, and installation of dedicatory plaque, metal letters, and plastic signs at interior and exterior locations.

1.4 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

B. ADAAG - Americans with Disabilities Act Accessibility Guidelines.

C. TAS - Texas Accessibility Standards (current edition).

1.5 REGULATORY REQUIREMENTS

A. Conform to ADAAG, TAS and ANSI A117.1 for requirements for the physically handicapped.

B. Adhesives, Sealants, and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168, Adhesive and Sealant Applications (amended January 2005, or current edition).

1.6 QUALITY ASSURANCE

A. Supplier must be in business for minimum of 2 years making comparable products and be able to provide references upon request.

B. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos-free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.7 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.

C. Samples: Submit two signs, full size illustrating type, style, letter font, and colors specified; method of attachment.

D. Manufacturer's Installation Instructions: Submit installation template and attachment devices.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Package signs, labeled in name groups.

C. Store adhesive attachment tape at ambient room temperatures.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. ASI Sign Systems, Inc.; InTouch™ ADA- Ready™ Sign System (Interior Raised Letter Signs - Basis of Design).
2. Sign Resource Management, 512-863-9929.
3. Southwell Company, 210-223-1831.
4. National Signage Affiliates, 800-322-4515
5. Substitutions: Refer to Section 01 60 00.

2.2 DEDICATORY PLAQUE

A. Plaque shall be cast of virgin ingots (85-5-5-5 Standard U. S. bronze alloy). Casting shall be free of pits and gas holes and all letters shall be sharp and hand tooled. Border and faces of raised letters shall be satin/brushed finish and background shall be leatherette finish. Plaque

shall be chemically cleaned and etched and treated with Alodine and sprayed with two coats of clear acrylic lacquer.

1. Size: 24 inch wide x 36 inch high.
2. Border Design: Raised, satin/brushed finish.
3. Letter Style: "Helvetica," satin/brushed finish.
4. Background: Leatherette finish, Oxidized-Dark Bronze.

B. Text: Owner shall provide exact wording at a later date.

2.3 EXTERIOR (WALL-MOUNTED) BUILDING LETTERS

A. Non-Illuminated Letters.
1. Flat Cut
2. Materials: 1” Aluminum. If required, manufacturer to provide stiffeners to prevent any flex and oil canning.
3. Finishes: Pre-finished – Owner Selected Color
4. Anchoring/Mounting: Refer manufacturer recommendations.

B. Text Height & Text Width : “7710” @ 8”H & 2”W

C. Text Style: Arial.

2.4 INTERIOR (TACTILE) RAISED LETTER SIGNS

A. Manufacturer shall provide raised/laminate signs of one/two tone laminate (WilsonArt), VisiTouch®/CCSW Accent Series, per details. Raised messages shall consist of construction containing the following:
1. Raised Tactile Grade 2 Braille shall be integral with the sign face and be raised 1/32”. Glass or metallic rasters to have .059 surface diameter with body of sphere pressure secured below face laminate. Glued on dots will NOT be acceptable.
2. Raised symbols shall be as indicated on Drawings, raised 1/32” from sign face and unitized with the acrylic sign core.
3. All raised lettering shall be 5/8” high (min.), raised 1/32” and be integral with the sign face; letter style to be Helvetica Medium or Helvetica Regular Condensed where required to fit.
4. All lettering shall be upper case.
5. All copy (lettering, numbering & symbols) shall have a contrast with their background and have and Egg Shell matte finish.

B. Provide signs with clear acrylic lense window for changeable message where scheduled.

C. Sign Face and Back: WilsonArt, Nevamar, or Formica laminate with a core of 1/8” or 1/4” acrylic as required. Edges shall be painted to match face color of adjacent surface.

D. Fabrication: Process using dimensional letters precision cut from acrylic and chemically welded through the face laminate to the acrylic core, thus producing an integral raised letter 1/32”.
1. GP-2 VisiTouch® with DuraDot© Braille, or approved equal.
2. Manufacturing process shall be in conformance with provisions of the TAS and ADA.

2.5 EXTERIOR ACRYLIC SIGN

A. Materials:
1. Back: 1/4" Acrylic Sheet, size as shown on drawings.

2. Letters: Premium Adhesive Vinyl.
3. Match logo and lettering of existing sign.
4. Provide Braille and graphic symbol per TAS – 2012.

B. Accessories:
1. Tape Adhesive: Double sided tape, permanent adhesive.
2. Screws: Flat head, countersunk; pre-painted to match background color of sign.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine the area and conditions under which Architectural letters/plaques are to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after surfaces are finished, in locations scheduled.

C. Locate sign on wall surface, level, mounted 60 inches above finished floor.

D. Attach with tape adhesive and mechanically fasten with one screw in each corner of sign.

E. Install Acrylic sign to concrete and masonry surfaces.
1. Predrill concrete/masonry for expanding anchors, size as recommended by anchor manufacturer.
2. Mount sign using neoprene washers under sign to protect and prevent damage to sign.

3.3 CLEAN UP

A. Clean up all debris caused by the work of this Section, keeping the premises clean and neat at all times.

END OF SECTION

SECTION 10 21 13.19

PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes solid plastic toilet compartments and urinal screens.

B. Attachment hardware.

C. Related Sections:
1. Section 05 50 00 – Miscellaneous Fabrications: Concealed steel support members.
2. Section 06 10 00 - Rough Carpentry: Concealed wood framing and blocking for compartment support.
3. Section 10 28 13 - Toilet and Bath Accessories.

1.2 REFERENCES

A. American Society for Testing and Materials:
1. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
2. ADA-ADAAG – Americans With Disabilities Act Accessibility Guidelines.
3. TAS – Texas Accessibility Standard.

1.3 QUALITY ASSURANCE

A. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.

C. Product Data: Submit data on panel construction, hardware, and accessories.

D. Samples: Submit two 2 x 3 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.

1.5 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with placement of support framing and anchors in wall and ceiling.

PART 2 - PRODUCTS

2.1 SOLID PLASTIC TOILET COMPARTMENTS

A. Manufacturers:
   1. Columbia Partitions, a Division of PSiSC.
   2. Accurate Partitions Corp.
   3. Global Partitions.
   4. Substitutions: Refer to Section 01 60 00 - Material and Equipment.

B. Product Description: Floor mounted, overhead braced.

C. Materials: 100 percent recycled high density polyethylene sheet shall be from resins under high pressure forming a single component section.
   1. Colors shall be homogeneous, uniform, extending from the surface throughout the material thickness. Colors shall be selected from manufacturers custom color selections.
   2. Panels shall be waterproof, non-absorbent and have a self-lubricating finish that resists marking with pens, pencils, or other writing utensils.
   3. Sheet material used for doors, panels and pilasters shall be 1" thick with all edges machined to.25" radius.

D. Wall brackets shall be continuous, full length of panel made from aluminum extrusion (6063-T6 alloy) with mill finish.

2.2 COMPONENTS

A. Toilet Compartments: Solid molded plastic panels, doors, and pilasters, floor-mounted headrail-braced.
   1. Color: Single color as selected.

B. Door and Panel Dimensions:
   1. Thickness: 1 inch
   2. Door Width: 24 inch
   3. Accessible Door Width: 32 inch clear opening, out-swinging.
   4. Height: 55 inch
   5. Height of Pilasters: 82”1-1/4 inch.

2.3 ACCESSORIES

A. Pilaster Shoe: Formed solid plastic of same material as pilaster, 3 inch high, concealing floor fastenings. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   1. Anchor to floor with No. 5 plaster anchors and No. 14 stainless steel Phillip’s head screws.

B. Wall Brackets: Full length continuous, Use for panel to panel and wall to panel connection.

C. Head Rails: Hollow mill finished aluminum tube, 1 x 1-5/8 inch size, with anti-grip profiles and cast socket wall brackets.
   1. Headrail Brackets: Satin stainless steel, 16 gauge minimum thickness.

D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; one-way sex bolts.

E. Hardware: Polished Satin chrome plated non-ferrous cast metal: Stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two for each door.
   2. Nylon bearings.
   3. Thumb turn door latch with exterior emergency access feature.
   4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   5. Coat hook with rubber bumper; one for each compartment, mounted on door panel.
   6. Furnish door pull for outswinging doors.
   7. Furnish metal heat sink at bottom of doors and partitions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify field measurements are as indicated on shop drawings.

C. Verify correct spacing of and between plumbing fixtures.

D. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

B. Attach panel brackets securely to walls using anchor devices.

C. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

D. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Indicated Position: 1/4 inch.

C. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

A. Section 01 77 00 - Execution Requirements: Testing, adjusting, and balancing.

B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

C. Adjust hinges to position doors in partial opening position of 15 degrees when unlatched. Return out-swinging doors to closed position.

D. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 23 32

CUBICLE CURTAIN TRACK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Overhead metal curtain track and guide.

B. Curtains.

1.2 RELATED SECTIONS

A. Section 09 51 10 - Suspended Acoustical Ceilings: Suspended ceiling system to support track.

B. Section 09 99 50 – Finish / Color Schedule.

1.3 REFERENCES

A. NFPA 701 - Fire Tests for Flame Resistant Textiles and Films.

B. UL (Underwriters Laboratories, Inc.) - Flammability Test 214.

1.4 SYSTEM DESCRIPTION

A. Track: Surface mounted.

1.5 PERFORMANCE REQUIREMENTS

A. Track: Support vertical test load of 50 lbs without visible deflection of track or damage to supports.

B. Track Size: Safely support moving loads.

C. Track and Mounting: Sufficiently rigid to resist visible deflection and without permanent set.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.

C. Product Data: Provide data for curtain fabric characteristics.

D. Samples: Submit two fabric samples, 6 x 6 inch in size illustrating fabric color.

E. Submit 12 x 12-inch sample patch of curtain cloth with representative hem stitch detail, heading with reinforcement, and carrier attachment to curtain header.

F. Submit 12-inch sample length of curtain track including typical splice and wall and ceiling hanger and escutcheon.

G. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.7 MAINTENANCE DATA

A. Submit under provisions of Section 01 77 00.

B. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code and NFPA 701 for flame/smoke rating requirements for flame resistant material in accordance with ASTM E84 for curtain fabric.

1.9 MOCKUP

A. Provide mockup of curtain, track and accessories under provisions of Section 01 40 00.

B. Provide complete section mockup, with curtain track, curtain, cords and accessories.

C. Locate where directed.

D. Approved mockup may remain as part of the Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Accept curtain materials on site and inspect for damage.

C. Store curtain materials on site and deliver to the Owner for installation when requested.

1.11 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.12 EXTRA MATERIALS

A. Furnish under provisions of Section 01 77 00.

B. Provide five extra carriers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Pryor Products; Model.

B. General Cubical Co.

C. A.R. Nelson Company.

D. Substitutions: Under provisions of Section 01 25 00 and Section 01 60 00.

2.2 TRACK MATERIALS

A. System: Surface mounted system for ceiling height curtains.

B. Track: Extruded aluminum sections; #6063-T4, T5 alloy, one piece per cubicle track run, where possible.

C. Track End Stop: To fit track section.

D. Curtain Carriers: Nylon roller to accurately fit track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal; 2.3 carriers per lineal foot of track length.

E. Wand: Plastic hollow section, attached to lead carrier, for pull-to-close action.

2.3 CURTAIN MATERIALS

A. Curtain: 100% polyester, 15 oz./lin. yd.; anti-bacterial, self deodorizing, sanitized, preshrunk, flame-resistant to NFPA 701.

B. Curtain: Color selected from manufacturer's standard range.

C. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, same color as curtain.

2.4 FINISHING

A. Exposed Surfaces: Clear anodized finish.

2.5 FABRICATION

A. Manufacture curtains of one piece, sized 10 percent wider than track length. Terminate curtain 15 inches from floor.

B. Include open mesh cloth at top 21 inches of curtain for room air circulation.

C. Curtain Heading: Triple thickness 2 inches wide, with metal grommet holes for carriers 6 inches on center, double fold bottom hem 2 inches wide. Lock stitch seams in two rows. Turn seam edges and lock stitch.

D. Fabricate track bend with minimum 12 inch radius, without deforming track section, or impeding movement of carriers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and above ceiling supports are ready to receive work.

3.2 INSTALLATION

A. Install curtain track secure and rigid, true to ceiling line.

B. Install end caps.

C. Secure track to ceiling system.

D. Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 26 13

CORNER GUARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Corner guards.

1.2 RELATED SECTIONS

A. Section 09 21 16 – Gypsum Wallboard Systems: Wall construction.

B. Section 09 22 16 – Non-structural metal framing.

C. Section 09 99 50 – Finish / Color Schedule.

1.3 PERFORMANCE REQUIREMENTS

A. Installed Component Assembly: Class 1 fire rating with impact resistance of 16 ft. lbs/in. minimum in accordance with ASTM D 256.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

C. Samples: Submit two sections of corner guard, 24 inch long, illustrating component design, configuration, color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.7 COORDINATION

A. Coordinate work under provisions of Section 01 30 00.

B. Coordinate the work with wall or partition sections for installation of concealed blocking or anchor devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. American Floor Products Company, Inc. (AFCO); Space (CG-2145).

B. Construction Specialties, Inc.; Acrovyn LG Series, LG-250.

C. Pawling Corporation, Standard Products Division; Pro-Tek Impact Protection Systems, CG-18 & CG-19.

D. Substitutions: Under provisions of Section 01 60 00.

2.2 COMPONENTS

A. Corner Guard - Surface Mounted: 2 1/2 x 2 1/2 inch for 90 and 135 degree corners:
   1. Material: 0.125-inch nominal clear polycarbonate resin.
   2. Length: 96 inches; one piece.
   3. Color: Clear.

B. Attachment Hardware: Countersunk chrome-plated or stainless steel screws.

2.3 FABRICATION

A. Fabricate components with uniform corners and edges.

B. Pre-drill holes for attachment to wall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 30 00.

B. Verify that rough-in for components are correctly sized and located.

C. Verify actual height of base.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.

B. Position corner guards 4 inches above finished floor to 8’-4” inches high.

3.3 SCHEDULE

A. Provide corner guards at all external corners of gypsum wallboard partitions in the Administrative area.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet room accessories.

B. Accessories at custodial closets, utility rooms and sinks.

C. Related Sections:
1. Section 04 20 00 – Unit Masonry Assemblies.
2. Section 06 10 00 – Rough Carpentry: In-wall framing and plates for support of accessories.
3. Section 08 81 00 – Glazing: Other mirrors.
4. Section 09 30 00 – Tile.
5. Section 09 99 50 – Finish / Color Schedule.
6. Section 10 21 13.19 – Plastic Toilet Compartments.

1.2 REFERENCES

A. American Society for Testing and Materials:
1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
5. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
6. ASTM C1036 - Standard Specification for Flat Glass.

B. Federal Specification Unit:
1. FS A-A-3002 - Mirrors, Glass.

C. Accessibility Guidelines:
1. ADAAG – Americans With Disabilities Act Accessibility Guidelines.
2. TAS – Texas Accessibility Standards.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.

C. Samples: Submit two samples of each accessory, illustrating color and finish.

D. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.

1.4 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 - PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

A. Manufacturers - General:
1. Bobrick Washroom Equipment (BWE).
2. Bradley Corporation.
3. Charles Parker Company
4. Kimberly-Clark (KC)
5. Truebro Inc.
6. Koala Care (Koala).
7. Substitutions: Section 01 25 00 Substitution Request and 01 60 00 - Product Requirements.

B. Manufacturers – Miscellaneous:
1. Ives
2. Rockwood
3. Royce Rolls Ringer Company (RRR).
4. Scott Paper Company (SPC).
5. Trimco
6. Substitutions: Not Permitted.

C. Manufacturers – Hand Dryers:
1. World Dryer Corp. (WDC).
2. Substitutions: Not Permitted.

2.2 COMPONENTS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Furnish five keys for each accessory to Owner. Master key all accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269, stainless steel.

E. Galvanized Sheet Steel: ASTM A653, G90 zinc coating.

F. Mirror Glass: Float glass, Type I, Class 1, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with FS A-A-3002.

G. Adhesive: Contact type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.

I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FACTORY FINISHING

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, Type SC 2, satin finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Galvanizing for Items other than Sheet: ASTM A123/A123M to 1.25 oz/sq yd. Galvanize ferrous metal and fastening devices.

E. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

F. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify exact location of accessories for installation.

C. Verify field measurements are as indicated on product data.

D. See Sections 04 20 00 and 06 10 00 for installation of blocking, reinforcing plates and concealed anchors in walls and ceilings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Mounting Heights and Locations: As required by accessibility regulations and manufacturer’s instructions.

3.4 SCHEDULE (BASE BID – KITCHEN)

Mark	Description	Model No.	Mfg.
TA-1	Grab Bar, 42 inch - satin finish, concealed mounting, snap flange	B-6806x42	BWE
TA-2	Grab Bar, 36 inch - satin finish, concealed mounting, snap flange	B-6806x36	BWE
TA-3	Mirror - stainless steel frame, concealed wall hangers; width and height indicated on Toilet Acc. Schedule	B-290	BWE
TA-4	Liquid Soap Dispenser	Note: Owner Furnished/Owner Installed	
TA-5	Toilet Paper Dispenser dual roll, lockable; padlock by Owner	TP-2	RRR
TA-6	Paper Towel Dispenser; surface mounted, lever roll type	#09736	KC
TA-7	Undersink Protective Cover	Laveguard 2	Truebro
TA-8	Mop and Broom Holder	B-224x36	BWE
TA-9	Wall Splash – stainless steel, 90 degree corner 24” x 24” x 10”, .050 inch thick, US32D finish Provide at mop sinks in Custodial Closets	Ives, Rockwood Trimco are acceptable	
TA-10	Electric hand dryer	XL-SB	EXCEL
TA-11	Motorized Changing Station	AM-SX 106	Armedica Manufacturing corp

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Portable fire extinguishers.

B. Fire extinguisher cabinets.

1.2 QUALITY ASSURANCE

A. Source Quality Control: Furnish portable fire extinguishers and accessories from only one manufacturer.

B. Requirements of Regulatory Agencies: Provide only portable fire extinguishers that are approved and labeled by UL in accordance with the 1991 Uniform Building Code.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified.
   1. UL, Fire Classification Rating.
   2. NFPA 10 - Portable Fire Extinguishers.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Submit copies of manufacturer's technical data, certification of UL rating and installation instructions for all portable fire extinguishers required.

1.4 COORDINATION

A. Coordinate Work under provisions of Section 01 40 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Potter-Roemer.

B. Larsen's Manufacturing Co.

C. J. L. Industries.

D. Substitutions: Under provisions of Section 01 25 00 and Section 01 60 00.

2.2 FIRE EXTINGUISHER CABINETS

A. Manufacturer:
   1. Potter-Roemer; 7000 Alta Series Cabinet.
   2. Larsen's Manufacturing Co.; Architectural Series Cabinet.

3. J. L. Industries; Ambassador Series Cabinet.

B. Construction:
1. Semi-Recessed Cabinets: Model No. 7012-E.
2. Door and Trim: Door with center break glass panel; cam lock; 2-1/2 inch projection.
3. Cabinet Box: Cold rolled steel, heavy gauge, with white baked enamel finish.

2.3 FIRE EXTINGUISHERS

A. Fire Extinguisher Type 1: Multi-purpose Dry Chemical; 5 pound capacity, UL rating 3A-10B:C.
1. Manufacturers:
a. Potter-Roemer; Model 3005.
b. Larsen's Manufacturing Co; MP5.
c. J. L. Industries; Cosmic 5E.

B. Fire Extinguisher Type 2: Carbon Dioxide; 5 pound capacity, UL rating 5-B:C.
1. Manufacturers:
a. Potter-Roemer; Model 3405.
b. Larsen's Manufacturing Co; CD5.
c. J. L. Industries; Sentinel 5.

C. Fire Extinguisher Type 3: Type 'K'.

D. Provide each fire extinguisher not installed in a fire extinguisher cabinet with manufacturer's standard mounting bracket.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the portable fire extinguisher Work is to be installed, and notify the Architect in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install items included in this Section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
1. In locations indicated on Drawings as "F.E.C.", provide fire extinguisher and cabinet.
2. In locations indicated as "F.E.", provide fire extinguisher mounted on manufacturer's standard hook.

B. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

C. Fit cabinet trim to wall surfaces.

D. Check extinguishers for proper charge and operation.

E. Remove and replace damaged, defective or undercharged units.

3.3 SCHEDULE

A. Except as indicated below, provide each location indicated on Drawings with Fire Extinguisher Type 1.
   1. Provide Fire Extinguisher Type 3 in Scullery/Kitchen B103.
   2. Provide Fire Extinguisher Type 1 in Corridor A118.

END OF SECTION

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SECTION 10 90 00

MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.1 EXTENT OF WORK

A. Provide miscellaneous specialty items as shown on the Drawings and specified herein:

1. Audio/Visual Equipment Mounting Systems.

1.2 RELATED WORK

A. Section 04 20 00 – Unit Masonry Assemblies.

B. Section 09 21 16 – Gypsum Wallboard Systems.

C. Section 09 99 50 – Finish / Color Schedule.

D. Section 11 52 13 – Projection Screens.

E. Section 27 41 00 – Audio Visual Systems.

1.3 MEASUREMENTS

A. Verify all dimensions shown on Drawings by taking field measurement; proper fit and attachment of all parts is required.

1.4 ANCHORAGE

A. Furnish and install all anchorage devices required to install the item and its appurtenances complete. Provide anchorage in ample time when required to be built in by other trades.

1.5 SUBMITTALS

A. Provide manufacturer's data and installation instructions and details, including applicable dimensions.

1.6 QUALITY ASSURANCE

A. Provide items which are products of a single manufacturer. Furnish each item complete with screws, bolts, clips and similar accessory parts which are essential to proper servicing and operation.

B. Location: Coordinate miscellaneous specialty item locations to avoid interference with other Work and to assure proper servicing and operation.

C. Appearance: Provide units which are without blemish or damage, and without stamped names or labels in conspicuous locations.

D. Coordination: Assure that the Work is coordinated in a timely manner with the Work of other trades. Provide blocking and concealed reinforcement as required to rigidly support installations. Provide templates to assure correct installation.

E. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

PART 2 - PRODUCTS

2.1 AUDIO-VISUAL EQUIPMENT MOUNTING SYSTEMS

A. Overhead Projection Ceiling Plate (Contractor-Furnished, Contractor-Installed): CMJ500R1 Suspended Ceiling Kit as manufactured by Peerless or approved equal.
1. Kit shall include 8 by 24 inch filler tray and 15-3/4 by 24 inch ceiling tray suspended by four tie wires from structure above.
2. Provide safety cable, strand wire, turnbuckles, and outlet knockouts as required in Division 16.
3. Support ceiling plate at each corner.
4. Installation of Owner-provided overhead projector shall be by Others.

B. Overhead Projector Mount Accessories:
1. Truss Ceiling Adapter: Model ACC 557; black.
2. Structural Ceiling Plate: Model CMJ 310; 8 by 8 inch; black.
3. Extension Columns: 1-1/2 inch O.D. length to suit application; black
4. Escutcheon Ring: Model ACC 640.
5. Attachment Hardware: Hanger clamps, bolts, screws to suit application.

2.2 NURSE'S CLINIC EQUIPMENT AND FURNISHINGS

A. Medical Table: 3030-30 Straight Line, Treatment Table with Shelving as manufactured by Clinton Industries Inc., or approved equal.
1. Rigid all steel frame.
2. Adjustable backrest.
3. Laminate shelving.
4. 450lbs. load capacity under normal use.

2.3 SPECIAL NEEDS CHANGING TABLE

A. Hi-Lo Changing Table: AM-SX 1060 Changing Table as manufactured by Armedica Manufacturing Corporation, or approved equal.
1. Top Dimensions: 60" x 25"
2. Height Range 18" – 37"
3. Footswitch control
4. 400lbs. lifting capacity
5. 120-volt 60hz motor

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install miscellaneous specialties in compliance with manufacturer's instructions, plumb and level or otherwise properly aligned.

B. All anchorage screws, bolts and/or set screws shall be fully tightened and accessories shall be rigidly supported. Use fasteners which are appropriate for the substrate and as recommended by the manufacturer.

C. Install ceiling plates above ceiling at locations indicated on Drawings for projectors. Verify exact location with Owner's Representative prior to installation. Center of projector mount shall be centered on projection screen.

3.2 CLEANING

A. Prior to final inspection clean exposed surfaces as recommended by the manufacturer.

END OF SECTION

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SECTION 11 40 00

FOODSERVICE EQUIPMENT

PART 1 GENERAL

1.1 CONDITIONS OF CONTRACT and DIVISION 1, as indexed, apply to this section.

1.2 SCOPE: All Foodservice Equipment as shown on the drawing and as specified herein.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A.	Heating, Ventilation and Air Conditioning	Division 15/23
B.	Plumbing	Division 15/22
C.	Electrical	Division 16/26
D.	Technology	Division 17/27

1.4 RELATED WORK BY OTHERS

A. The rough-in service and the actual connection between kitchen equipment shall be furnished under Electrical, Plumbing and Mechanical Contractors unless specifically called for in the Item Specifications. The actual hardware connections and required labor to connect equipment to rough-ins shall be the entire responsibility of the prospective Contractor.

B. The Plumbing Contractor shall furnish and install all tailpieces, “P” traps, line strainers, grease traps, indirect copper drain lines, check valves, backflow preventers, fittings and stops for a complete system. All connections shall be made in accordance with local codes, except where plans and specifications exceed code requirements. Exhaust fans, ducts, gas flues and/or vents shall be furnished by the Mechanical Contractor. Final connection to kitchen equipment shall be by Plumbing Contractor. All faucet and prerinse assemblies for foodservice equipment are to be furnished by Kitchen Equipment Contractor and installed by Plumbing Contractor unless noted otherwise in item specifications.

C. All exhaust ducts, fans shall be furnished and installed by the Mechanical Contractor. Exhaust ducts to have water and grease tight connections and be constructed of rust resistant metal with continuous welded joints.

D. The Electrical Contractor shall furnish and install disconnect switches, safety shut-offs, control panels, fuse boxes, fan starters and other electrical controls to complete the project. Starting switches for the kitchen equipment are to be furnished by the Kitchen Contractor. Labor for connections shall be by the Electrical Contractor.

E. Sleeves and P.V.C. tubing for syrup lines and refrigeration lines shall be furnished and installed by the Plumbing Contractor.

F. The Kitchen Contractor shall be responsible to furnish and install all related refrigeration work. Final plumbing and electrical connections shall be made by other related Contractors.

G. All Masonry bases, depressions, and built up recessed walk-in floors shall be the

responsibility of the General Contractor. The General Contractor shall be responsible for providing all wall blocking for overshelves, pot racks, rack shelves, etc. as mention herein. Kitchen Equipment Contractor shall detail and indicate all special provisions required for food service equipment submitted.

1.5 APPROVED KITCHEN EQUIPMENT CONTRACTORS

A. Subcontractors providing the foodservice equipment, foodservice equipment fabrication and foodservice equipment installation for this project shall meet the following criteria:
   1. Subcontractor shall have successfully completed three projects of similar size and scope to this project within a three year period prior to bidding this project.
   2. Subcontractor shall be an authorized Dealer for all equipment as specified in this section.
   3. Stainless steel fabrication contractor shall be an N.S.F. Certified fabricator.

1.6 QUALITY ASSURANCE

A. Workmanship and Employees: Workmanship shall be of the highest grade throughout and in accordance with best standards as practiced for heavy-duty kitchen equipment. The Contractor shall enforce at all times strict discipline and good order among his employees, and shall not employ any unfit person.

1.7 STANDARDS

A. All food service equipment shall be fabricated in accordance with the National Sanitation Foundation (NSF) and post the seal of approval. Where Contract Documents exceed NSF requirements, the Contact Documents govern. If the Architect is not satisfied with the sanitary construction casework details, the Contractor shall call in the area NSF representative for an onsite inspection and evaluation at no cost to the Owner.

B. All plumbing pipes and fixtures listed herein shall conform to the Safe Drinking Water Act (SDWA) and its LEAD FREE standards. If for any reason the fixtures do not pass the standards as set forth by the SDWA, it is the Contractors responsibility to replace those fixtures with an approved equal, which does comply.

C. All equipment, related components including refrigerants and performance must be in compliance with the current governing IECC requirements.

D. The kitchen facility and related equipment shall be in compliance with the current Texas Accessibilities Standards.

1.8 MECHANICAL

A. All gas burners, valves, fittings, etc. shall be installed in accordance with local codes and the American Gas Association. All buy-out gas equipment shall bear the seal of A.G.A. All hot and cold water service stops at the point of equipment to be furnished by others.

1.9 ELECTRICAL

A. All fabricated equipment electrical work shall be installed in accordance with local codes Uniform Building and National Electrical Codes, except where plans exceed codes and specifications. All buy-out equipment to be listed and/or recognized by Under-writers Laboratories, Inc. All vertical service mounted controls to be recessed.

B. Electrical fittings and components: furnished under this Section area as follows. Components provided loose under this Section for field installation and connection under Division 16 are indicated by asterisk * or as indicated on detail. Coordinate foodservice equipment voltage and phase with building system.

*1. Walk-in Cooler/Freezer ceiling lights are to include mounting hardware consisting of F.S. junction box with cover and plastic nipple to fasten to walk-in box ceiling panels. Division 16/26 contractor is to provide and install all loop wire between light fixtures in seal tight flexible conduit exposed on the interior of the walk-in assemblies and routed to the rough-in junction box at the top of the walk-in assembly door panel. One ceiling penetration each in the cooler and freezer are to be provided by kitchen equipment contractor. All penetrations and inside of electrical conduits are to be properly sealed by the Division 16/26 electrical contractor to prevent temperature transfer and development of condensation at penetrations and light fixtures. All wiring to be in seal tight conduit with PVC fittings and mounted to interior ceiling of walk-ins with non-corrosive PVC brackets.

2. Division 16/26 to provide and connect all control wiring for walk-in box evaporators and provide disconnect switch on the evaporator or on the wall panel directly behind evaporator. All wiring and rigid metal conduit are to be in accordance with governing code requirements. Kitchen Equipment Contractor to supply remote outdoor refrigeration rack, pre- wired to master control panel with outdoor type NEMA 4 power disconnect. Division 16/26 to connect power lines from rough-in points to master control panel.

1.10 SUBMITTALS

A. The Contractor shall submit six sets for the Consultant's approval such as assembly drawings, electrical and mechanical rough-in connection plans, details for plumbing, electrical, air conditioning and ventilation services for all kitchens equipment and brochures, catalog cut-sheets, specifications and operating characteristics for buy-out equipment. This submittal set shall be submitted within 35 days of notification of bid award. Submittals shall be submitted in the following format:

1. Submittal shall be submitted with front and rear hard protective covers with labeled project name.
2. Front sheet indicating the name and address of the project, Architect, Foodservice Consultant and Kitchen Equipment Supplier.
3. A separate divider sheet for each component/item of equipment indicating: item number, name, quantity, manufacturer, optional equipment, modifications and utility requirements.
4. Clearly indicate any deviations from contract Documents, such as arrangement of piping, connections, wiring method of fabrication, manner of structural conditions, standard shop practices, or other reasons, as noted in letter of transmittal accompanying submittals.
5. Drawing of fabricated equipment shall not be less than ¾" equal on foot scale. Rough-in drawings shall not be less than ¼" equal one foot scale.
6. Under no circumstances shall any work be undertaken or material shipped prior to the written approval of the Consultant. Approval of such plans and brochures by the Consultant shall not relieve the Kitchen Contractor of any obligation to furnish all materials and labor required for the completion of the project. The Consultant's approval shall not relieve the Kitchen Contractor of any responsibility, with regard to the final successful operation of the Equipment nor shall it under any circumstances

relieve the Kitchen Contractor from fulfilling any or all guarantees made in the agreement.

7. The Contractor shall, after all revisions are complete, furnish for the Consultant three (3) sets of final drawings and specifications.

1.10 FIELD MEASUREMENTS

A. All measurements required to facilitate the installation and connection of all kitchen equipment shall be the responsibility of the Kitchen Contractor. Drawing dimensions are approximate locations for all plumbing, electrical and ventilation connections. Any conflicting dimensions and/or obstacles performed by others that prevent the installation of specified equipment shall be reported to the Consultant before proceeding with installation.

PART 2 – EQUIPMENT SUBSTITUTIONS:

2.1 SUBSTITUTIONS

A. Wherever a specific equipment item is specified, it is not the intention of the Owner or Consultant to discriminate against another manufacturer. It is rather the intention to set a definite standard as to the class of material itself. Under no circumstances, however, shall any substitution be made without the written approval of the Consultant. In making his proposal, each prospective Contractor is expected to include in his proposed sum the cost of the materials, which are specified.

B. No substitutions will be approved prior to bid award. Substitutions may then be considered as provided by other sections of these specifications. If the proposed substitution is not found to be acceptable by the Owner, Consultant and or Architect, the specified item must be provided.

C. In all instances such request shall be accompanied by complete descriptive literature and complete operation and performance data. The Consultant will investigate such request for substitutions, consult the Owner when necessary and render final decision as promptly as possible.

D. If a substitution granted proves unsatisfactory for the service for which it was intended within the guarantee period, the Contractor shall make the Project conform to the specifications at his own expense.

E. If substituted equipment requires more of different electrical, plumbing or mechanical connections, the Kitchen Contractor shall pay for said additions to respective Electrical or Mechanical Contractor. INSPECTION, TESTING AND BALANCING.

2.2 CONDEMNATION

A. Final approval of equipment and installation shall be made by the Consultant and/or Owner's Agent. A review of the installed equipment shall be made with the Contractor at which time the Contractor shall demonstrate the operation procedures of each item. Three hard bound sets of operation procedures and repair part lists shall be presented to the Owner at the time of inspection.

B. Should any equipment item be rejected by the Consultant or Architect as not meeting Contract Documents requirements, the Contractor shall remove the equipment item within a twenty-four hour period.

C. All-tests of individual equipment components and steel gauge shall be conducted without cost to Owner.

PART 3 – EQUIPMENT

3.1 KITCHEN EQUIPMENT

A. **Fabricated Equipment:** All fabricated equipment such as food servicing units, tables,sinks, etc. described in the item specifications, other than by name and catalog number shall be manufactured in the successful bidder's manufacturing plant having personnel with expertise and facilities to manufacture high quality kitchen equipment. If the bidder does not maintain and operate a fabrication plant he shall submit the name and address of the factory that is fabricating the proposed equipment.

B. **Buy-Out Equipment:** The successful bidder shall be an authorized distributor of the buy-out equipment specified in the item specifications. He shall be responsible to furnish any replacement part promptly when required.

C. **Guarantee:** The Kitchen Contractor shall guarantee all equipment, materials and workmanship incorporated in the Project for a period of one year after the date of the final acceptance of the Project. Faults discovered by the Owner within the guarantee period shall be corrected by the Kitchen Contractor.

D. Any equipment that requires removal to repair shall be replaced with an equal to or better piece of equipment on a loan basis.

3.2 MATERIALS:

A. **General:** All material installed as a permanent part of the fabricated equipment shall be new and unused and of the quality specified. The material on the job shall be maintained in an undamaged condition. All items of buy-out equipment shall be of the latest model at the time of bidding.

B. Stainless steel used in the construction of the fabricated kitchen equipment to be Type 304, having a standard analysis type of 188-8. Exposed stainless steel shall be polished to a No. 4 finish. Sheet colors throughout with a uniform finish and appearance.

C. Galvanized metal shall be copper bearing galvanized steel sheets or ingot galvanized iron steel sheets equal to Armco or Toncon, re-rolled for smoothness and used in the largest possible size to facilitate as few welded joints as necessary.

D. **Structural Shapes:** Galvanized 1 ½" x 1 ½" x 1/8" steel angle as required for structural support of fabricated equipment.

E. **Bolts, Screws and Rivets:** All working surfaces shall be free of bolts, screws and rivet heads. When fasteners are required on working and/or exposed surfaces they shall be approved concealed type. All fasteners shall be of the same composition as metal to be fastened.

F. Tubing shall be seamless 1 5/8" outside diameter, 16-gauge stainless steel.

G. Sealant shall be CLEAR silicone by General Electric Co. or equal and approved by USDA for incidental food contact.

3.3 FABRICATION:

A. **Welding:** All welds of stainless steel shall be heli-arc welded. Welds to be free of pits and flaws and ground smooth and uniform to the grain and finish of the original sheet. Where grinding and polishing have destroyed the grain, restore and blend the joints such that all traces of the weld are removed. All welds are to be backgrounded. Acetylene welding or silver solder shall not be used. All galvanized welding shall be arc-welded. Welds shall be free of pits and flaws and peined to remove flux and other impurities, and ground smooth.

B. **Finishing:** All exposed edges shall be deburred such that a rounded smooth edge is produced. All stainless steel shall have a No. 4 finish except for leading edges that will be highlighted to a No. 7 finish.

C. **Painting:** All tables, cabinets and sinks under carriages, except for stainless steel, shall be painted with black semi-gloss acrylic enamel. A baked enamel finish, according to paint manufacturer's recommendations, is required for all exposed surface.

D. **Laminated Plastic:** Wherever laminated plastic is specified for cabinet work it shall be Formica, Wilson Art or equal. Plastic to be bonded with a Urea based cement, waterproof and heatproof. All edges to be mitered. Plastic shall be applied directly over 1/2" thick close grain plywood.

E. **Sound Deadening:** A plastic mastic sound deadening material shall be applied to underside of all counter tops, sinks and worktables to a minimum of 1/8" thickness. Excess mastic on visible part shall be cleaned. An NSF approved material shall be used. A tar base material is not acceptable.

F. **Field Joints:** Field joints shall be limited only to facilitate installation and transportation. All field joints to be continuously welded, grounded and finished smooth without buckling.

G. **Equipment Refrigeration:** All refrigeration equipment for a complete system shall be furnished by the Kitchen Contractor. All refrigeration systems rated over 1/3 hp shall have a sight glass, thermal expansion valve, high and low pressure controls and defrost cycle. All refrigeration lines to have Armaflex covering except for conduit runs.

1. All compressors to have a five (5) year warranty. Completed systems to have a one (1) year Warranty from date of substantial completion or acceptance.
2. All-thermostatic capillary tubes to be adequately protected from user damage.
3. All refrigeration systems less than 1 hp that use a capillary expansion line shall be properly charged such that ice balling does not occur at the frost line.

H. **Plumbing Trim:** Kitchen Contractor shall furnish all trim as specified within or in the Item Specifications.

1. Faucets, Splash Mount with adequate nozzle length as manufactured by T&S Brass.
2. Faucets, Deck Mount with adequate nozzle length as manufactured by T&S Brass.
3. Faucet, Pantry Type as manufactured by T&S Brass.
4. Pre-Rinse Unit as manufactured by T&S Brass.
5. Hose Reel as manufactured by T&S Brass.
6. Kettle Filler as manufactured by T&S Brass.
7. Drain--Klein 4591C with twist handle with no overflow assembly.
8. All foodservice related faucet assemblies, pot fillers, piping, fittings, etc. shall comply with the Federal Safe Drinking Water Act Requirements.

J. Hardware-Fabricated Equipment:

1. Casters--Klein 222-58-SR adjustable stainless steel bullet feet.
2. Counter Legs--Klein 222-60-S.
3. Leg Sockets--Klein 481-58 stainless steel.
4. Door Hinge--Klein 499A continuous stainless steel piano hinge.
5. Pull--Klein 12270 bevel edge recessed pull.

6. Hinged Door Catch--Klein 242 or 9475.
7. Refrigerator Door Handle and Lock--Klein 13000-C with walnut vinyl insert and keyed alike.
8. Sliding Door Track Assembly--Klein 550 track, NT-551 and NT-552 sheave, and Klein 1096 stainless steel guide pins.
9. Drawer Slide--Klein SSA-9100-HD.

K. Metal-Table and Counter Tops:

1. Working tops, unless otherwise specified, shall be 14-gauge stainless steel. All seams, corners, and end splashes shall be welded closed and finished. All edges not adjacent to walls shall be turned down 1 ½" at 90 degrees and tight hemmed. Where tops are adjacent to other fixtures they shall be flanged straight down two (2") inches or turned up two (2") inches. Tabletops shall overhang cabinet base section on working side not less than two (2") inches.

2. Counter top adjacent to walls shall overhang the base by 1", such that the cabinet can be adjusted to an irregular wall line. Return all body ends to wall. Top to be affixed to cabinet body by concealed welded studs. All backsplashes to be curved on 3/4" radius.

L. Cabinet Bodies and Enclosed Bases:

1. All cabinet bodies and enclosed bases shall be wrapped with 18-gauge stainless steel, galvanized iron or bonderized furniture steel as specified by each specific item. All exterior vertical corners adjacent to walls and kitchen equipment shall be at 90 degree angles.

2. Cabinets are to be supported by a 1 1/2" x 1 1/2" x 1/8" galvanized angle iron frame. All corners to be mitered and welded continuously. Gussets and added framework bracing shall be fabricated into the framework such that buckling does not occur. Weld-in sinks and drop-in equipment shall be spanned on each side by support members. All framework shall be designed and fabricated in such a manner that cabinet tops lay flush without warpage. Crossbracing shall not be less than twenty-four (24") inches on centers.

3. All enclosed cabinet bases are mounted on six (6") inches counter style stainless steel legs or masonry bases as specified in the Item Specifications.

M. Undershelves:

1. Interior shelves of enclosed bases and overhead cabinets shall be made on 18-gauge stainless steel unless noted otherwise.

2. All shelving shall be rigidly reinforced with angle and 1" x 4" x 1" channel framework to prevent sagging under shelf loads.

3. Removable shelving, where called out in the Item Specifications, shall not exceed 24" sections. Front and side edges to be turned down 1" and corners welded. Rear edge to be turned up 2" and tight hemmed. This removable shelving shall be set in a 1 1/2" x 1 1/2" x 1/8" steel angle frame. All exposed framing to be wrapped-with 24-gauge stainless steel.

N. Open Base Tables:

1. All open base kitchen equipment construction shall be of 1 5/8" O.D. and 16-gauge stainless steel tubing. All joints between legs and cross members shall be welded and ground the circumference of the tubing. Where legs meet table tops, a sanitary type stainless steel cylinder gusset, not less than 2 1/2" in diameter at top, shall be welded to a 4" wide 14 gauge galvanized steel channel. Leg will be inserted into gussets and held there with a set screw. Each leg shall be fitted with a sanitary type stainless steel adjustable bullet foot.

O. Hinged Doors:

1. All hinged doors shall be double pan construction with 18 gauge stainless steel panels. All exposed corners to be welded and ground smooth. Door hinges to be continuous stainless steel piano hinge the entire length of the door. Doors shall be fitted with stainless steel die-stamped recessed pulls with magnetic door catches.

P. Drawers:

1. All drawer bodies to be 18-gauge stainless steel die-stamped such that all corners are on 3/4" radius corners. Drawer bodies are to be 20" x 20" x 5" with ½", flanges unless otherwise specified. The drawer bodies shall be removable.

2. Drawer faces shall be doubled pan construction with 18 gauge stainless steel fronts and 20 gauge stainless steel rear panels. All corners to be welded and ground smooth. A sanitary stainless steel, die-stamped, recessed pull shall be used. Drawer faces shall be welded to a 3" channel 18 gauge galvanized iron frame to hold drawer body. Drawer slides to be mounted on channel frame and fitted with ball bearing nylon rollers. All drawers to be full opening.

Q. Elevated Shelves:

1. The elevated shelves shall be constructed of 14 gauge stainless steel. Front edge to be turned down 1" at 90 degrees. Real edges and ends adjacent to walls and other fixtures shall be turned up 2" on a ¾" radius. Vertical edge of end turn ups to be on a 2" radius.

2. All wall mounted shelves to be mounted on sanitary 14 gauge stainless steel brackets not greater than 4'-0" on centers. Wall mounted shelves are to be sealed to wall. Mounting of shelf to bracket shall be done with weld-on studs.

3. Shelves mounted over freestanding work tables shall be mounted on 1" stainless steel tubing welded continuous to the table top. Adequate framework to be fabricated in table tops to support freestanding overhead shelves.

R. Sinks:

1. All sinks to be constructed of 14 gauge stainless steel to the size specified, with a continuous sheet forming the back, bottom and front. All horizontal and vertical corners including ends and partitions shall have a 3/4" radius sink partitions to be double thickness with a 1 1/2" diameter top edge. All welds to be ground smooth with no pits. Solder is not acceptable. The front and side including drainboards shall

have a 1 1/2" diameter 180 degree rolldown. Faucet holes will be punched on 8" centers over center line of single compartment sinks and over partitions of multiple sinks. Sink assembly to be mounted at a 3” distance from rear of backsplash to wall.

2. All vats to be pitched toward a center drain. Drain to be a 3 1/2" Klein #4591-C twist handle drain with overflow heads or as specified in the Item Specifications. Lever to have sanitary bracket support.

S. Sink Inserts:

1. Where sinks are to be welded into table tops they shall be fully coved, deep drawn 16 gauge stainless steel. All welding to be continuous and ground and finished smooth. See Item Specifications for center drain requirements.

T. Drainboards and Dish Tables:

1. Drainboards to be constructed of 14-gauge stainless steel welded continuously to the sink body. All drainboards shall have a 2 ½” high rim with integral 180 degree rolled edges to match sink body. All corners to be on 3/4" radius. Drainboards to be pitched a minimum of 1/8" per foot to sink or dishwasher.

U. Hoods:

1. Hoods shall be 18 gauge all welded 304 stainless steel closure with stainless steel angle frame as required for support. Hood shall be hung with all thread rod. All welded brackets required for hanging of the hood shall be included. Unless specified, hood shall be supplied with 20" x 20" stainless steel baffle type filters.

2. All Type I hoods or portions thereof penetrating a ceiling, wall or furred space shall be enclosed in a fire rated enclosure as per local and jurisdictional code requirements. Enclosure and/or approved fire blanketing to be provided and installed by General Contractor.

3. Trim: Stainless steel trim shall be fabricated and installed in any location where an opening of 3/8" or greater exists between fabricated equipment and wall or adjacent equipment.

V. Fire Suppression System:

1. The fire suppression system shall be plenum fire protection system, U.L. listed, Wet chemical, fire suppression system to be Ansul R-102. Equipment and installation shall be according to NFPA standards 17, 17A and 96; UL 300 and all applicable local code requirements. System to be complete including remote fire pull station, mechanical gas shut-off valve, shunt trip and duct and hood protection devices.

2. Wet Chemical Agents: The fire extinguisher agent shall be potassium carbonate, potassium acetate base formulation designed for fire knockdown and securement of grease related fires. The agent shall be available in plastic container labeled with handling instructions.

3. Agent Tank: The agent tank shall be installed in the exhaust hood enclosure. The tank shall be constructed of stainless steel. The tank size shall be determined by the

Contractor to meet the requirements of the specific application. Tanks shall have 100 psi working pressure, 300 psi tank pressure and 600 psi minimum burst pressure.

4. Tank Adapter: Tank adapter assembly shall be chrome plate steel with a ¼" NPT female inlet and a 3/8" NPT male outlet.

5. Regulate Release Mechanism: Spring loaded, mechanical/pneumatic type capable of providing expellant gas supply to all agent tanks. It shall contain a factory installed regulator deadset at 100 psi.
6. Regulated Actuator Assembly: Provide expellant gas for additional tanks in systems requiring three or more tanks. It shall contain a factory-installed deadset at 100 psi.

7. Discharge Nozzles: Tested and listed for the specific application and stamped with the flow designation. Each nozzle shall be equipped with a protective cap to keep the nozzle tip orifice free of cooking grease build-up.

8. Equipment and materials
   a. Distribution Piping: Schedule 400 black steel pipe and fittings sized as per manufacture's recommendations. All piping shall be sealed with pipe tape.
   b. Actuation and Expellant piping: Schedule 40 black iron pipe and fittings sized per Manufacture's recommendations. All piping shall be sealed with pipe tape.
   c. All exposed distribution pipe and discharge nozzles are to individually penetrate the exhaust hood and be anchored with seal tight fasteners. All exposed pipes and discharge nozzles are to be sleeved with chromelated sleeves with no exposed threads. Avoid the use of hangers and support brackets in exposed areas but where required they must be chrome plated.
   d. Fire suppression Contractor is to coordinate with all respective Contractors for all requirements and final location.
   e. Pipe supports, spacing and routing of conduits and fire suppression piping are to comply with requirements listed in Sections 15/22 and 16/26 specifications.

Kitchen Contractor is to provide the kitchen and mechanical consultants a testing report on hood systems mentioned herein at the time of the completion of all exhaust and make-up supply fan installations.

W. Item Specifications:

1. General: The following basic category minimum features are listed followed by the specific item specifications. The quantity of items are to be as per plans and specifications. If there are any discrepancies or differences in the quantities shown on plans and specifications, the Contractor is to assume the larger quantity in their bid and contract.

2. Refrigeration Cabinets shall have the following minimum features unless noted otherwise by specific Model number or wording.
   a. Full depth cabinets
   b. Stainless steel exteriors and interiors
   c. Foam-in-place urethane insulation
   d. Six chrome wire shelves per full section
   e. Exterior thermometers and audible alarms
   f. Stainless steel adjustable legs

g. Field changeable door
h. Expansion valve refrigerator controls
i. Condensate evaporators
j. Door swings as shown on Plan
k. Keyed alike locks on all doors

3. Refrigerated buffet units and refrigerated food preparation units:
   a. Units shall conform to ANSI/NSF 7 section 6.3 and 2015 IECC.
   b. Units shall be capable of maintaining product in the open display area rail) at temperatures not greater than 41 degrees F and not less 33 degrees F. They shall also be capable of maintaining air temperature in enclosed refrigerated compartments (if provided) between 33degrees F and 40 degrees F.

4. Shelving shall have the following minimum features. Inter Metro Industries – MetroMax shelving or approved equal.
   a. Adjustable shelving
   b. Four tier in all floor mounted sections
   c. Standards are 74" high or as specified in item specifications.
   d. Order only after field dimensions are taken

5. Work Stations shall have minimum features as noted in the General Specifications, Sections 1-3, and as follows:
   a. Provide all stainless-steel trim pieces where station adjoins walls and/or other equipment.
   b. 4" wide x 18" long x 1" (length as scaled on Plans) deep splashes in front of all beverage dispensing equipment.

6. Cooking Equipment shall have the following minimum features unless noted otherwise:
   a. Pressure regulators
   b. Stainless steel adjustable leg kits
   c. Stainless steel fronts
   d. Cords and caps for all electrical equipment.
   e. All mobile cooking equipment to have Dormont quick disconnects of 36” minimum length.

7. Ventilation Equipment shall have the following minimum features:
   a. Underwriters' Laboratory approval
   b. Stainless steel grease extractors
   c. Vapor proof bullet type fixtures at 4’ on center. Pre-wire to junction box.
   d. Cooking line Vent hood shall have Ansul R.102 Ansulex liquid fire Suppressant system or equal; complete with hand extinguish, manual operation mode, and gas solenoid valve for incoming gas line to equipment under the hood.

8. Ware Washing and Disposal Equipment shall have the following minimum features:
   a. Stainless steel legs
   b. Plated vacuum breaker
   c. Pressure regulator
   d. Water temperature gauges
   e. Manual off-on (reverse) starter controls
   f. High water alarms

g. Water hammer arrestor
h. Prerinse unit.
i. Stainless steel exhaust ducts from conveyor machine to ceiling plus three inches to be coordinated with Mechanical Contractor.

8. Preparation Equipment shall have the following minimum features**:**
   a. Cord and cap set as required
   b. Leg kits

9. Food Holding Equipment shall have the following minimum features:
   a. Cord and cap set for mobile equipment
   b. Locking casters for mobile equipment.
   c. Manifold drain for steam tables with individual extension handles, drain valves pre-piped.
   d. Infinite controls
   e. Cords to run inside standards of over-food warmers by kitchen Contractor.

3.4 DELIVERY AND INSTALLATION

A. **Kitchen Contractor is not to install any kitchen equipment until all floors, ceilings and walls have been completed and cleaned as required. Damage to the equipment due to pre-mature installation shall be the responsibility of the General Contractor and must be replaced with new.**

B. **SUPERVISION:** Provide a competent foreman or supervisor who shall remain on the job during the entire installation.

C. **DELIVERY:** Foodservice equipment excluding exhaust hoods, trench liners and walk-in coolers are not to be delivered and/or set in place until the following construction has been completed: kitchen floors prepped and cleaned, wall painted, ceiling installed and wiring pulled to junction boxes. (Note 1. acid floor washes are not to be used on or near stainless steel or aluminum surfaces. 2. Walk-in cooler/freezer doors are to remain open during concrete cure).

1. Assemble, square, level and make ready items for final utility connections.
2. Scribing: cut neatly around obstructions to provide sanitary conditions. Where gaps occur between equipment, apply General Electric silicon construction sealant Series SE-1200 mastic or stainless steel trim molding of proper shape with concealed attachment. Use epoxy cement and/or "zee" clips wherever possible to secure trim.
3. At the discretion of Judson I.S.D., new equipment must be stored on-site, in a secured locked weatherproof container unit or within the kitchen facility upon delivery before payment can be issued. These facilities shall be accessible to Judson I.S.D. and their agents for inspection purposes. Cost of storage is the responsibility of the Kitchen Equipment Contractor.

D. **CLEAN AND ADJUST**

1. Clean up and remove from the job site, all debris resulting from the work as the installation progresses.
2. Thoroughly clean and polish all foodservice equipment, in and out, ready for the Owner's use prior to demonstration and final inspection.
3. Lubricate and adjust drawer slides, hinges and casters.

4. Clean and replace faucet aerators and water strainers.
5. Touch-up damage to painted finishes.
6. Start-up and check all refrigeration systems for at least 72 hours prior to acceptance.

E. **EQUIPMENT START-UP AND DEMONSTRATION**

1. Prior to final inspection, provide an authorized service agent to carefully test, adjust and regulate all equipment in accordance with the manufacturer's instructions and certify in writing to the Owner that the installation, adjustments and performance are in full compliance.
2. Provide Owner with a list of equipment, equipment representatives and their telephone numbers to allow the Owner to schedule demonstrations on the equipment at their own convenience.
3. Kitchen Contractor shall coordinate schedule and be present at an equipment operating demonstration and personnel training with the kitchen manager and staff at the completion of the project, prior to the week before school begins.
4. Kitchen Equipment Contractor shall include preventative maintenance for one full year and a warranty for parts and labor for a minimum of one year on all Contractor supplied equipment. Warranty begins the date of approved construction substantial completion.
5. Contractor is to issue all equipment keys with transmittal to the Owner at the time of equipment demonstrations.

F. **FINAL INSPECTION**

1. Final inspection will be made when the contractor will certify that they have completed their work; made through review of the installation/operation of each item in the contract and found it to be in compliance with the construction documents.
2. The Foodservice Consultant's repetitive final inspection and all costs associated thereto, incurred due to the Contractor's failure to comply with the requirements of this Article, will be invoiced to this Contractor.

4.01 KITCHEN EQUIPMENT ITEMS

Contractor is to include an **ITEMIZED** bid for each item as listed below with their submitted bid.

ITEM K1, K2, K3, K4, K5: SERVING COUNTER

Provide and install two (2) Item K1 Moduserve (MUS) custom fabricated serving counters the size and shape as detailed on plans. Units are to be constructed as listed below and each is to include the following components:

Item No. K02 MCT-CFSP-2-CUS COUNTER: Provide Two(2) Mod-U-Serve model #MCT-CFSP-2-CUS

- 30” A.F.F. 304 grade Stainless steel counter top
- 28” A.F.F. 12” Corian trayslide with stainless steel runners
- ¾” raised laminate panel
- GFCI Convenience outlets in apron of counter

- 18-gauge 304 stainless steel undershelf
- Custom Series full height breath guards with LED lighting
- Stainless steel kick plates
- 1/2” Deep recess to accommodate 18”x26” mechanically cooled sheet pans
- Modified angle and length as indicated per plan with counter top field joint fully welded and polished
- Flattop capable of accommodating QTY2 Dispense Rite #WR-COND-6 (Item #41 provided by others)
- Load center to be located in counter body per plan

Item No. K03 MCT-HF4-CUS COUNTER: Provide two (2) Mod-U-Serve model #MCT-HF4-CUS Counter

- 30” A.F.F. 304 grade Stainless steel counter top
- 28” A.F.F. 12” Corian trayslide with stainless steel runners
- ¾” raised laminate panel
- Unit to accommodate QTY Four (4) 12”x 20” Hot food wells
- GFCI Convenience outlets in apron of counter
- 18-gauge 304 stainless steel undershelf
- Custom Series full height breath guards with LED lighting and heat Lamp
- Stainless steel kick plates
- 1” Recess at hot well to accommodate 18”x26” sheet pans
- T&S model B-0605 pot filler faucet per counter. Located in plumbing compartment

Item No.K04 MCT-HF2-CUS COUNTER: Provide two (2) Mod-U-Serve model #MCT-HF2-CUS including:

- 35” A.F.F. 304 grade Stainless steel counter top
- 28” A.F.F. 12” Corian trayslide to accommodate QTY two (2) Vollrath #3062 pans
- ¾” raised laminate panel
- Unit to accommodate QTY Two (2) 12”x 20” Hot food wells
- 1” recess at hot well to accommodate 18”x 26” sheet pan
- Custom Full Height breath guards with LED lighting and Heat Lamp
- Stainless steel kick plates
- GFCI Convenience outlets in apron of counter
- 5-15R Convenience outlet on side of counter to accommodate Item #05 milk cooler
- 18-gauge 304 stainless steel undershelf
- 5” counter recess with 1’4” Stainless steel pass thru space and plumbing compartment
- T&S model B-0605 pot filler faucet per counter. Located in plumbing compartment

Item No. K05 CASHIER COUNTER: Provide two (2) Mod-U-Serve model #MCT-CRSG-CUS including:

- 35” A.F.F. 304 grade Stainless steel counter top
- 28” A.F.F. 12” Corian trayslide with stainless steel runners
- Single Cashier Stand. Modified size and configuration per drawing
- One (1) 18-gauge, type 304 series stainless steel cash drawer with extension slides and cylinder lock. 3” deep stainless-steel liner with removable cash till
- One (1) Grommeted hole for POS cables.
- Provide SR 5-15R convenience outlet
- Cat 5 receptacle in undershelf
- Stainless steel kick plates

Countercraft may be substituted as an approved alternate but must meet or exceed these specifications.

Moduserve/CounterCraft Installation Specifications of Fully Custom Counter Installation and Project Management Services must be purchased from and provided by Moduserve/CounterCraft. Services to include: Site visits for dimensioning, field coordination, templating (as required), delivery of counters and built-in equipment, set-in place installation, completion of all field welds and joints, leveling and final assembly. NO EXCEPTIONS WITHOUT WRITTEN APPROVAL FROM THE CONSULTANT. Final connections of utilities, by others.

Kitchen Equipment Contractor to provide as a submittal letter to the Consultant from Moduserve/CounterCraft acknowledging the project name and proof that the Installation and Project Management Services have been purchased for the project. Failure to provide the letter will result in the submittal being rejected.

ITEM K6: MILK COOLER

Provide and install two (2) Moduserve Model MCT-DM2 double drop mobile milk coolers. Units to be equipped with the following features:

- 51”L x 30 ½” W x 42”H
- 120v, 1/3hp, 1ph, 8.0 amp, NEMA 5-15P (cord to be located near to the serving line. Reference plan for orientation)
- Twelve (12) case capacity
- Interior Liner: 18-gauge stainless steel fully welded liner with breaker strip attachment to exterior panel
- Exterior: 20-gauge stainless steel
- Doors: 20-gauge double pan insulated door with magnetic gasket
- Milko air curtains on student side only.
- Insulation: High pressure foamed in place 2” thick polyurethane.
- Condensing Unit: R404A high temperature hermetically sealed with expansion valve and pressure switch operation.
- Drain: 1/2” stainless steel nipple fully welded to interior drain liner with brass gate valve at exterior.
- Corner Bumpers: Rubber bumpers provided on each corner
- Casters: Heavy-duty 5” diameter plate casters with brake models at rear corners of cabinet.
- 5-year compressor body warranty
- Controls to be located on kitchen side.

ITEM K7: PROOFING CABINET

Provide and install one (1) Crescor Model 121-PH-UA-11D non-insulated proof/hot cabinet. Unit is to include all standard features. Unit is to be mounted on 5" heavy duty swivel casters, two with brakes. Unit is to be equipped with eleven sets of chrome plated wire universal angles to accommodate a large variety of pan sizes on adjustable 1-1/2" centers. Unit is to be 120V/1PH/2000 watts and equipped with 5-20P plug and cord assembly.

ITEM K8: UTILITY CART

Provide and install two (2) Lakeside model 243 all stainless steel medium duty tubular carts. Cart capacity to be 400 lbs. total. Units to be equipped with two all stainless steel shelves. Units to include round corner bumpers. Overall dimensions not to exceed 22" wide x 36" long x 40-5/8" high. Units to be NSF Listed.
Provide and install two (2) Lakeside model 244 all stainless steel medium duty tubular carts. Cart capacity to be 400 lbs. total. Units to be equipped with three all stainless steel shelves. Units to include round corner bumpers. Overall dimensions not to exceed 22" wide x 36" long x 40-5/8" high. Units to be NSF Listed.

ITEM K9: ICE MACHINE

Provide and install one (1) Manitowoc Model IYT-0420A S Series air cooled ice machine complete with Model D-420 stainless steel bin. Unit is to be equipped with all standard features including the following:

- Warranty: 5 Year parts and labor on ice machine evaporator.
  5 Year parts and 3 Year labor on ice machine compressor.
  3 Year parts and labor on all other ice machine dispenser and bin components.
- Electrical: 120Volts/60Hz/1Ph, 11.3 amps. Plug and cord.
- Stainless steel braided water hose kit as required.
- Arctic Pure model AR-PRE and AR-20000 water filtration system.
- Provide bid adaptor as required.

ITEM K10: EXHAUST HOOD

MFR AVTEC
MODEL AFWO-PBB
Provide and install one (1) AVTEC UL Listed, NSF approved Model No. AFWO-PBB Baffle Filter type ventilator, in compliance with NFPA Pamphlet No. 96, BOCA, ICBO, [Uniform Mechanical Code], SBCCI and local governing codes. Unit is to consist of one (1) 11'-0" L x 5'-0" W (not including supply plenum) x 2'-6" H ventilators the size and shape as shown on drawing and shall be complete with U.L. Classified baffle type filters, duct collar, plenum, insulated top, balancing dampers, concealed collection trough, and hanger brackets. Contractor is to field verify all dimensions and clearances before ordering units.

A. CONSTRUCTION
   1. Entire unit shall be constructed of a minimum of No. 18 gage type No. 300 series stainless steel with a No. 4 finish. All external seams and joints to be welded and liquid tight; all exposed welds to be ground and polished.

B. FILTERS
   1. Provide U.L. Classified 304 series stainless steel baffle type filters, installed at not less than a 45degree angle, running full length in back of canopy.

C. COLLECTION TROUGH
   1. Provide a exposed, full length grease trough, accessible from the top for cleaning, with removable, concealed grease cups each end.

D. SUPPLY AIR MAKE UP
   1. Make-up Air plenum box with perforated bottom face, Model PBB. All 300 series stainless Perforated Supply Plenum to include steel hanging brackets in fixed locations to support product via utilization of hanging rods. Perforated supply plenum utilizes stainless steel perforated panels at 39% clear area. Internal perforated diffuser panels shall be included to diffuse air over full surface. Supplied with

balancing dampers and UL 555 listed fire dampers to meet volume requirements. Balancing dampers designed for air velocities between 800 and 1000 FPM. Units to be shipped loose for installation in the field. Bottom face of plenum is to be mounted flush with finished ceiling in kitchen area.

E. OPTIONS AND ACCESSORIES
1. Insulated top.
2. U.L. Listed vaporproof LED light fixtures as per plan pre-wired to one connection point.
3. Model VCCW Control Panel recessed wall mounted includes fan switch with fire system interface and H.O.A. fan starter interface, tempered air on/off switch and light switch. Control panel is to include additional interface for interconnection to building energy management system provided by others to override exhaust hood controls. All requirements are to be coordinated with the installer of the energy management system, if applicable.
4. 18 ga. 304 series stainless steel trim to ceiling on sides and front as required.
5. Field verify all dimensions prior to fabricating.
6. Heat sensor assemblies.
7. One (1) filter removal tool.

ITEM K11: EXHAUST HOOD

MFR AVTEC
MODEL AFWO-PBB
Provide and install one (1) AVTEC UL Listed, NSF approved Model No. AFWO-PBB Baffle Filter type ventilator, in compliance with NFPA Pamphlet No. 96, BOCA, ICBO, [Uniform Mechanical Code], SBCCI and local governing codes. Unit is to consist of one (1) 11'-0" L x 5'-6" W (not including supply plenum) x 2'-6" H ventilators the size and shape as shown on drawing and shall be complete with U.L. Classified baffle type filters, duct collar, plenum, insulated top, balancing dampers, concealed collection trough, and hanger brackets. Contractor is to field verify all dimensions and clearances before ordering units.

A. CONSTRUCTION
1. Entire unit shall be constructed of a minimum of No. 18 gage type No. 300 series stainless steel with a No. 4 finish. All external seams and joints to be welded and liquid tight; all exposed welds to be ground and polished.

B. FILTERS
1. Provide U.L. Classified 304 series stainless steel baffle type filters, installed at not less than a 45degree angle, running full length in back of canopy.

C. COLLECTION TROUGH
1. Provide a exposed, full length grease trough, accessible from the top for cleaning, with removable, concealed grease cups each end.

D. SUPPLY AIR MAKE UP
1. Make-up Air plenum box with perforated bottom face, Model PBB. All 300 series stainless Perforated Supply Plenum to include steel hanging brackets in fixed locations to support product via utilization of hanging rods. Perforated supply plenum utilizes stainless steel perforated panels at 39% clear area. Internal perforated diffuser panels shall be included to diffuse air over full surface. Supplied with balancing dampers and UL 555 listed fire dampers to meet volume requirements. Balancing dampers designed for air velocities between 800 and 1000 FPM. Units to be shipped loose for installation in the field. Bottom face of plenum is to be mounted flush with finished ceiling in kitchen area.

E. OPTIONS AND ACCESSORIES
1. Insulated top.
2. U.L. Listed vaporproof LED light fixtures as per plan pre-wired to one connection point.
3. Model VCCW Control Panel recessed wall mounted includes fan switch with fire system interface and H.O.A. fan starter interface, tempered air on/off switch and light switch. Control panel is to include additional interface for interconnection to building energy management system provided by others to override exhaust hood controls. All requirements are to be coordinated with the installer of the energy management system, if applicable.
4. 18 ga. 304 series stainless steel trim to ceiling on sides and front as required.

5. Field verify all dimensions prior to fabricating.
6. Heat sensor assemblies.
7. See Item K32 specification for fire suppression system requirements.

ITEM K12: DOUBLE STACKED CONVECTION OVEN

Provide and install two (2) Blodgett Model DFG-100-ES full-size double compartment convection oven. Each compartment to have double-sided porcelainized steel liners and to accept standard size bake pans (18”x26”). Doors shall have 60/40 dual panel thermal glass windows with porcelainized handle and simultaneous operation. Oven doors are triple mounted into the full angle iron frame. Stainless steel front, top, right and left sides. Units to include black enamel finish with full angle iron frame for long lasting structural integrity, uncompromising rigid-framed insulation. Unit to be gas heated electronic spark ignition and dual-flow blower powered by a two speed 1/3 HP motor (1140 and 1725 RPM) with thermal overload protection. Each chamber shall be fitted with two commercial lamps and five chrome-plated removable racks adjustable to eleven positions 1 5/8” spacing. Modular front slide out control panel with standard solid state controls, blower speed control, light switch and 60 minute timer. Includes 6” stainless steel legs, stainless steel draft diverter or draft hood and flue connector and pressure regulator. Requires one ¾” NPT gas connections 45,000 BTU per section and 115V/60/1PH, 2 wire with ground, 8 amp electrical connections per section. Provide cord and plug set as required. Dimensions not to exceed 38-1/4”W x 36-7/8”D x 78 5/8”H. Net weight 990 lbs. Crated weight 1120 lbs. Warranty 2 year parts and labor, 5 year door warranty. Provide Dormont Quick Connect gas hose kits with swivel connectors sized accordingly as required for each unit. Units to be mounted on 6" adjustable stainless-steel legs.

ITEM K13: Item not used.

ITEM K14: DOUBLE COMBI-OVEN/STEAMER

Provide Two (2) Convotherm Model C4 ET 6.20GB Convotherm Combi Oven/Steamer, gas, with steam generator, (7) 18" x 26" full size sheet pan or (14) 12" x 20" x 1" hotel pan capacity, 9" easyTouch control panel, 20 stages each & 399 cooking recipes storage, (4) cooking modes: hot air, steam, combi-steam & retherm, multipoint core temperature probe, five-speed auto reversing fan, antimicrobial hygienic door handle, pull-out spray hose, stainless steel construction, NSF Dimensions 32.91(h) x 46.87(w) x 41.66(d).

EACH unit to be provided and installed with the following:

- 12 month parts and labor warranty and second 12 month parts only warranty, standard
- Natural Gas: 129,600 BTU
- CACK ConvoClean “Hands Free” automatic cleaning system, comes with: (1) 1 liter ConvoCare and set of connectors and hoses. DD-TT Disappearing Door, for Easy Touch 6.20 CHS6.20 Heat Shield , for C4 6.20 (p/n 3455851)
- A water analysis is required for the proper selection of water treatment system. C9797-K2PF Everpure Kleenseam II Water treatment System including one pre-filter, one scalestick cartridge, two 7CB5 cartridges, for all OEB & OGB combi’s with a generator unit to be installed on Item K17
- Model 3456174 Stacking Kit on 6” Legs for 6.20 on 6.20 gas models.
- Electrical: 120v/60/1-ph, 7.5 amps, 0.6 Kw
- Dormont quick connect gas hose kit equipped with swivel elbows and connectors sized as required.
- Stainless steel braided water hose kits.
- Division 22 plumbing contractor is to provide all final connections and start up for water filtration system.
- Lip Strainer

ITEM K15: 40 GALLON BRAISING PAN

Provide and install one (1) Groen BPM-40GC stainless-steel gas heated, thermostatically controlled 40-gallon braising pan, and mounted on rounded tubular leg stand with flanged feet. The pan body shall be of type 304 stainless-steel, solid one-piece welded heavy-duty construction, with a 10” deep pan depth with 3” radius coved corners as standard. Heavy 5/8” thick stainless-steel clad pan bottom with specially designed gas burner/combustion chamber and specially designed welded heat transfer fins. Electronic ignition is standard. The unit shall be equipped with controls that allow operation at a 7-degree tilt. The braising pan shall have a smooth-action, quick-tilting body with manual crank tilt mechanism. A heavy gauge, fully adjustable one-piece cover is standard with torsion bar type counterbalance designed to maintain selected cover position and includes a condensate drip shield. Tilt mechanism and controls completely enclosed in stainless steel housings mounted to the braising pan body. Classic -C Models include: Power ON-OFF switch with indicator light, temperature control knob with 175° to 425°F (79° to 218°C) range increments and HEAT(ing) indicator light. All controls are to be located in a right- front mounted water resistant IPX6 rated enclosure. CSA design-certified and NSF approved/listed. Single electric connection is required. Made in USA. Dimensions are to be 48” left to right, 40” front to back, and

Included options are as follows:

- Etch marks at five (5) gallons increments
- Pan carrier to hold 12” x 20” steam table pan at front pouring lip
- Warranty: One (1) year parts and labor, standard

Require Utilities are as follows:

- Electrical Connection: 115-volt operation, single phase, five (5) amps; Note: cord and plug assembly by Kitchen Equipment Contractor.
- 3/4” NPT minimum gas supply line; 144,000 BTUs
- Dormont Quick Connect gas hose kit with swivel elbows, connectors, and restraint device, a required.
- Provide one (1) Fisher Faucets CUSTOM Pot Filler with Additional Sprayer to consist of the following:

  Pot Filler Assembly to include:

  (1) 13080 Faucet Control valve

  (1) 2901-0000

  (1) 72748 4” Riser

  (1) 2926-3300 Pipe to Hose Adaptor

  (1) 2915 60” S/S Pre-Rinse Flex Hose

  (1) 2913 Insulated Handle

  (1) 11061 Pot filler valve

  Sprayer Hose Assembly to include:

  (1) 2931 Swivel Hose adaptor for Hose

  (1) 2915 60” S/S Pre-Rinse Flex Hose

  (1) 2913 Insulated Handle

  (1) 2920 Pre Rinse Spray Valve

ITEM K16: TWO BURNER RANGE

Provide and install one (1) Garland Model MST4S HD Range, 17” wide heavy duty cabinet base gas range. Unit is to be complete with stainless steel front, front top ledge, stub back and base with cabinet door. Unit to

be mounted on 6” adjustable legs with flanged feet. Each open burner is to be 30,000 BTU/hr, two piece open burners with individual pilot for each burner. Unit to include one year limited parts and labor warranty. Unit is to be complete with the following features and accessories:

- Stainless steel sides.
- Cap and covers for both left and right manifold ends.
- 3/4” rear gas connection.
- 12 month parts and labor warranty.
- Natural Gas.
- 3/4” NPT pressure regulator w/reducer.
- Model SEISMIC-FEET/4 Seismic legs with flanged feet.
- Dormont quick connect gas hose kit equipped with swivel elbows and connectors sized as required.

ITEM K17: STAINLESS STEEL CABINET

Provide and install one (1) custom fabricated 16 gauge 304 series stainless steel cabinet. Unit to be 48” long x 8" deep and 40" high. Unit to be constructed as described in the general specifications of this section. Unit is to include the following minimum features:

- Cabinet shall have hinged door and door handle as shown detail D42 sheet FS8.
- 1-1/2” inner flange on inside of cabinet to allow for fastening to wall.
- All stainless steel shall have a No. 4 finish.
- Field measure prior to fabricating.
- Cabinet to be sized to allow dimensions for Item K14 C9797-K2PF Everpure Kleensteam II Water treatment System.

ITEM K18: PAN RACK

Provide and install three (3) New Age model 1331 end loading all aluminum mobile bun pan racks. Units to be constructed of heavy duty, high tensile, extruded aluminum, Type 6063-T5 alloy. Tray slides are all to be fully welded with 3” runner spacing. Each unit to include four platform type 5” diameter, full swivel design casters with sealed ball bearings.

ITEM K19: PASS THRU REFRIGERATOR

Provide and install two (2) Traulsen Model RHT132WPUT-FHS single section, pass-through refrigerators. Refrigeration system shall be completely top mounted, self-contained using R-450a refrigerant and located behind a one-piece louver assembly. System to have plenum effect blower coil, large, high humidity evaporator coil located outside the food zone, and a top mounted non-electric condensate evaporator.
Cabinet Exterior and Interior to be stainless steel with stainless steel door liner and guaranteed for life stainless steel breaker caps. Unit shall be UL and NSF listed. Insulation of cabinet and door to be high density, non-CFC, foamed in place polyurethane.

Unit to have full height stainless steel doors on serving side and full height stainless door on kitchen side and hinged as shown on plans. All doors will have removable plug cylinder locks and guaranteed for life cam-lift, gravity action, self-closing metal, glide hinges with stay open feature at 120 degrees. Hinges to include switch to automatically activate interior incandescent lighting. Guaranteed for life work flow door handle to be mounted horizontally over recess in door to limit protrusion into aisleway. A snap-in magnetic door gasket shall ensure a tight door seal to the cabinet. Anti-condensate heaters are located behind each door opening.
Unit will have an externally mounted, water resistant INTELA-TRAUL digital microprocessor control to include RS485 and IRDA ports for communications ability. Control to have two-year warranty. Controls are to be mounted on kitchen side.

Cabinet front frame shall be constructed of stainless steel. The unit shall come standard with 6" all metal legs and adjustable stainless steel feet. Include thirteen (13) universal pan files for 12"x 20” or 18"x 26” pans per section. Unit to be equipped with 6' electrical cord and plug. Electrical 115/60/1 phase.
Refrigerator shall have a full three-year warranty with a five-year compressor warranty, which includes parts, labor, and travel expenses during normal working hours.
Dimensions must not exceed: 29-7/8” W x 37-15/16” D x 83-1/4”H.

ITEM K20: PASS THRU HEATED CABINET

Provide and install two (2) Traulsen Model RHF132WP-FHS single section, pass-through hot food cabinet capable of maintaining temperatures between 120 degrees F and 180 degrees F. Heating system shall be strip heating elements sheathed in monel. Fans provided to assure even temperature throughout cabinet. A vent is to be top located for positive humidity control.

Entire cabinet exterior and interior to be stainless steel with stainless steel door liner and guaranteed for life stainless steel breaker caps. Unit shall be UL and NSF listed. Insulation of cabinet and door to be high density, non-CFC, foamed in place polyurethane.

Unit to have full height stainless steel doors on serving side and full height stainless door on kitchen side and hinged as shown on plans. All doors will have removable plug cylinder locks and guaranteed for life cam-lift, gravity action, self-closing metal, glide hinges with stay open feature at 120 degrees. Hinges to include switch to automatically activate interior incandescent lighting. Guaranteed for life work flow door handle to be mounted horizontally over recess in door to limit protrusion into aisleway. A snap-in magnetic door gasket shall ensure a tight door seal to the cabinet.

Unit will have an externally mounted, water resistant INTELA-TRAUL digital microprocessor control to include RS485 and IRDA ports for communications ability. Control to have two-year warranty. Controls are to be mounted on kitchen side.

Cabinet front frame shall be constructed of stainless steel. The unit shall come standard with 6" all stainless steel legs and adjustable feet. Include thirteen (13) universal pan files for 12"x 20” or 18"x 26” pans per section. Unit to be equipped with 6' electrical cord and twist lock plug assembly. Electrical 208/115/60/1 phase.

Hot food cabinet shall have a full three-year warranty, which includes parts, labor, and travel expenses during normal working hours.

Dimensions must not exceed: 29-7/8” W x 37-15/16” D x 83-1/4”H

Junction box to be top located for electrical connection. Units to be equipped with 6 foot 50W cord – 115-208/60/1 phase.

ITEM K21: MICROWAVE OVEN

Provide and install one (1) Amana model RC17S2 heavy volume commercial microwave oven. Unit is to be complete with all standard features. Unit to be 208V/60Hz/1Ph/13 amps and complete with a NEMA 6-20P plug and cord assembly.

ITEM K22: SLICER

Provide and install one (1) Hobart HS6N automatic Slicer with the following minimum features:

- 13” CleanCut Knife with zero knife exposure, removable ring guard cover, heavy-gauge stainless steel knife cover.
- Top mounted Borazon Stone sharpener.
- ½ HP knife drive motor, with no-volt release safety interlock
- Burnished aluminum base, machined grooves on gauge plate and knife cover.
- Exclusive tilting, removable carriage system, rear-mounted, removable meat/vegetable grip, ergonomic style handle, spring kickstand.
- Electro-less nickel-plated single slide rod with reservoir wick in transport, and double action indexing cam.
- Provide optional food chute, low fence, and slaw tray.
- 120volt/60/1-phase, 5.4 amps and equipped with cord and plug assembly as required.
- NSF listed.

ITEM K23: CONDENSATE HOOD

Provide and install one (1) Avtec U.L. Listed, NSF approved Model No. ACWO wall mounted condensate type ventilator, in compliance with NFPA Pamphlet No. 96, BOCA, ICBO and SBCCI. Ventilator shall 44” long x 44” wide x 2’-6” high and size and shape as shown on drawing and shall be complete with duct collar, plenum, 2-1/2” full perimeter condensate gutter, and 1” drain manifold and hanger brackets. Entire unit shall be constructed of 18 gauge 304 stainless steel with a No. 4 finish. All external seams and joints to be welded and liquid tight, all exposed welds to be ground and polished.

Options:

- Vent fan controls to be included with Item K58.
- K.E.C. is to provide and install 18 gauge stainless steel enclosure panels to ceiling & walls as required.
- Div. 22 is to provide and install stainless steel drain line and route to nearest floor sink.

Warranty:

- One year parts and labor warranty.

ITEM K24 & K25: WALK-IN FREEZER AND COOLER

Provide and install the following:

General specifications: Walk-in cooler/freezer specified under this portion of specifications shall be pre-fabricated modular construction or equal. It shall be designed and constructed to allow fast and easy assembly, disassembly, relocation and enlargement of unit by the addition of like modular panels. Overall size shall be 28’-6” long x 9’-0” wide 8'-6" interior ceiling height after finished floor is installed as detailed in construction documents and specified below (Field verify all dimensions). Panels are to be routed around building structural column if shown on plans or field verification confirms. Walk-in to be manufactured by Thermo-Kool / Mid South Industries, Inc. Actual size required. No nominal sizes accepted.

Walk-in assembly, all components and refrigerant shall comply and have a performance rating in accordance with the current governing International Energy Conservation Codes (IECC).

Panel Construction: Standard wall, ceiling and floor panels shall be in 46”, 34 ½”, 23” and 11 ½” widths. Corner panels shall be 90 degree angle, 12” x 12”. All panels shall be interchangeable with like panels for fast and easy assembly. All panels shall consist of metal pans formed to precise dimensions. Metal finish to be as specified. Insulation shall be “foamed-in place” urethane to bond permanently to the complete inner surface of

both interior and exterior metal pans to form a strong rigid unit. Panels shall not have internal wood or metal, support framing, straps or other non-insulating members. Each panel shall be 100” urethane foam insulation exclusive of metal pans. Perimeter structure shall be formed of DURATHANE, high-density urethane insulation forming tongues and grooves to assure vapor proof and airtight joints and to prevent pre-installation damage and deterioration of exposed urethane surfaces.

Warranty: Panels shall be covered by a ten-year Factory Warranty.
Floor Construction Cooler & Freezer:

General Contractor is to provide 8” slab depression the size and shape as detailed on plans. Before the installation of the walk-in assembly the General Contractor is to provide and install a 2” setting bed of clean dry sand for leveling unit. Once walk-in assembly is installed the General Contractor is to provide and install approximately a 2” thick wearing floor and finished floor material to match finished floor level in the kitchen area. No ramps or special threshold should be required. Finished floor material to be grit type non-skid surface and include 4”–6” tall base around entire exposed interior and exterior perimeters and all colors to match the rest of kitchen area.

Floor panels shall be fabricated similar to other panels and designed to withstand uniformity distributed stationary loads of 600 lbs. per square foot. Floor finish to be heavy gauge galvanized steel.

Insulation: Insulation shall be 4” thick rigid low ozone depleting HFC 134a blown Class 1 urethane classified according to UL 723 (ASTM-E-84) as tested by Underwriters Laboratories, Inc. Urethane foam to have a thermal conductivity (K Factor) of not more than 0.125 BTU/Hr/Sq Ft. per degrees Fahrenheit/inch, and an overall coefficient of heat transfer (U Factor) of not more than 0.31. “R” Factor shall be no less than R-32. Prefabricated urethane foam panels shall be supplied with a Class I fire hazard classification according to UL 723 (ASTM-E-84) as tested by Underwriters Laboratories, Inc. The 4” core material shall have a flame spread rating of 25 or less and a smoke density of 250. This rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

Metal Finishes: All metal finishes for panel skins shall be as follows:

Exterior Open into Kitchen (including doors & frames)	Stainless Steel .022
Exterior Unexposed:	Stucco Galvanized .026
Interior Wall Finish:	White Stucco embossed Aluminum .040
Interior Ceiling Finish:	White Stucco embossed Aluminum .040

Panel Locking Assemblies: Assembly of walk-in shall be accomplished by “Insta-locks” consisting of cam-action hook arm assembly set in on a panel and a self aligning, self-centering pin assembly set in the matching panel. Rotation of the cam-action hook arm shall pull and lock panels together to form airtight, vapor proof joints. No metal straps connecting rods shall be used inside panels. Rotation of the cam locks shall be operated from inside the walk-in through access ports that are sealed with vinyl snap-in closures.

Panel Gaskets: NSF approved double-bead vinyl gaskets shall be applied to the tongue side of all panels, on both interior and exterior. Gaskets shall be impervious to stains, grease, oils, mildew, sunlight, etc.

Entrance Door and Frame: Walk-in shall be equipped with (2) two 34” x 76” hinged-type, flush mounted entrance door and mounted in a nominal 4’, 5’ or 6’ frame. Door and frame shall be listed by Underwriters Laboratories, Inc., and bear the UL Seal of Approval and be equipped with the following.

Door shall be equipped with a one piece perimeter PVC accordion type removable gasket with magnetic core at the top and along the side perimeter of the door. An adjustable wiper gasket shall be mounted along the bottom edge of the door. Latch shall be breakaway type with cylinder lock and inside release handle so the door can be opened from inside even if locked. A positive action hydraulic door closer shall be include to

ensure gently closing action of door to opening and to ensure positive closing of door. The latch shall be of high pressure zinc die cast with highly polished chrome finish.

Hinges shall be (9) inch modified strap, cam-lift self closing design with door lift off capability of density zinc die cast with highly polished chrome finish.

Door frame shall consist of heavy reinforced steel “U” channel frame to encompass entire perimeter of opening, foamed-in-place to give extra support and rigidity to frame and to prevent racking, distortion, warping and twisting. An armored anti-sweat heater cable shall be run in a breaker strip located behind removable heavy gauge stainless steel trim for easy access to heater cable. Heater cable shall be run under threshold consisting of heavy reinforcement “U” channel, breaker strip and heavy gauge stainless steel threshold. Each door section shall be provided with an operating toggle switch and pilot light mounted on the exterior side of the door frame. An incandescent vapor proof light and face mounted inlet box shall be mounted on the interior side of the door frame for 115 volt, 60 cycle, 1 phase AC service. All wiring shall be conceal rigid conduit.

A digital thermometer shall be provided on exterior of door section to provide temperature readings of minus 40 degrees F to +300 degrees F. Thermostat lead to be of sufficient length to mount probe at least 8 feet from the entrance door on wall.

HEATING PRESSURE RELIEF VENT: The cooler and freezer shall be equipped with one (1) each two way heated pressure relief vent to equalize pressure between interior and exterior caused by defrost cycles and opening of doors. Electric shall be 115/60/1.

Special Accessories:

- Two (2) foot treadles.
- Two (2) stainless steel kick plates for exterior of doors.
- Two (2) aluminum tread plate kick plates for interior of doors.
- Metal insert with vinyl bumper guards on all exterior exposed wall panels to be mounted and centered at the same height as the door handles on walk-in cooler/freezer doors (approximately 36” a.f.f.)
- Provide five (5) Keil LED48X754-CL-N LED vapor-proof light fixtures with –40° to 110° F operating temperature range mounted at locations shown on drawings. Switches to be on interior and exterior of unit.
- Stainless steel enclosure panel to ceiling as detailed on plans.
- Stainless steel trim strips to close vaults to wall.
- Kitchen Equipment Contractor is to provide and install a fully welded 16 gauge stainless steel encasement and trim at the cased opening in building located at the cooler door area. Field verify dimensions and provide shop drawings of proposed fabrication prior to installation.
- **Assembling of walk-in units and refrigeration systems to be performed by a Factory Certified installer. Provide written approval from manufacturer before installation.**
- Kitchen contractor responsible for condensate drain and insulating piping inside walk-ins.
- Pad lock hardware at each door.
- Laminated plastic identification door signs at each door identifying “Cooler and Freezer”.
- Two (2) 14”x24” peek windows. One to be installed in each door. Bottom of window seal to be 4’-6” above finished floor.
- Two (2) Clear-Vue CCI hinging air curtain door on interior of cooler and freezer.

NSF Construction: Walk-ins and refrigeration systems shall be constructed in accordance with National Sanitation Foundation, Inc. - Standard No. 7. The NSF approved seal shall be affixed to the serial plate of the walk-in.

Installation, Operation and Maintenance Instructions: Each walk-in shall be supplied with a complete set of installation, operation and maintenance instructions to cover erection of walk-in, installation of refrigeration

systems, operating procedures and routine maintenance schedule.

General Contractor coordinate and provide the installation of the final electrical and plumbing connections by licensed trades. Once final connections are accomplished the Kitchen Contractor is to start-up the refrigeration and make necessary adjustments. The start-up will include holding the freezer vault at 40 degrees for 5 days prior to allowing the unit to reach freezing temperatures. Installation of walk-in after delivery shall not exceed five (5) working days.

Successful Kitchen Equipment contractor shall be responsible for taking delivery of walk-in from freight company to check for any damage in shipment.

Refrigeration Systems: ITEM K71

Provide Refrigerated Design Technologies Mode ZS1-02Z-CT3-ASTI UL Listed air-cooled refrigerated rack system housed in a weather protected structural steal frame. The equipment to be protected by a stainless steel one piece louvers. Unit to be factory pre-piped and pre-wired aluminum fin copper tube condenser.
Each unit to be equipped with a ball bearing fan motor, adjustable head pressure control, crank case heaters, suction filter, sight glass, drier and stainless steel superhose connection. The liquid line valve is to be all welded.

Refrigeration system, all components and refrigerant utilized shall comply and have a performance rating in accordance with the current governing International Energy Conservation Codes (IECC).
Evaporator coil units to mount flush with ceiling of walk-ins.

All compressor units shall be scroll-type and factory assembled to operate with the refrigeration specified.
All refrigerant lines to be extended to one side of the package in a neat and orderly manner. All tubing shall be supported and anchored with a non-corrosive coated clamps. All joints to be welded not soldered. All piping and controls shall be factory tested with nitrogen at 200 PSI.

The package shall have a factory mounted and pre-wired control panel complete with main fuse disconnect, circuit breakers, contactors and time clocks wired for single point power connection.

The roof curb is to be provided and installed by roofing contractor. Reference Architectural Construction Documents for details and specifications. All roof penetrations are to be provided and properly sealed by the Roofing Contractor.

Electrical: 208V/60HZ/3PH 32.7 amps

Equipment	Cooler	Freezer
Compressor	ZS11KAE	ZF18K4E
Amps	11.2	21.5
Refrigerant	R-448A	R-448A
Evaporator Model	BEL0105	BEL0155
Fan Motors	1.8A 115V/1PH	1.5A 208V/1PH
Defrost Heater N/A		13.7A 208V/1PH
Evaporator Wt.	52 lbs	78 lbs.
Rack Wt.	500 lbs.	
Total Wt.	630 lbs.	

Accessories to include:

- Evaporator coils shall be a direct expansion type, will be "Underwriters Laboratory Listed" and supplied from factory with an expansion valve, solenoid valve and Eco-Smart demand defrost controller, pre-wired and pre-piped under nitrogen pressure and designed for use with the refrigerant \

specified.
- One year manufacturer parts and labor warranty and five year compressor warranty provided solely by Refrigeration Design Technologies of Texas on the specified rack systems listed.
- All exposed refrigerant piping on exterior of building is to be encased in aluminum jacketing to comply with requirements listed in Division 15/22 and 15/23.

INSTALLATION OF FOOD SERVICE EQUIPMENT REFRIGERATION SYSTEMS:

a) Install complete with all refrigerant, oil dials, dehydrators, gauges, controls as required for the proper operation of the system.
b) Self-contained of factory-installed compressors: Check and adjust to proper operating temperature.
c) Guarantee: Provide 5 year compressor warranty and 10 year panel warranty.
d) General Contractor shall furnish, install and provide final electrical and plumbing connections by licensed trades on refrigeration system.
e) **Refrigeration Installer is to verify that expansion valves settings are at 10° superheat.**

Drain Lines: All evaporator coils shall be provided with proper sized insulated drain lines and p-traps, supplied and field installed by contractor. Drains shall be trapped outside of walk-in. Drain shall be heated and insulated to prevent freezing. All plumbing to be in accordance with applicable codes.
Responsibilities of the Kitchen Equipment Contractor shall include the following:

1) Provide penetrations for electrical, plumbing and fire control devices. Seal said penetrations and inside conduits for moisture prevention and leakage.
2) All door sweep adjustments on bottom of doors to prevent air leakage.
3) Check all handle latches, hinges and hardware for proper fit, attachment and adjustment.
4) Provide properly sized drain lines, p-traps and heat tape where applicable.
5) Check all panels for alignment, seal and levelness.
6) Clean and inspect all surfaces for esthetic appearance.

Once final connections are accomplished the Kitchen Contractor is to start-up the refrigeration and make necessary adjustments. The start-up will include holding the freezer vault at 40 degrees for 5 days prior to allowing the unit to reach freezing temperatures. Installation of walk-in after delivery shall not exceed five (5) working days.

ITEM K26: FREEZER SHELVING

Provide and install one (1) LOT of InterMetro Metro Max Q shelving units the sizes and shape as shown on plans (field measure), with all standard features; Units to consist of the following minimum features:
- Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection. The adjustable foot of the 72” post is reinforced with nylon.
- Assembles without use of tools, posts have numbered grooves at 1” increments, shelf edge lock connectors with window.
- Open grid can be removed and interchanged for cleaning at any time. Open grid mats fits easily into dishwasher. Industry Council on Food Safety approved.
- Four vented tiers each (coordinate with Judson I.S.D. Foodservice Department for spacing requirements).

ITEM K27: COOLER SHELVING

Provide and install one (1) LOT of InterMetro Metro Max Q shelving units the sizes and shape as shown on plans (field measure), with all standard features; Units to consist of the following minimum features:

- Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection. The adjustable foot of the 72" post is reinforced with nylon.
- Assembles without use of tools, posts have numbered grooves at 1" increments, shelf edge lock connectors with window.
- Open grid can be removed and interchanged for cleaning at any time. Open grid mats fits easily into dishwasher. Industry Council on Food Safety approved.
- Four vented tiers each (coordinate with Judson I.S.D. Foodservice Department for spacing requirements).

ITEM K28: STORAGE SHELVING

Provide and install one (1) LOT of InterMetro Metro Max Q shelving units the sizes and shape as shown on plans (field measure), with all standard features; Units to consist of the following minimum features:

- Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection. The adjustable foot of the 84" post is reinforced with nylon.
- Assembles without use of tools, posts have numbered grooves at 1" increments, shelf edge lock connectors with window.
- Open grid can be removed and interchanged for cleaning at any time. Open grid mats fits easily into dishwasher. Industry Council on Food Safety approved.
- Four vented tiers each (coordinate with Judson I.S.D. Foodservice Department for spacing requirements).

ITEM K29: DRYER (OWNER FURNISHED)

Owner to provide and install electric dryer. Unit to be 208 volt, 1 phase and complete with cord and plug. Coordinate plug configuration with Division 26 contractor. Flexible dryer hose to be included with unit (verify length required).

ITEM K30: WASHER (OWNER FURNISHED)

Owner to provide and install one washer unit. Unit to be 120 volt, 1 phase, 15 amps and complete with cord and plug. Unit to include hot and cold water hoses and flexible drain hose as required.

ITEM K31: CHEMICAL SHELVING

Provide and install one (1) InterMetro Metro Max Q shelving unit the size and shape as shown on plans (field measure), with all standard features; Units to consist of the following minimum features:

- Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection. The adjustable foot of the 72" post is reinforced with nylon.
- Assembles without use of tools, posts have numbered grooves at 1" increments, shelf edge lock

connectors with window.

- Open grid can be removed and interchanged for cleaning at any time. Open grid mats fits easily into dishwasher. Industry Council on Food Safety approved.
- Five vented tiers each (coordinate with Judson I.S.D. Foodservice Department for spacing requirements).

ITEM K32: FIRE SUPPRESSION SYSTEM

Provide and install one (1) fire suppression system for exhaust hood K11 as specified below:

A. FIRE SUPPRESSION SYSTEM:

1. The fire suppression system shall be plenum fire protection system, U.L. listed, wet chemical, fire suppression system to be Ansul R-102. Equipment and installation shall be according to NFPA standards including 17, 17A and 96; UL 300 Standards; and all applicable local code requirements. System to be complete including remote fire pull station, two (2) mechanical gas shut-off valves, shunt trip and duct and hood protection devices.

2. Wet Chemical Agents: The fire extinguisher agent shall be potassium carbonate, potassium acetate base formulation designed for fire knockdown and securement of grease related fires. The agent shall be available in plastic container labeled with handling instructions.

3. Agent Tank: The agent tank shall be installed in a stainless steel wall mounted enclosure. The tank shall be constructed of stainless steel. The tank size shall be determined by the contractor to meet the requirements of the specific application. Tanks shall have 100 psi working pressure, 300 psi tank pressure and 600 psi minimum burst pressure.

4. Tank Adapter: Tank adapter assembly shall be chrome plate steel with ¼" NPT female inlet and a 3/8" NPT male outlet.

5. Regulate Release Mechanism: Spring loaded, mechanical/pneumatic type capable of providing expellant gas supply to all agent tanks. It shall contain a factory installed regulator deadset at 100 psi.

6. Regulated Actuator Assembly: Provide expellant gas for additional tanks in systems requiring three or more tanks. It shall contain a factory installed deadset at 100 psi.

7. Discharge Nozzles: Tested and listed for the specific application and stamped with the flow designation. Each nozzle shall be equipped with a protective cap to keep the nozzle tip orifice free of cooking grease build- up.

8. Portable Fire Extinguisher: Provide one (1) Ansul Class K fire extinguisher in accordance with local governing fire codes. Contractor is to provide and install wall mounting bracket as required. Final mounting location is to be field verified.

B. EQUIPMENT AND MATERIALS

1. Distribution Piping: Schedule 400 black steel pipe and fittings sized as per manufacture's recommendations. All piping shall be sealed with pipe tape.

2. Actuation and Expellant piping: Schedule 40 black iron pipe and fittings sized per manufacture's recommendations. All piping shall be sealed with pipe tape.

3. All exposed distribution pipe and discharge nozzles are to individually penetrate the exhaust hood and be anchored with seal tight fasteners. All exposed pipes and discharge nozzles are to be sleeved with chrome plated sleeves with no exposed threads. Avoid the use of hangers and support brackets in exposed areas but where required they must be chrome plated.

4. Pipe supports, spacing and routing of conduits and fire suppression piping are to comply with requirements listed in Sections 22 and 26 specifications.

C. TESTING

1. Upon completion of the installation, the Fire Suppression System Contractor is to be present and coordinate with the governing jurisdiction's Fire Marshall during the testing procedures. The Fire Suppression System Contractor is to assure the entire system is approved and green tagged by the governing Fire Marshall and Owner's third party inspector at the substantial completion date of this project.

2. Fire suppression system is to interconnect with the building fire alarm system. Fire suppression contractor is to coordinate with all respective contractors with requirements and final locations.

ITEM K33: HAND SINK

Provide and install four (4) Advance Tabco model 7-PS-70 all stainless steel wall mounted hand sinks. Units are to be constructed from one sheet of heavy gauge stainless steel with no welded seams other than at corners. Welded areas are to be blended to match adjacent surfaces and to a satin finish. Unit to be equipped with 1-1/2" IPS stainless steel basket drain, chrome plated 1-1/2" P-Trap, 10"x14"x5" sink bowl and stainless steel wall mounting brackets. Units to be equipped with T&S model B-1146-02A-WH4 gooseneck faucet assemblies with hot and cold wing style handles. General Contractor is to reference architectural construction documents and provide paper towel dispensers at each hand sink location as specified. Soap dispensers are to be furnished by Owner/Judson I.S.D. and installed by General Contractor.

ITEM K34: POT WASH SINK

Provide and install one (1) "L" shaped custom fabricated 14 gauge 304 series all stainless steel constructed pot wash sink. Unit to be the size and shape as shown on the attached plan. Unit to be equipped with rolled edge front. Top to include 10" backsplashes at as shown on plans. Field measure before fabrication. Top of unit to be No. 4 finish with grain running the length of unit. Unit to be equipped with the following features:

- Provide one (1) all coved stainless steel scrap sink compartment, 24"x28"x10" deep. Bottom of sink compartment is to include a 12"x12"x6" deep coved recessed basin to accept scrap collection basket as specified below. Provide and install one (1) lever drain assembly.
- One (1) custom fabricated removable stainless perforated scrap collection basket as detailed on plans. Unit to be approximately 11"x11"x4" deep and include 1/8" diameter perforations for proper scrap collection and drainage.
- Provide three (3) all coved stainless steel sink compartments, 24"x28"x14" deep.
- Provide two (2) T&S model B-0291 splash mounted Big-Flo faucet assemblies.
- Provide one (1) T&S Model B-2278-CR with B-0044-H2A pre-rinse assembly, s/s hose with backflow b preventer, B-0425 spray nipples and locknuts and two (2) each B-0109-01 6" wall brackets.
- Provide three (3) lever drain assemblies with overflows with bracket supports.
- Provide 16 gauge all welded stainless steel undershelves as shown on plans.
- Drain boards as shown are to slope towards sink compartments and/or dishmachine.

- Transition at dishwasher connection.
- Full length all welded stainless steel front apron at sink compartments to conceal space between sink bowls.
- Provide open base for Item K49 trash can as detailed on plans.
- 14 gauge stainless steel z-clips for attaching unit to the wall.
- Field verify all dimensions prior to fabrication.

ITEM K35: WALL MOUNTED POT RACK AND DRYING RACK

Provide and install one (1) custom fabricated wall mounted pot rack. Unit to be constructed entirely of 304 series stainless steel. Unit to be 9'-6" long and the size and shape as detailed on plans. Mount top of pot rack at 76" A.F.F. Pot/Utensil racks to be constructed of 2" x ¼" stainless steel bar length as shown on plans with Standard-Keil No. 1576-1010-1351 pot hooks 8" on centers. General Contractor is to provide and install concealed wall blocking where applicable.

Provide and install one (1) custom fabricated wall mounted tubular drying shelf the size and shape as detailed on plans. Unit to be 9'-6" long (field measure) x 12" deep. Unit to be assembled as follows:

- Three bars: 1" o.d. 18 gauge stainless steel seamless welded tubing. Close ends with flat or spherical plugs of stainless or chrome plated steel.
- Brackets: one piece formed or die stamped 14 gauge stainless steel. Remove sharp edges. Space brackets a minimum of 2'-4" o.c. and weld to bars. Secure rack to wall with chrome plated or stainless steel molly bolts and expansion bolts through stainless steel washers. Mount top of rack 54" above finished floor (verify with Owner), and located as shown on plans.
- Field measure before fabricating.
- General Contractor to provide concealed wall blocking where applicable.

ITEM K36: RETRACTABLE GATE ASSEMBLY

Reference Architectural Construction Documents for Retractable Gate Assembly requirements.

ITEM K37: WALL MOUNTED OVERSHELF AND POT RACK

Provide and install one (1) custom fabricated 16 gauge 5'-4" long x 18" deep (field verify) wall mounted stainless steel overshelf the size and shape as detailed on plans. Unit is to be mounted on top of 49" high wall and to include 14 gauge stainless steel wall brackets with 1-1/2" flange at wall for proper mounting. Shelf is to be fabricated with 1" radius front edges and to include 1" turn down as detailed on plans. All wall fasteners are to be stainless steel and spaced as required. Provide grommeted penetration for prerinse assembly riser as required. Field measure wall before fabricating. All stainless steel shall have a No. 4 finish.

Provide stainless steel circular design pot and utensil rack approximately 6'-0" long x 24" wide and the size and shape as detailed on plans. Unit to include 1-5/8" diameter stainless steel support posts secured to top of 56" high wall and overshelf assembly. Mounting assembly to have clean finish and be properly supported to secure pot rack system and intended weight of pots and pans. Unit to be equipped with adjustable stainless steel "S" hooks every 10" on center. Top of unit to be mounted 76" A.F.F.

ITEM K38: WORK TABLE

Provide and install one (1) custom fabricated 14 gauge 304 series stainless steel work table the size and shape as detailed on plans. Unit to be 8'-0" long x 3'-6" deep x 35-1/2" high. Table fabrication must comply with NSF guidelines and include UL approval for all electrical components. Units to include the following minimum features:

- Two (2) each 20” X 20” stainless steel drawer assemblies using Component Hardware parts to match and located as detailed on plans. Model S90-0020 stainless steel drawer assembly specifications. Refer to plans for drawer locations.
- 16 gauge 304 series stainless steel 1-5/8" tubular base with adjustable flanged feet (do not bolt to floor).
- Provide 16 gauge 304 series stainless steel fully welded undershelves.
- Provide open base for (2) two Item K49 trash can as detailed on plans.
- 14 gauge stainless steel countertop with No. 4 finish.
- Table is to be prewired for (2) single point final electrical connections to ceiling mounted receptacle. Table fabricator is to install one (2) 4” square UL approved stainless steel outlet box mounted on pot rack extension thru top of table (see plan for mounting side). Table fabricator is to install conduits, wiring, stainless steel coverplate, cord and twist lock NEMA plug as required to ceiling receptacle. Table fabricator is to provide and mount two (2) stainless steel electrical receptacle boxes under table top as shown on plans equipped with 120V duplex receptacles and stainless steel cover plates. An additional 208v/1ph receptacle and stainless steel cover plates and bracket is to be installed for item Item K61 Conveyor Toaster. All electrical conduits and wiring for complete electrical connections on table are to be provided and installed by table fabricator. All electrical devices and connections are to comply with local governing electrical codes and to include UL approval and listing as required. Reference Work Table Details / Sheets FS4 and FS6.

ITEM K39: AIR CURTAIN

Provide and install one (1) Berner Air Curtain Model CHC10-11048A-SS. Unit dimensions to be 51” W x 15” D x 14” H. Unit to be equipped with the following features:

- One (1) ½ HP three speed motor, for door height up to 10-feet high, aluminum housing with stainless steel finish, indoor mounting only, UL
- One (1) five year parts warranty (unheated units)
- One (1) Model A 120/60/1ph, 6.5 amps
- One (1) Model 9503SD020-P Automatic Door Switches, plunger type, activates air door when door opens, single phase only & max. amp draw of 20 amps
- One (1) Stainless steel housing

ITEM K40: VEGETABLE PREP TABLE

Provide and install one (1) custom fabricated 14 gauge 304 series stainless steel vegetable prep table with two compartment sink assembly as detailed on plans. Unit to be 9’-6” long x68" deep and 35-1/2" high with 8" rear backsplash where 56” high wall penetrates countertop (Field Measure). Unit to be constructed as described in the general specifications of this section. Unit is to include the following minimum features:

- Marine edge at front and ends; 8" high back splash where abutting 56” high wall penetration in countertop.
- One (1) 24" x 24" x 12" deep all coved stainless steel sink compartment.
- One (1) 24" x 24" x 12" deep all coved stainless steel sink compartment. Bottom of sink compartment is to include a 12”x12”x6” deep coved recessed basin to accommodate removable scrap basket as specified below and as detailed on plans.
- Stainless steel apron at front of to conceal space between sink compartments.
- One (1) modified T&S Model B-2278-01-CR prerinse unit complete with faucet add-on with 12” swing nozzle, Model B-0970-FEZ backflow preventer, 8” O.C. wall mounted assembly. ½” IPS female eccentric

flanged inlets, 34” high, 15” overhand, 18” riser, B-107 spray valve, one (1) B-0109-01 wall bracket and B-0044H flexible S/S hose.

- Two (2) Component Hardware Model No. D53-7215, rotary drain or approved equal with connected overflow, tailpiece and bracket support.
- Four (4) 20” x 20” x 6” stainless steel drawer assembly using Component Hardware parts to match Model S90-0020 stainless steel drawer assembly specifications.
- 16 gauge 1-5/8" stainless steel tubular base with adjustable flanged feet secured to floor with stainless steel bolts.
- 16 gauge all welded stainless steel undershelf as shown on plans.
- Open base at one locations for Item K49 trash cans.
- All stainless steel shall have a No. 4 finish.
- Provide and install custom fabricated removable stainless perforated scrap collection basket as detailed on plans. Unit are to be sized accordingly to fit into scrap sink compartment. Units are to be 11”x11” x4” deep and include 1/8” diameter perforations for proper scrap collection and drainage.
- Provide and install 18 gauge wall encasement for portions of the 56” high wall that penetrate above the top of this counter. Field verify locations of electrical receptacles and provide required cut-out as required.
- Field verify all dimensions prior to fabrication.

ITEM K41: CAN RACK

Provide and install one (1) New Age Industries Model 1250CK can dispensing rack for #10 cans. Capacity to be 162 #10 cans. Unit to be equipped with four 6" plate casters, two swivel and two rigid. Dimensions not to exceed 25” wide x 35” deep x 77 1/4” high.

ITEM K42: POINT OF SALE SYSTEM AND KEYPAD (OWNER FURNISHED)

General Contractor is to coordinate with the Judson Independent School District for all point of sale cash register system requirements.

ITEM K43: STAINLESS STEEL CORNER GUARDS

Provide and install one (1) LOT custom fabricated 14 gauge 304 series stainless steel corner protectors at all wall corners throughout kitchen area as shown on plans (field verify quantity). Units are to be 3" x 3" x 60" high and the angle as presented at each wall location. Units are to be secured to wall with heavy duty adhesive and where wall fasteners are required they shall be stainless steel and spaced equally in line on each angle of the unit. Silicone caulk around entire base of protector at floor.

ITEM K44: BAKERS TABLE

Provide and install one (1) custom fabricated 6'-0" long x 30" deep x 35-1/2" high bakers table the size and shape as detailed on plans. Unit is to be constructed of 304 series stainless steel 1-5/8" tubular open base construction and 14 gauge stainless steel top with 6" side and rear coved risers. Backs of all coved risers and/or backsplashes are to be enclosed with stainless steel. All stainless steel shall have a No. 4 finish. Field measure prior to fabrication.

ITEM K45: INGREDIENT BIN

Provide and install three (3) Rubbermaid Triemold Model 3602 mobile ingredient bins complete with sliding hinging lid. Unit dimensions to be 29-3/4” long x 15-1/2” wide x 28” high. Verify clearance requirements under Item K10 before ordering.

ITEM K46: 60 QUART MIXER

Provide and install one (1) Hobart HL600 60 Quart Floor Mixer. Transmission to utilize hardened steel worm and special bronze worm wheel to transmit power from the motor directly to the transmission with a three fixed speed transmission. Gears are heat treated alloy steel and in constant mesh with a special permanent lubrication. No belts, pulleys, or chains are acceptable. Motor to be 2.7 H.P. with fixed speed designed and built specifically for this unit. The motor shall have grease packed ball bearings, ventilation, and a splash proof enclosure. Bowl lift to have hand lever spring counter-balanced which shall be adjustable to assure proper agitator and bowl clearance. Unit to be provided with bowl guard as standard equipment that is easily removable for cleaning. Finish to be metallic gray polyurethane enamel. Electrical to be 208 Volt / 60HZ/3 phase. Mixer shall be listed by UL, NSF, and certified by the Baking Industry Sanitation Standard Committee.

Provide the following accessories for each unit:

- One 60-quart stainless steel bowl
- One "B" flat beater
- One "D" wire loop whip
- One ED dough hook
- One electric timer
- One bowl truck
- One VS9-12 9” vegetable slicer with #12 back case, hopper front and adjustable slicer plate.
- One #12 plate holder and the following plates: ½” shredder plate, 3/16” shredder plate, 3/32” shredder plate, 5/16” shredder plate and VS9 grater plate.
- Coordinate with division 26 for disconnect switch and electrical direct connection requirements.
- Warranty: Unit to have full two-year warranty on parts and labor.

ITEM K47: WALL MOUNTED ACCESSORY RACK

Provide and install one (1) custom fabricated 3’-0” wall mounted pot rack the size and shape as detailed on plans. Unit to be constructed entirely of 304 series stainless steel. Mount top of rack at 80” A.F.F. Pot/Utensil racks to be constructed of 2” x ¼” stainless steel bar length as shown on plans with Standard-Keil No. 1576-1010-1351 pot hooks every 8” on center. General Contractor to provide concealed wall blocking as required.

ITEM K48: POT FILLER

Provide and install one (1) T&S Model B-0605 pot filler assembly with flexible 68” long stainless steel hose, vacuum breaker, 4-Arm handle with finger hook. Unit is to be mounted 48” A.F.F. Unit is to be installed by Division 22 (plumbing contractor).

ITEM K49: TRASH CAN

Provide and install five (5) Rubbermaid model 2632 BRUTE trash containers complete with Model 2631 lids and Model 2640 dollies. Color of container and lids to be Gray. Verify clearance requirements under counters before ordering.

ITEM K50: WALL MOUNTED WIRE OVERSHELVES

Provide and install one (1) LOT of InterMetro Super Erecta shelving units the sizes and shape as shown on plans (field measure), with all standard features; Units to consist of the following minimum features:

- Provide two (2) Metro Super Erecta, model 1460NC chrome plated wire shelf units 14”X60”.
- Provide four (4) Metro model 1WD14C chrome plated direct wall brackets.
- General contractor is to provide concealed wall blocking if applicable.

ITEM K51: WALL SHELF

Provide and install two (2) 6’-0” long x 12” 16 gauge wall mounted stainless steel overshelf the size and shape as detailed on plans. Unit to include 14 gauge stainless steel fully welded wall brackets space a maximum of 24” on center. All wall fasteners are to be stainless steel. General Contractor is to provide concealed wall blocking as required for mounting the units 66” AFF. Field verify dimensions prior to fabricating.

ITEM K52: WORK TABLE

Provide and install one (1) custom fabricated 14 gauge 304 series stainless steel work table the size and shape as detailed on plans. Unit to be 6’-0” long x 30" deep x 35-1/2" high with 6" rear backsplash. Table fabrication must comply with NSF guidelines and include UL approval for all electrical components. Units to include the following minimum features:

- Two (2) each 20” X 20” stainless steel drawer assemblies using Component Hardware parts to match and located as detailed on plans. Model S90-0020 stainless steel drawer assembly specifications. Refer to plans for drawer locations.
- 16 gauge 304 series stainless steel 1-5/8" tubular base with adjustable flanged feet (do not bolt to floor).
- Provide 16 gauge 304 series stainless steel fully welded undershelf.
- 14 gauge stainless steel countertop with No. 4 finish.
- Two (2) table mounted 16 ga. stainless steel mounted shelves welded to 14 ga. sst brackets to support post on mounted backsplash @ 54” A.F.F. and 66” A.F.F. Refer to detail D20 sheet FS6.
- Provide flat surface for Item K67 manual can opener.
- Table is to be prewired for (1) single point final electrical connections to ceiling mounted receptacle. Table fabricator is to install one (1) 4” square UL approved stainless steel outlet box mounted on pot rack extension thru top of table (see plan for mounting side). Table fabricator is to install conduits, wiring, stainless steel coverplate, cord and twist lock NEMA plug as required to ceiling receptacle. Table fabricator is to provide and mount two (2) stainless steel electrical receptacle boxes under table top as shown on plans equipped with 120V duplex receptacles and stainless steel cover plates. All electrical conduits and wiring for complete electrical connections on table are to be provided and installed by table fabricator. All electrical devices and connections are to comply with local governing electrical codes and to include UL approval and listing as required. Reference Work Table Details / Sheets FS4 and FS6.

ITEM K53: TRENCH DRAIN

Provide and install one (1) IMC/Teddy ASFT-3036 stainless steel trench drain. Unit dimensions to be 30" wide x 36" long. Unit to be equipped with the following minimum features:

- Anti-Spill design floor trough constructed of 14-gauge, 18.8, type 304 stainless steel with fully welded corners ground and polished smooth.
- Trough shall have a built In pitch toward center of unit where drain is located and anchor straps for securing unit to the floor, Trough shall have a stainless steel waste cup with a removable stainless steel basket for up to a 3” waste pipe.
- 30”x36” ADA compliant fiberglass grating.
- Unit to be installed flush with finished floor. Verify finished floor material and modify units accordingly.
- Unit to be installed by Division 15/22 (Plumbing Contractor).

ITEM K54: MOP / BROOM RACK

Provide and install two (2) Rubbermaid Model 1993 34” wall mounted mop racks. General contractor to provide concealed wall blocking for mounting where applicable.

ITEM K55: SERVICE FAUCET

Provide one (1) T&S Model B-0665-CK-BSTP Service Faucet complete with 8' centers 9-7/8" from wall to center of outlet, polished chrome plated finish, 4” wrist action handles, vacuum breaker nozzle with 3/4" garden hose thread and 1/2" NPT female eccentric flanged inlets. Contractor is to provide 18” heavy duty garden hose assembly. Unit to be installed by Division 15/22 (Plumbing Contractor) 30" above finished floor.

ITEM K56: POT DRYING SHELF

Provide and install two (2) Intermetro Industries Model PR36VX Custom Drying Rack Units. Dimensions are to be 48"L x 24"W x 76"H and 36” x 24”W x 76”H. Each rack unit is to be equipped with all standard features including:

- Three (3) Microban antimicrobial product protection shelves that are easily removable for easy fit in dishwasher.
- Shelves are adjustable at ½” increments along the height of the numbered posts
- One (1) stainless steel drop-in.
- One (1) cutting board & tray drying rack systems.
- All units to be mounted on 6" casters (two locking).
- Lifetime warranty against rust and corrosion.

ITEM K57: MOP SINK BASIN

Provide one and install one (1) custom fabricated stainless-steel mop sink basin as detailed on plans. Unit dimensions of trench drain to be 36" wide x 24" deep, total dimensions 40” wide x 28” deep as detailed on plans. Unit to be equipped with the following minimum features:

- Mop sink basin is to be constructed of 14-gauge, 18.8, type 304 stainless steel with fully welded corners ground and polished smooth.
- Mop Sink Basin shall have a built-in pitch toward center of unit where drain is located and anchor flanges for securing unit to the floor.
- Basin shall have a stainless-steel waste cup with a removable stainless-steel basket for up to a 3” waste pipe.
- Unit is to be equipped with custom fiberglass trough grating, sized accordingly.
- Unit to be abutted to adjacent wall with 8” high rear and left side backsplash as detailed on plans.
- Unit is to be installed by Division 15/22, Plumbing Contractor prior to the installation of the finished floor material.
- Kitchen Equipment Contractor is to field verify all dimensions prior to fabrication.
- Kitchen Equipment Contractor is to provide 16-gauge, 304 series, stainless-steel wainscoting on the walls abutting the mop sink basin. Wainscoting is to be 36” high. Reference sheet FS8 detail D44.

ITEM K58: DISHWASHER

Provide and install one (1) Hobart AM15T dishwasher with the following minimum features and options:

- NSF pot and pan cycle listed for 2, 4, and 6 minute cycles. Timed cycles for 1, 2, 4 or 6 minutes.
- 27" door opening for 18" x 26" sheet pans or 60 qt. mixer bowl.
- Solid state, integrated controls with digital status indicators – Delime cycle, service diagnostics, NAFEM Data Protocol capable.
- Self-draining, high efficiency stainless steel pump and stainless steel impeller.
- Stainless steel drawn tank, tank shelf, chamber, trim panels, frame and feet.
- Revolving, interchangeable upper and lower anti-clogging wash and rinse arms.
- Slanted, self-locating, one-piece scrap screen and basket system.
- Unit to have Auto-fill, door actuated start and vent fan control.
- Additionally provide Hobart ¾" pressure regulator valve.
- 480/60/3-phase, 23.7 amps single point connection
- Internal booster heater @ 8.5 kw
- DISHRACK-PEG20 (4 each) 20x20 Peg Rack
- Combination Rack (2 each) 20X20

ITEM K59: CLEAN DISHTABLE

Provide and install one (1) custom fabricated 14 gauge stainless steel clean dishtable the size and shape as detailed on plans. Unit to be constructed as follows and include all features and accessories as listed below:

- 5'-6" long x 30" (Field Verify)
- 14 ga. 304 S/S, #4 Finish
- 10" x 2-1/2" Sloped backsplash at rear, 14 ga. z-clips
- 3"H rolled rim at front and right side, 34" work height
- 16 ga. 304 S/S legs and rails
- Legs: 1-5/8" diameter rails
- Adjustable stainless steel bullet feet.
- 16 ga. 304 series stainless steel undershelf.
- 14 ga. galvanized channels
- Counter transition as required to attach to dishwasher.
- Provide fully welded stainless steel quick drain with grate as shown on plans. Division 15/22 plumbing contractor is to branch copper drain line to nearest floor sink.
- Fully welded stainless steel quick drain with stainless steel grate. Division 22 is to route copper drain line to nearest floor sink.
- NSF Approved
- Field measure prior to fabricating.
- 14 gauge stainless steel z-clips.
- Undermount stainless steel prerinse mounting bracket, per plans. Unit to be equipped with stainless steel hose rack and T&S Model B-104-D Dummy wall hook.
- Penetrations in splash for Item K64 vacuum breaker

ITEM K60: WALL SHELF

Provide and install one (1) 2'-0" long x 12" deep 16 gauge wall mounted stainless steel overshelf the size and shape as detailed on plans. Unit to include 14 gauge stainless steel fully welded wall brackets space a maximum of 24" on center. All wall fasteners are to be stainless steel. General Contractor is to provide

concealed wall blocking as required for mounting the unit 54" AFF. Field verify dimensions prior to fabricating. Field verify mounting height prior to installing.

ITEM K61: CONVEYOR TOASTER AND CART

Provide and install one (1) Hatco model TQ-400 conveyor toaster. Unit to be 208V/1Ph, 10.7 amp and equipped with NEMA 6-15P plug and cord assemblies. Units to toast up to 360 slices of bread per hour.

Provide one (1) Advance Tabco Model MT-SS-302 all stainless steel table complete with 1-5/8" tubular stainless steel legs and 6" heavy duty casters, two with brakes. Unit to be 30"W x 24"L x 34"H (custom overall height). Top to be 14 gauge type 304 stainless steel. Undershelf to be 304 series 16 gauge stainless steel.

ITEM K62: DUNNAGE RACKS

Provide and install one (1) LOT of New Age Industrial stationary all welded aluminum dunnage racks, the size and shape as shown on plans. Units to be 8" high and contractor is to field measure all storage areas before ordering to insure proper sizing. Units to have the following minimum requirements:

- 2000 lbs. weight capacity
- Lifetime warranty against rust and corrosion

ITEM K63: FOOD PROCESSOR

Owner to provide and install one (1) Robot Coupe model R2 Dice combination food processor, 3 QT to include the following minimum features:

- 3 qt. cutter bowl with stainless steel "s" blade
- see-thru lid with two deep feed openings
- one 5/32" (4mm) slicing disc, and one 5/64" (2mm) medium grating disc.
- 120v/60/1-ph, 7 amps, nema 5-15p
- Switching: control panel with push-type on/ off buttons.

ITEM K64: UNDERCOUNTER PRERINSE ASSEMBLY

Provide and install one (1) T&S Brass Pre-Rinse Assembly consisting of the following components:

- 1 ea. 002832-40 Pre-Rinse Base Faucet, Wall Mount, 8" Centers (female)
- 1 ea. B000357-40 Nipple 3/8" x 2"
- 2 ea. B-0432 Vertical Mounted Base, 3/8" IPS female inlet & outlet, fits T&S standard rigid gooseneck.
- 1 ea. B-0455 Vacuum breaker unit, ½" IPS piping, slip flanges for mounting on 45 degree surface, 6" between piping.
- 1 ea. 053A Adapter, for prerinse spray hose, 3/8" IPS male (Chicago) (replacement part for standard 1/2" IPS male)
- 1 ea. B-0044-H-MOD hose, flexible, inner rubber tubing, supplied on most prerinse units with spring action gooseneck, stainless steel, MODIFIED TO 74" END TO END HOSE IS 68" LONG.
- 1 ea. B-0107 Spray Valve assembly with hold down ring & rubber bumper.
- 1 ea. BR-10 Brush Attachment with H quality nylon bristle brush.
- 1 ea. 002970-45 HOSE HANGER
- 1 ea. B-0104-D Dummy wall hook without inlet connection

- Unit is to be mounted on stainless steel undercounter bracket as included on Item K59. All final plumbing connections are to be provided and installed by Division 22 Plumbing Contractor.

ITEM K65: WORKTABLE

Provide and install one (1) custom fabricated “L-shaped” 14 gauge 304 series stainless steel work table the size and shape detailed on plans. Unit to be 30" deep and 35-1/2" high with 6" rear backsplash (Field Measure). Unit to be constructed as described in the general specifications of this section. Unit is to include the following minimum features:

- 14 gauge stainless steel countertop with No. 4 finish.
- Two (2) 20” x 20” x 6” stainless steel drawer assembly using Component Hardware parts to match Model S90-0020 stainless steel drawer assembly specifications.
- 16 gauge 1-5/8" stainless steel tubular base with adjustable feet.
- 16 gauge all welded stainless steel undershelf as shown on plans.
- Unit to be secured to wall with 14 gauge stainless steel zee clips as detailed on plans.
- Provide flat mounting surface for Item K67 manual can opener.
- Field measure prior to fabricating.
- Provide one (1) cantilever 16 ga. stainless steel wall mounted shelf for Item K21 Microwave Oven. Refer to details sheet D21, 22, 23 & 24 sheet FS6. Field measure prior to fabricating. General contractor to provide wall blocking if needed.

ITEM K66: MILK DOLLY

Provide two (2) Channel milk crate dollies model MC1326 constructed with heavy duty, high tensile extruded aluminum. Units are to include the following minimum features:

- lifetime guarantee against rust.
- standard 5" full swivel non-marking casters.
- 5b - heavy duty caster brakes
- 022 - corner bumpers
- ph10 - pull hook

ITEM K67: MANUAL CAN OPENER

Provide and install two (2) Edlund Model #1S manual can opener with stainless steel. Unit is to be mounted on Item K52 & K65 as shown on plans.

ITEM K68: LOCKER UNITS (BY GENERAL CONTRACTOR)

General Contractor to reference Architectural construction documents for specifications.

ITEM K69: CONDIMENT BINS

Provide two (2) Dispense-Rite model WR-COND-6 Countertop Organizers with 6 removable plastic bins and one wire rack.

ITEM K70: WALL MOUNTED OVERSHELF

Provide and install one (1) custom fabricated 16-gauge 6-1” long x 10" deep (field verify) wall mounted stainless-steel shelf, the size and shape as detailed on plans. Unit is to be mounted on top of 56" high wall and to include 14-gauge stainless-steel wall brackets with 1-1/2" flange at wall for proper mounting. Shelf is to

be fabricated with 1" radius front edges and to include 1" turn down as detailed on plans. Unit to be equipped with 1” turn-up at full height wall as detailed on plans. All wall fasteners are to be stainless-steel and spaced as required. Field measure wall prior to fabrication. All stainless steel shall have a No. 4 finish.

ITEM K71: REFRIGERATION RACK

Included in Item K24 and K25 specification.

END OF SECTION 11 40 00

SECTION 11 52 13

PROJECTION SCREEN

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Electrically operated concealed mounted projection screens.
2. Manually operated exposed mounted projection screens.
3. Related accessories.

B. Related Sections:
1. Section 03 30 00 – Cast-In-Place Concrete.
2. Section 04 20 00 – Unit Masonry Assemblies.
3. Section 09 21 16 – Gypsum Board Assemblies.
4. Section 09 51 10 – Suspended Acoustical Ceilings.
5. Section 09 99 50 – Finish / Color Schedule.
6. Division 26 – Equipment Wiring Connections: Electrical characteristics and wiring connections.

1.2 REFERENCES

A. National Fire Protection Association: NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

B. Underwriters Laboratories Inc.: UL - Electrical Appliance and Utilization Equipment Directory.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Submit manufacturer’s wiring diagram for electrically operated controls. Also detailed drawings concealed mounting.

C. Product Data: Submit manufacturer’s product data on materials, finishes, operation of unit, and electrical requirements.

D. Samples: Submit two samples in size illustrating screen case prefinished components, and screen surface.

E. Manufacturer's Installation Instructions: Submit detailed installation instructions including rough-in measurements.

F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data:
   1. Submit parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
   2. Submit technical information for servicing operating equipment.

1.5 QUALITY ASSURANCE

A. Flame Resistant Fabrics: Passes when tested in accordance with NFPA 701, Test 1 or Test 2.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience and approved by manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver projection screens after building is enclosed, other work within spaces where screens are to be installed is substantially complete, and installation of screens is ready to take place.

C. Protect projection screens from damage before, during and after installation.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of ceilings, walls, electric service power characteristics, and location.

PART 2 - PRODUCTS

2.1 PROJECTION SCREEN - ELECTRICALLY OPERATED CONCEALED

A. Manufacturers:
   1. BEI Audio-Visual Products.
   2. Da-Lite Screen Company, Advantage Deluxe (basis of design).

3. Draper Inc.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Size: Diagonal: 136.75”; Viewable Height: 72.50”; Viewable Width: 116”.
1. Furnish extra black drop lengths to lower screen within 48 inches of finished floor.

C. Type: Two motors, one to operate door and one to operate screen; fully recessed mounting with automatic ceiling closure complete with integrated low voltage control unit and three position control switch with cover plate.
1. Door Motor: Electrically operated 120 volt (60 Hz) not more than 1.2 amp, mounted inside the roller; three wire with ground, quick reversal type, oiled for life, with automatic thermal overload cutout, integral gears, capacitor and an electric brake to prevent coasting.
   a. Pre-set but adjustable limit switches shall automatically stop fabric door in the open position.
   b. Roller: 1.6 inch diameter aluminum.
2. Screen Motor: Electrically operated 120 volt (60 Hz) not more than 2.4 amp, mounted inside the roller; three wire with ground quick reversal type, oiled for life, with automatic thermal overload cutout, integral gears, capacitor and an electric brake to prevent coasting.
   a. Preset but adjustable limit switches to automatically stop picture surface in the “up” and “down” positions.
   b. Rigid metal roller: 5-3/4 inch diameter minimum.

D. Components:
1. Screen fabric: Flame retardant and mildew resistant fiberglass with black masking borders.
   a. Bottom of fabric shall be formed into a pocket holding a metal rod with plastic caps.
2. Case shall be a white powder coated aluminum extrusion; bottom of case to be self-trimming with a built-in flange around the bottom of the case.
   a. Section of the bottom of the case shall be a retractable aluminum door that opens and closes automatically with the lowering and raising of the picture surface.
   b. Balance of the bottom of the case shall be a second aluminum door with manual opening to provide access.
3. Junction box: Internally integrated into the housing making it possible to install the housing and wire to the building’s electrical system during construction.
   a. Junction box shall contain a quick connect connector mounted in the housing for easy plug-in connection to the motorized fabric and roller assembly.
4. Motorized fabric and roller assembly shall be installed in the case at a later time at the job site.

2.2 PROJECTION SCREEN – WALL MOUNTED

A. Manufacturers:
1. Da-Lite Screen Company, Model C – 33409 (basis of design).
2. Draper Inc.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Screen Case:
1. Steel, minimum 21 gage.
2. Top mounting hooks for hanging from mounting brackets.

3. Finish: Powder coated, white color.

C. Screen: Standard matte finish on flame retardant and mildew resistant fiberglass fabric.
1. Mount on a ball bearing rigid steel spring roller. Fabric shall be permanently attached to roller.
2. Borders: No masking borders.

D. Mounting Brackets: Prefinished steel angle mounting brackets and fasteners in color as selected.

E. Size: 72 by 72 inch, unless otherwise indicated on Drawings.

2.3 SCREEN SURFACES

A. Screen: Matte white with minimum gain characteristics; no borders.

2.4 PROJECTION SCREEN MOTORS

A. Motors:

1. Instant reversing, gear drive motor of size and capacity recommended by screen manufacturer, with permanently lubricated ball bearing, automatic thermal overload protection, preset limit switches to automatically stop screen in UP and DOWN position, and positive stop action to prevent coasting; remotely controlled as indicated on Drawings.

2. Motor Mounting: Mounted on end of screen.

B. Screen Control: Multiple station, Key operated, UL listed control switch for each screen with metal device box and cover plate for flush wall mounting and for connection to 120 Volts AC electric power supply.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify rough-in opening and conditions are acceptable.

C. Verify electrical power is available and of correct characteristics.

3.2 INSTALLATION

A. Install projection screens at location indicated on Drawings.

B. Coordinate with electrical connection.

C. Coordinate installation with ceiling finishes for application of ceiling finish to screen case bottom panels.

D. Securely anchor to supporting substrate.

E. Install to produce smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when lowered.

F. Test electrically-operated units to verify screen controls, limit switches, closure and other operating components are in optimum functioning conditions.

3.3 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for balancing and adjusting.

B. Adjust installed unit for smooth and balanced operation.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Remove protective coverings from finished surfaces. Clean surfaces and components ready for inspection.

3.5 DEMONSTRATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate projection screens to Owner.

3.6 PROTECTION OF FINISHED WORK

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Do not permit use of projection screens after installation.

END OF SECTION

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SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.2 RELATED SECTIONS

A. Section 08 41 13 – Aluminum Entrances and Storefronts.

B. Section 09 99 50 – Finish / Color Schedule.

1.3 SYSTEM DESCRIPTION

A. Horizontal slat louver blinds installed at window openings; manual control of raising and lowering by cord for full range locking; blade angle adjustable by control wand.

1.4 QUALITY ASSURANCE

A. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certification is mandatory before approval will be issued. Submittals furnished without the asbestos -free Certification will be returned to the Contractor with no action taken until such Certification is provided.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

C. Product Data: Provide data indicating physical and dimensional characteristics and operating features.

D. Samples: Submit two samples, 12 inch long illustrating slat materials and finish, color, rod type and color.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.8 COORDINATION

A. Coordinate work under provisions of Section 01 30 00.

B. Coordinate the work with window installation and placement of concealed blocking to support blinds.

1.9 EXTRA MATERIALS

A. Provide under provisions of Section 01 77 00.

B. Provide ten additional slats.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hunter Douglas, Inc., Window Coverings Division; Contract Flexalum Decor.

B. Levolor Window Treatment Systems.

C. Springs Window Fashions Division, Inc.; Bali-Graber Contract.

D. Substitutions: Under provisions of Section 01 60 00.

2.2 MATERIALS

A. Metal Slats: 1 inch wide; 0.008 inch thick spring tempered pre-finished aluminum horizontal slats, square slats with radiused corners, with manufacturing burrs removed.

B. Slat Support: Ladder configuration, 100 percent polyester yarn of color compatible with slats.

C. Head Rail: Pre-finished, formed steel box; internally fitted with hardware, pulleys, and bearings for operation.

D. Cord: Two-ply polyester cord filler and braided polyester jacket; continuous loop, free end weighted.

E. Control Wand: Extruded clear acrylic; tubular shape; removable type; length of window opening height less 3 inches, but, in all cases, not less than 48 inches to bottom of wand from the floor for A.D.A. compliance.

F. Head Support Bracket: Overhead head rail attachment; Coordinate with Section 08 41 16 for installation.

G. Accessory Hardware: Type recommended by blind manufacturer.

2.3 FINISHES

A. Blind Slat and Head Rail Housing: Painted solid color; color as selected by Architect from manufacturer’s full range of colors.

B. Control Wand: Clear color.

2.4 FABRICATION

A. Fabricate blinds to fit openings with uniform edge clearance of 1/4 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed.

3.2 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with concealed fasteners.

C. Place intermediate head supports at 60 inch oc.

3.3 INSTALLATION TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

3.4 ADJUSTING

A. Adjust work under provisions of Section 01 77 00.

B. Adjust blinds for smooth operation.

3.5 CLEANING

A. Clean work under provisions of 01 77 00.

B. Clean blind surfaces just prior to occupancy.

3.6 SCHEDULE

A. Install blinds at the following locations:
   1. All exterior windows.

END OF SECTION

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SECTION 22 02 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all Work herein.

B. The Contract Drawings indicate the extent and general arrangement of the systems. If any departure from the Contract Drawings is deemed necessary by the Contractor, details of such departure and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as reasonably practicable. No such departures shall be made without the prior written approval of the Architect/Engineer.

C. Notwithstanding any reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, such reference shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect/Engineer, expressed in writing, is equal to that specified.

1.2 SCOPE OF WORK

A. The Work included under this Contract consists of the furnishing and installation of all equipment and material necessary and required to form the complete and functioning systems in all of their various phases, all as shown on the accompanying Drawings and/or described in these Specifications. The Contractor shall review all pertinent Drawings, including those of other contracts, prior to commencement of Work.

B. This Division requires the furnishing and installing of all items as specified herein, indicated on the Drawings, or reasonably inferred as necessary for safe and proper operation; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to: materials, labor, supervision, transportation, storage, equipment, utilities, all required permits, licenses and inspections. All work performed under this Section shall be in accordance with the Project Manual, Drawings and Specifications and is subject to the terms and conditions of the Contract.

C. The approximate locations of Plumbing and Fire Protection items are indicated on the Drawings. These Drawings are not intended to give complete and accurate details with regards to location of outlets, apparatus, etc. Exact locations are to be determined by actual measurements at the building/job-site, and will in all cases be subject to the Review of the Owner or Engineer, who reserves the right to make any reasonable changes in the locations indicated without additional cost to the Owner.

D. Items specifically mentioned in the Specifications but not shown on the Drawings and/or items shown on Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

E. All discrepancies between the Contract Documents and actual job-site conditions shall be reported to the Owner or Engineer so that they will be resolved prior to bidding. Where

this cannot be done at least seven (7) working days prior to bid; the greater or more costly of the discrepancy shall be bid. All labor and materials required to perform the work described shall be included as part of this Contract.

F. It is the intention of this Section of the specifications to outline minimum requirements to furnish the Owner with a turn-key and fully operating system in cooperation with other trades.

G. It is the intent of the above "Scope" to give the Contractor a general outline of the extent of the Work involved; however, it is not intended to include each and every item required for the Work. Anything omitted from the "Scope" but shown on the Drawings, or specified elsewhere, or necessary for complete and functioning plumbing systems shall be considered a part of the overall "Scope".

H. The Contractor shall rough-in fixtures and equipment furnished by others from rough-in and placement drawings furnished by others. The Contractor shall make final connection to fixtures and equipment furnished by others.

I. The Contractor shall participate in the Commissioning process as required; including, but not necessarily limited to: meeting attendance, completion of checklists, and participation in functional testing.

1.3 SCHEMATIC NATURE OF CONTRACT DOCUMENTS

A. The contract documents are schematic in nature in that they are only to establish scope and a minimum level of quality. They are not to be used as actual working construction drawings. The actual working construction drawings shall be the reviewed Shop Drawings.

B. All piping, fixture, or equipment locations as indicated on the documents do not indicate every transition, offset, or exact location. All transitions, offsets, clearances and exact locations shall be established by actual field measurements, coordination with the structural, architectural and reflected ceiling plans, and other trades. Submit Shop Drawings for review.

C. All transitions, offsets and relocations as required by actual field conditions shall be performed by the Contractor at no additional cost to the owner.

D. Additional coordination with Electrical Subcontractor may be required to allow adequate clearances of electrical equipment, fixtures, and associated appurtenances. Contractor to notify Architect and Engineer of unresolved clearances, conflicts, or equipment locations.

1.4 SITE VISIT AND FAMILIARIZATION

A. Before submitting a bid, it will be necessary for each Contractor whose work is involved to visit the site and ascertain for himself the conditions to be met therein in installing his work and make due provision for same in his bid. It will be assumed that this Contractor in submitting his bid has visited the premises and that his bid covers all work necessary to properly install the piping, fixtures and equipment shown. Failure on the part of the Contractor to comply with this requirement shall not be considered justification for the omission or faulty installation of any work covered by these Specifications and Drawings.

B. Understand the existing utilities from which services will be supplied; verify locations of utility services, and determine requirements for connections.

C. Determine in advance that equipment and materials proposed for installation fit into the

confines indicated.

1.5 WORK SPECIFIED IN OTHER SECTIONS

A. Finish painting is specified. Prime and protective painting is included in the work of this Division.

B. Owner and General Contractor furnished equipment shall be properly connected to plumbing systems.

C. Furnishing and installing all required plumbing equipment, control relays and electrical interlock devices, conduit, wire and junction boxes are included in the Work of this Division.

1.6 PERMITS, TESTS, INSPECTIONS

A. Arrange and pay for all permits, fees, tests, and all inspections as required by governmental authorities.

1.7 DATE OF FINAL ACCEPTANCE

A. The date of final acceptance shall be the date of Owner occupancy, or the date all punch list items have been completed, or the date final payment has been received. Refer to Division 01 for additional requirements.

B. The date of final acceptance shall be documented in writing and signed by the Architect, Owner and Contractor.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Deliver products to the project at such times as the project is ready to receive the equipment, pipe or valves - properly protected from incidental damage and weather damage.

C. Damaged equipment, valves or pipe shall be promptly removed from the site and new, undamaged equipment, valves and pipe shall be provided in its place promptly with no additional charge to the Owner.

1.9 NOISE AND VIBRATION

A. The plumbing systems and the component parts thereof shall be guaranteed to operate without objectionable noise and vibration.

B. Provide foundations, supports and isolators as specified or indicated, properly adjusted to prevent transmission of vibration to the building structure, piping and other items.

C. Carefully fabricate pipe and fittings with smooth interior finish to prevent turbulence and generation or regeneration of noise.

D. All equipment shall be selected to operate with minimum of noise and vibration. If, in the opinion of the Architect/Engineer, objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping or other parts of the Work, the Contractor shall rectify such conditions without extra cost to the Owner.

1.10 APPLICABLE CODES

A. Obtain all required permits and inspections for all work required by the Contract Documents and pay all required fees in connection thereof.

B. Arrange with the serving utility companies for the connection, relocation, and upgrade of all required utilities and pay all charges, meter charges, connection fees and inspection fees, if required.

C. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations and the applicable requirements of the following nationally accepted codes and standards, including, but not necessarily limited to:

1. American Standards Association, ASA.
2. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., ASHRAE.
3. American Society of Mechanical Engineers, ASME.
4. American Society of Plumbing Engineers, ASPE.
5. American Society of Testing Materials, ASTM.
6. American Water Works Association, AWWA.
7. National Bureau of Standards, NBS.
8. National Fire Protection Association, NFPA.
9. UL, LLC (formerly Underwriters Laboratories).
10. FM Global.
11. International Energy Conservation Code, IECC.
12. International Fire Code.
13. International Gas Code.

D. Where differences exist between the Contract Documents and applicable state or city building codes, state and local ordinances, industry standards, utility company regulations and the applicable requirements of the above listed nationally accepted codes and standards, the more stringent or costly application shall govern. Promptly notify the Architect/Engineer in writing of all differences.

E. When directed in writing by the Architect/Engineer, remove all work installed that does not comply with the Contract Documents and applicable state or city building codes, state and local ordinances, industry standards, utility company regulations and the applicable requirements of the above listed nationally accepted codes and standards. Correct the deficiencies and complete the work at no additional cost to the Owner.

1.11 DEFINITIONS AND SYMBOLS

A. General Explanation: A substantial amount of construction and Specification language constitutes definitions for terms found in other Contract Documents, including Drawings which must be recognized as diagrammatic and schematic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article, unless defined otherwise in Division 01.

B. Definitions and explanations of this Section are not necessarily either complete or exclusive, but are general for work to the extent not stated more explicitly in another provision of the Contract Documents.

C. Indicated: The term "Indicated" is a cross-reference to details, notes or schedules on the Drawings, to other paragraphs or schedules in the Specifications and to similar means of recording requirements in Contract Documents. Where such terms as "Shown", "Noted",

"Scheduled", "Specified" and "Detailed" are used in lieu of "Indicated", it is for the purpose of helping the reader locate cross-reference material, and no limitation of location is intended except as specifically shown.

D. Directed: Where not otherwise explained, terms such as "Directed", "Requested", "Accepted", and "Permitted" mean by the Architect or Engineer. However, no such implied meaning will be interpreted to extend the Architect's or Engineer's responsibility into the Contractor's area of construction supervision.

E. Reviewed: Where used in conjunction with the Engineer's response to submittals, requests for information, applications, inquiries, reports and claims by the Contractor the meaning of the term "Reviewed" will be held to limitations of Architect's and Engineer's responsibilities and duties as specified in the General and Supplemental Conditions. In no case will "Reviewed" by Engineer be interpreted as a release of the Contractor from responsibility to fulfill the terms and requirements of the Contract Documents.

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

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

H. Provide: Except as otherwise defined in greater detail, the term "Provide" is used to mean "Furnish and Install", complete and ready for intended use, as applicable in each instance.

I. Installer: Entity (person or firm) engaged by the Contractor or its Subcontractor for performance of a particular unit of work at the project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protection, cleaning and similar operations, as applicable in each instance. It is a general requirement that such entities (Installers) be expert in the operations they are engaged to perform.

J. Imperative Language: Used generally in Specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or when so noted by other identified installers or entities.

K. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended as minimum quality level or quantity of work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable tolerance limits. In complying with requirements, indicated or scheduled numeric values are either minimums or maximums as noted or as appropriate for the context of the requirements. Refer instances of uncertainty to Owner or Engineer via a request for information (RFI) for decision before proceeding.

L. Abbreviations and Symbols: The language of Specifications and other Contract Documents including Drawings is of an abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in text of Specifications and Drawings. Specific abbreviations and symbols have been established, principally for lengthy

technical terminology and primarily in conjunction with coordination of Specification requirements with notations on Drawings and in Schedules. These are frequently defined in Section at first instance of use or on a Legend and Symbol Drawing. Trade and industry association names and titles of generally recognized industry standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of Contract Documents so indicate. Except as otherwise indicated, graphic symbols and abbreviations used on Drawings and in Specifications are those recognized in construction industry for indicated purposes. Where not otherwise noted symbols and abbreviations are defined by 2009 ASHRAE Fundamentals Handbook, chapter 34 "Abbreviations and Symbols", ASME and ASPE published standards.

1.12 DRAWINGS AND SPECIFICATIONS

A. These Specifications are intended to supplement the Drawings. It will not be the province of the Specifications to mention any part of the work which the Drawings are competent to fully explain in every particular and such omission shall not to relieve the Contractor from carrying out portions indicated on the Drawings only.

B. Should items be required by these Specifications and not indicated on the Drawings, they are to be supplied even if of such nature that they could have been indicated thereon. In case of disagreement between Drawings and Specifications, or within either Drawings or Specifications, the better quality or greater quantity of work shall be estimated and the matter referred to the Architect or Engineer for review with a request for information and clarification at least seven (7) working days prior to bid opening date for issuance of an addendum.

C. The listing of product manufacturers, materials and methods in the various sections of the Specifications, and indicated on the Drawings, is intended to establish a standard of quality only. It is not the intention of the Owner or Engineer to discriminate against any product, material or method that is equal to the standards as indicated and/or specified, nor is it intended to preclude open, competitive bidding. The fact that a specific manufacturer is listed as an acceptable manufacturer should not be interpreted to mean that the manufacturers' standard product will meet the requirements of the project design, Drawings, Specifications and space constraints.

D. The Architect or Engineer and Owner shall be the sole judge of quality and equivalence of equipment, materials and methods.

E. Products by other reliable manufacturers, other materials, and other methods, will be accepted as outlined, provided they have equal capacity, construction, and performance. However, under no circumstances shall any substitution by made without the written permission of the Architect or Engineer and Owner. **Request for prior approval must be made in writing at least ten (10) days prior to the bid date without fail.**

F. Wherever a definite product, material or method is specified and there is not a statement that another product, material or method will be acceptable, it is the intention of the Owner or Engineer that the specified product, material or method is the only one that shall be used without prior approval.

G. Wherever a definite material or manufacturer's product is specified and the Specification states that products of similar design and equal construction from the specified list of manufacturers may be substituted, it is the intention of the Owner or Engineer that products of manufacturers that are specified are the only products that will be acceptable and that products of other manufacturers will not be considered for substitution without approval.

H. Wherever a definite product, material or method is specified and there is a statement that "OR EQUAL" product, material or method will be acceptable, it is the intention of the Owner or Engineer that the specified product, material or method or an "OR EQUAL" product, material or method may be used if it complies with the specifications and is submitted for review to the Engineer as outline herein.

I. Where permission to use substituted or alternative equipment on the project is granted by the Owner or Engineer in writing, it shall be the responsibility of the Contractor or Subcontractor involved to verify that the equipment will fit in the space available which includes allowances for all required Code and maintenance clearances, and to coordinate all equipment structural support, plumbing and electrical requirements and provisions with the Mechanical and Plumbing Design Documents and all other trades, including Division 26.

J. Changes in architectural, structural, electrical, mechanical, and plumbing requirements for the substitution shall be the responsibility of the bidder wishing to make the substitution. This shall include the cost of redesign by the affected designer(s). Any additional cost incurred by affected Subcontractors shall be the responsibility of this bidder and not the Owner.

K. If any request for a substitution of product, material or method is rejected, the Contractor will automatically be required to furnish the product, material or method named in the Specifications. Repetitive requests for substitutions will not be considered.

L. The Owner or Engineer will investigate all requests for substitutions when submitted in accordance with above and if accepted, will issue a written acceptance allowing the substitutions.

M. Where equipment other than that used in the design as specified or shown on the Drawings is substituted (either from an approved manufacturers list or by submittal review), it shall be the responsibility of the substituting Contractor to coordinate space requirements, building provisions and connection requirements with his trades and all other trades and pay all additional costs to other trades, the Owner, the Architect or Engineer, if any, due to the substitutions.

1.13 SUBMITTALS

A. Coordinate with Division 01 for submittal timetable requirements, unless noted otherwise within thirty (30) days after the Contract is awarded. The Contractor shall submit an electronic copy of a complete set of Shop Drawings and complete data covering each item of equipment or material. The submittal of each item requiring a submittal must be received by the Architect or Engineer within the above thirty (30) day period. The Architect or Engineer shall not be responsible for any delays or costs incurred due to excessive Shop Drawing review time for submittals received after the thirty (30) day time limit. The Architect and Engineer will retain a copy of all Shop Drawings for their files. All literature pertaining to items subject to Shop Drawing submittal shall be submitted at one time. Submittals shall be placed in one electronic file in PDF 8.0 format and bookmarked for individual specification sections. Individual electronic files of submittals for individual specifications shall not be permitted. Each submittal shall include the following items:

1. A cover sheet with the names and addresses of the Project, Architect, MEP Engineer, General Contractor and the Subcontractor making the submittal. The cover sheet shall also contain the section number covering the item or items submitted and the item nomenclature or description.
2. An index page with a listing of all data included in the Submittal.

3. A list of variations page with a listing all variations, including unfurnished or additional required accessories, items or other features, between the submitted equipment and the specified equipment. If there are no variations, then this page shall state "NO VARIATIONS". Where variations affect the work of other Contractors, then the Contractor shall certify on this page that these variations have been fully coordinated with the affected Contractors and that all expenses associated with the variations will be paid by the submitting Contractor. This page will be signed by the submitting Contractor.
4. Equipment information including manufacturer's name and designation, size, performance and capacity data as applicable. All applicable Listings, Labels, Approvals and Standards shall be clearly indicated.
5. Dimensional data and scaled drawings as applicable to show that the submitted equipment will fit the space available with all required Code and maintenance clearances clearly indicated and labeled at a minimum scale of 1/4" = 1'-0", as required to demonstrate that the alternate or substituted product will fit in the space available.
6. Identification of each item of material or equipment matching that indicated on the Drawings.
7. Sufficient pictorial, descriptive and diagrammatic data on each item to show its conformance with the Drawings and Specifications. Any options or special requirements or accessories shall be so indicated. All applicable information shall be clearly indicated with arrows or another approved method.
8. Additional information as required in other Sections of this Division.
9. Certification by the General Contractor and Subcontractor that the material submitted is in accordance with the Drawings and Specifications, signed and dated in long hand. Submittals that do not comply with the above requirements shall be returned to the Contractor and shall be marked "REVISE AND RESUBMIT".

B. Refer to Division 00 and Division 01 for additional information on Shop Drawings and submittals.

C. Equipment and materials submittals and Shop Drawings will be reviewed for compliance with design concept only. It will be assumed that the submitting Contractor has verified that all items submitted can be installed in the space allotted. Review of Shop Drawings and submittals shall not be considered as a verification or guarantee of measurements or building conditions.

D. Where Shop Drawings and submittals are marked "REVIEWED", the review of the submittal does not indicate that submittals have been checked in detail nor does it in any way relieve the Contractor from his responsibility to furnish material and perform work as required by the Contract Documents.

E. Shop Drawings shall be reviewed and returned to the Contractor with one of the following categories indicated:

1. REVIEWED: Contractor need take no further submittal action, shall include this submittal in the O&M manual and may order the equipment submitted on.
2. REVIEWED AS NOTED: Contractor shall submit a letter verifying that required exceptions to the submittal have been received and complied with including additional accessories or coordination action as noted, and shall include this submittal and compliance letter in the O&M manual. The Contractor may order the equipment submitted on at the time of the returned submittal providing the Contractor complies with the exceptions noted.
3. NOT APPROVED: Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is not

approved, the Contractor will automatically be required to furnish the product, material or method named in the Specifications and/or Drawings. Contractor shall not order equipment that is not approved. Repetitive requests for substitutions will not be considered.

4. REVISE AND RESUBMIT: Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is marked revise and resubmit, the Contractor will automatically be required to furnish the product, material or method named in the Specifications and/or provide as noted on previous Shop Drawings. Contractor shall not order equipment marked revise and resubmit. Repetitive requests for substitutions will not be considered.
5. CONTRACTOR'S CERTIFICATION REQUIRED: Contractor shall resubmit submittal on material, equipment or method of installation. The Contractor's stamp is required stating the submittal meets all conditions of the contract documents. The stamp shall be signed by the General Contractor. The submittal will not be reviewed if the stamp is not placed and signed on all Shop Drawings.
6. MANUFACTURER NOT AS SPECIFIED: Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is marked manufacturer not as specified, the Contractor will automatically be required to furnish the product, material or method named in the specifications. Contractor shall not order equipment where submittal is marked manufacturer not as specified. Repetitive requests for substitutions will not be considered.

F. Materials and equipment which are purchased or installed without Shop Drawing review shall be at the risk of the Contractor and the cost for removal and replacement of such materials and equipment and related work which is judged unsatisfactory by the Owner or Engineer for any reason shall be at the expense of the Contractor. The responsible Contractor shall remove the material and equipment noted above and replace with specified equipment or material at his own expense when directed in writing by the Architect or Engineer.

G. Shop Drawing Submittals shall be complete and checked prior to submission to the Engineer for review.

H. Submittals are required for, but not necessarily limited to, the following items:

1. Basic Materials.
2. Plumbing Fixtures and Valves.
3. Supports and Carriers.
4. Floor Drains, Roof Drains, and Cleanouts.
5. Interceptors/Traps (All Types).
6. Water Heaters and Boilers.
7. Expansion Tanks.
8. Water Softeners.
9. Water Treatment Equipment.
10. Water Filters.
11. Domestic Water Booster Pumps.
12. Fire Pumps and Jockey Pumps.
13. Storm, Sanitary, and Wastewater Pumps and Ejectors.
14. Fire Pump and Jockey Pump Controllers.
15. Domestic Water and Fire Protection Break Tanks.
16. Backflow Preventers.
17. Plumbing Piping.
18. Piping, Vessel, and Equipment Insulation.
19. Air Compressors and Air Dryers.
20. Expansion Fittings and Devices.

21. Variable Frequency Drives.
22. Noise and Vibration Controls.
23. Pipe and Equipment Hangers and Supports.
24. Plumbing Specialties.
25. Test, Adjust and Balance Reports.
26. Testing, Adjusting and Balancing Contractor Qualifications.
27. Coordination Drawings.

I. Refer to other Division 22 sections for additional Shop Drawing and submittal requirements. Provide samples of actual materials and/or equipment to be used on the Project upon request of the Owner or Engineer.

1.14 COORDINATION DRAWINGS

A. Prepare coordination drawings to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of pipe, equipment, and other materials. Include the following:
   a. Wall locations and types.
   b. Clearances for installing and maintaining insulation.
   c. Locations of light fixtures and sprinkler heads.
   d. Clearances for servicing and maintaining equipment, including tube removal and space for equipment disassembly required for periodic maintenance.
   e. Equipment connections and support details.
   f. Exterior wall and foundation penetrations.
   g. Routing of storm, sanitary sewer piping and plumbing piping.
   h. Fire-rated wall and floor penetrations.
   i. Sizes and location of required concrete pads and bases.
   j. Valve stem movement.
   k. Structural floor, wall and roof opening sizes and details.
2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

B. This Contractor shall be responsible for coordination of all items that will affect the installation of the work of this Division. This coordination shall include, but not be limited to: voltage, ampacity, capacity, electrical and piping connections, space requirements, sequence of construction, building requirements and special conditions.

C. By submitting Shop Drawings on the project, this Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified and intended, in full coordination with all other Contractors and Subcontractors.

1.15 RECORD DOCUMENTS

A. Prepare Record Documents in accordance with the requirements of Division 00 and Division 01, in addition to the requirements specified in Division 22.

B. The Contractor shall maintain a separate set of clearly and legibly marked Record Drawings on the job site to record all changes and modifications, including, but not limited to the following: work details, alterations to meet site conditions, and changes made by "Change Order" notices. Mark the drawings with colored pencil(s). These shall be available for review by the Owner, Architect or Engineer during the entire construction stage.

C. The Record Drawings shall be updated concurrently as construction progresses, and in no case less frequently than a daily basis. They shall indicate accurate dimensions for all buried or concealed work; precise locations of all concealed pipe; locations of all valves, controls and operable devices; and any deviations from the work shown on the Construction Documents. All dimensions shall include at least two dimensions to permanent structure points.

D. Record Drawings shall indicate, at a minimum, the following installed conditions:

1. Mains and branches of piping systems, with valves and control devices located and numbered, unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion fittings, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
4. Contract Modifications, actual equipment and materials installed.

E. Engage the services of a Land Surveyor or Professional Engineer registered in the state in which the project is located as specified herein to record the locations and invert elevations of underground installations.

F. If the Contractor does not keep an accurate set of Record Documents, the pay request may be altered or delayed at the request of the Architect. Delivery of Record Documents is a condition of final acceptance. Record Drawings shall be furnished in addition to Shop Drawings.

G. Upon completion of the Work, the Contractor shall submit three (3) full size sets of Record Drawing prints to the Architect or Engineer for review prior to scheduling the final inspection at the completion of the work. The drawings shall have the name(s) and seal(s) of the Engineer(s) removed or blanked out and shall be clearly marked and signed on each sheet as follows:

CERTIFIED RECORD DRAWINGS

DATE:

(NAME OF GENERAL CONTRACTOR)

BY:_____
(SIGNATURE)

(NAME OF SUBCONTRACTOR)

BY:_____
(SIGNATURE)

1.16 CERTIFICATIONS AND TEST REPORTS

A. Submit a detailed schedule for completion and testing of each system indicating scheduled dates for completion of system installation and outlining tests to be performed and scheduled dates for each test. This detailed completion and test schedule shall be submittal at least ninety (90) days before the projected Project completion date.

B. Test result reporting forms shall be submitted for review no later than the date of the detailed schedule submitted.

C. Submit four (4) copies of all certifications and test reports to the Architect or Engineer for review adequately in advance of completion of the Work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

D. Certifications and test reports to be submitted shall include, but not be limited to those items outlined in other Sections of Division 22.

1.17 OPERATIONS AND MAINTENANCE MANUALS

A. Prepare Operations and Maintenance manuals in accordance with the requirements of Division 01 and Division 22. In addition to the requirements of other Sections, this shall include the following information for fixtures, specialties, and equipment items:

1. Identifying names, name tags designations and locations for all equipment.
2. Valve tag lists with valve number, type, color coding, location and function.
3. Reviewed Shop Drawing submittals with exceptions noted compliance letter.
4. Fabrication drawings.
5. Equipment and device bulletins and data sheets clearly highlighted to show equipment installed on the project and including performance curves and data as applicable, i.e., description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and model numbers of replacement parts.
6. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
7. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
8. Servicing instructions and lubrication charts and schedules.
9. Equipment and motor name plate data.
10. Wiring diagrams.
11. Exploded parts views and parts lists for all equipment and devices.
12. Color coding charts for all painted equipment and conduit.
13. Location and listing of all spare parts and special keys and tools furnished to the Owner.
14. Furnish recommended lubrication schedule for all required lubrication points with listing of type and approximate amount of lubricant required.

B. Coordinate with Division 01 for Operations and Maintenance manual requirements. Unless noted otherwise, bind together in “D ring” style three-ring binders (National model no. 79-883 or equivalent). Binders shall be large enough to allow ¼” of spare capacity. Include three (3) sets with all approved Shop Drawing submittals, fabrication drawings, bulletins, maintenance instructions, operating instructions and parts exploded views and lists for each and every piece of equipment furnished under this Specification. All sections shall be typed and indexed into sections with tabbed insertable dividers, labeled

for easy reference. Utilize the individual specification section numbers shown in the Plumbing Specifications as an organization guideline. Bulletins containing information about equipment that is not installed on the project shall be properly marked up or stripped and reassembled. All pertinent information required by the Owner for proper operation and maintenance of equipment supplied by Division 22 shall be clearly and legibly set forth in memoranda that shall, likewise, be bound with bulletins.

C. In addition to the bound “hard-copy” Operation and Maintenance manuals referenced above, provide an identical electronic copy in searchable PDF format, with all sections bookmarked within the file for easy reference. Provide a USB flash drive with the final manual to the Owner.

D. Operating and Maintenance Manuals shall be turned over to the Owner or Engineer for review a minimum of fourteen (14) working days prior to the beginning of the operator training period.

E. **Operating and Maintenance Manuals which the Engineer deems incomplete, poorly organized, or otherwise unacceptable will be rejected in writing**. The Contractor will subsequently be required to again turn over Operating and Maintenance Manuals, with all deficiencies corrected, until deemed acceptable by the Engineer.

1.18 OPERATOR TRAINING

A. The Contractor shall furnish the services of factory trained specialists to instruct the Owner's operating personnel. The Owner's operator training shall include a minimum of 12 hours of on- site training in three (3) shifts of four (4) hours each.

B. Before proceeding with the instruction of Owner’s Personnel, prepare a typed outline in triplicate, listing the subjects that will be covered in this instruction, and submit the outline for review by the Owner. At the conclusion of the instruction period, obtain the signature of each person being instructed on each copy of the reviewed outline to signify that he or she has a proper understanding of the operation and maintenance of the systems and then resubmit the signed outlines.

C. Refer to other Sections of Division 22 for additional Operator Training requirements.

1.19 FINAL COMPLETION

A. At the completion of the work, all equipment, operable appurtenances, and systems shall be tested. All faulty equipment and material shall be repaired or replaced. Refer to other Sections of Division 22 for additional requirements.

B. Clean and adjust all fixtures, flushometers, valves and operable devices. Replace faulty or otherwise damaged parts immediately prior to final acceptance.

C. Touch up and/or refinish any scratched equipment and devices immediately prior to final acceptance. This shall be acceptable **only for minor superficial scratches**, the determination of which rests solely on the judgment of the Architect or Engineer.

1.20 CONTRACTOR'S GUARANTEE

A. Use of the Plumbing systems to provide temporary service during the construction period shall not be allowed without written permission from the Owner, and, if granted, shall not be cause for the warranty period to start, except as defined below.

B. Contractor shall guarantee to keep the entire installation in repair and perfect working order for a period of one (1) year after its completion and final acceptance, and shall furnish free of additional cost to the Owner all materials and labor necessary to comply with the above guarantee throughout the year beginning from the date of issue of Substantial Completion, Beneficial Occupancy by the Owner, or the Certificate of Final Payment as agreed upon by all parties.

C. This guarantee shall not include cleaning or changing filters except as required by testing, adjusting and balancing.

D. Refer to other Sections of Division 22 for additional guarantee or warranty requirements.

1.21 TRANSFER OF ELECTRONIC FILES

A. Project documents are not intended or represented to be suitable for re-use by Architect/Owner or others on extensions of this project or on any other project. Any such re-use or modification without written verification or adaptation by Engineer, as appropriate for the specific purpose intended, will be at Architect/Owner's risk and without liability or legal exposure to Engineer or its consultants from all claims, damages, losses and expense, including attorney's fees arising out of or resulting thereof.

B. Because data stored in electric media format can deteriorate or be modified inadvertently, or otherwise without authorization of the data's creator, the party receiving the electronic files agrees that it will perform acceptance tests or procedures within sixty (60) days of receipt, after which time the receiving party shall be deemed to have accepted the data thus transferred to be acceptable. Any errors detected within the sixty (60) day acceptance period will be corrected by the party delivering the electronic files. Engineer is not responsible for maintaining documents stored in electronic media format after acceptance by the Architect/Owner.

C. When transferring documents in electronic media format, Engineer makes no representations as to the long-term compatibility, usability or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by Engineer at the beginning of the Project.

D. Any re-use or modifications will be Contractor's sole risk and without liability or legal exposure to Architect, Engineer or any consultant.

E. The Texas Board of Architectural Examiners (TBAE) has stated that it is in violation of Texas law for persons other than the Architect of record to revise the Architectural drawings without the Architect's written consent.

1. It is agreed that "MEP" hard copy or computer-generated documents will not be issued to any other party except directly to the Architect/Owner. The Contract Documents are contractually copyrighted and cannot be used for any other project or purpose except as specifically indicated in AIA B-141 Standard Form of Agreement Between Architect and Owner.
2. If the client, Architect/Owner, or developer of the project requires electronic media for "record purposes", then an AutoCAD based compact disc ("CD") will be prepared. The "CD" will be submitted with all title block references intact and will be formatted in a "plot" format to permit the end user to only view and plot the drawings. Revisions will not be permitted in this configuration.

E. At the Architect/Owner's request, Engineer will prepare one "CD" of electronic media to assist the Contractor in the preparation of submittals. The Engineer will prepare and submit the "CD" to the Architect/Owner for distribution to the Contractor.

1. The “CD” will be prepared and all title blocks, names and dates will be removed. The “CD” will be prepared in a “.dwg” format to permit the end user to revise the drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials and equipment manufactured by a domestic United States manufacturer and assembled in the United States for all local and Federal Government projects. These materials and equipment shall comply with “Buy American Act.”

B. Access Doors: Provide access doors as required for access to equipment, valves, controls, cleanouts and other apparatus where concealed. Access doors shall have concealed hinges and screw driver cam locks unless indicated otherwise.

C. All access panels located in wet areas such as toilet rooms, locker rooms, shower rooms, natatoriums, kitchens, and any other wet areas shall be constructed of stainless steel.

D. Access doors shall be as follows:

1. Plastic Surfaces: Milcor Style K.
2. Ceramic Tile Surfaces: Milcor Style M.
3. Drywall Surfaces: Milcor Style DW.
4. Install panels only in locations approved by the Architect.

2.2 EQUIPMENT PADS

A. Provide four (4) inch high concrete pads for indoor floor mounted equipment. Pads shall conform to the shape of the equipment with a minimum extension of six (6) inches beyond the equipment. Top and sides of pads shall be troweled to a smooth finish, equivalent to the floor. External corners shall be bull-nosed to a 3/4" radius, unless shown otherwise.

B. Provide six (6) inch high concrete pads for all exterior mounted equipment. Pads shall conform to the shape of the equipment with a minimum extension of six (6) inches beyond the equipment. Provide a four (4) foot monolithic extension to the pad in front of the equipment for service when mounted on a non-finished area (i.e. landscape, gravel, clay, etc.) Top and sides of pads shall be troweled to a smooth finish. External corners shall be bull-nosed to a 3/4" radius, unless shown otherwise.

PART 3 - EXECUTION

3.1 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected via reviewed submittals.

B. Refer to equipment specifications in other Divisions (10, 11, 12, 13, 21, 22, etc.) for additional rough-in requirements as necessary and provide accordingly.

3.2 PLUMBING INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of plumbing and fire systems, materials, and equipment. Comply with the following requirements:

1. Coordinate plumbing and fire protection systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, leave-outs, and other openings in building components during progress of construction to allow for plumbing installations.
4. Coordinate the installation of required supporting devices, sleeves, and pathways to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of plumbing and fire protection systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with architectural action markings on submittal, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, resolve conflicts and submit proposed solution to the Architect for review.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location and label.
11. Install access panels or doors where valves, operable devices, and equipment are concealed behind finished surfaces. Refer to Article 2.1 of this Section and to Architectural documents for specifications and locations.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Provide roof curbs for all roof mounted equipment. Coordinate with roof construction for pitched roof. Provide roof curb to match roof slope. Refer to architectural drawings and details.
14. The equipment to be furnished under this Specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the product of the same manufacturer.
15. The architectural and structural features of the building and the space limitations shall be considered in selection of all equipment. No equipment shall be furnished which will not suit the arrangement and space limitations indicated.
16. Lubrication: Prior to start-up, check and properly lubricate all bearings as recommended by the manufacturer.
17. Where the word "Concealed" is used in these Specifications in connection with insulating, painting, piping, valves, etc., it shall be understood to mean hidden from sight as in chases, furred spaces or suspended ceilings. "Exposed" shall be understood to mean the opposite of concealed.
18. Identification of Plumbing Equipment:
    a. Plumbing equipment shall be identified by means of nameplates permanently attached to the equipment. Nameplates shall be engraved

laminated plastic or etched metal. Shop Drawings shall include dimensions and lettering format for approval. Attachments shall be with escutcheon pins, self-tapping screws, or machine screws.

b. Tags shall be attached to all valves, including control valves, with nonferrous chains. Tags shall be brass and at least 1-1/2 inches in diameter. Nameplate and tag symbols shall correspond to the identification symbols on the Record Drawings.

3.3 CUTTING AND PATCHING

A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of plumbing equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed Work.
2. Remove and replace defective Work.
3. Remove and replace Work not conforming to requirements of the Contract Documents.
4. Remove samples of installed Work as specified for testing.
5. Install equipment and materials in existing structures.
6. Upon written instructions from the Engineer, uncover and restore Work to provide for Engineer/Owner's observation of concealed Work, without additional cost to the Owner.
7. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers; refer to the materials and methods required for the surface and building components being patched; Refer to Article 1.11 DEFINITIONS AND SYMBOLS for definition of "Installer."

C. Cut, remove and legally dispose of selected plumbing equipment, components, and materials as indicated, including but not limited to removal of plumbing piping, equipment, plumbing fixtures and trim, and other plumbing items made obsolete by the new Work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

3.4 WORK SEQUENCE, TIMING, COORDINATION WITH OWNER, ARCHITECT AND ENGINEER

A. The Owner will cooperate with the Contractor, however, the following provisions must be observed:

1. A meeting will be held at the project site, prior to any construction, between the Owner's Representative, the General Contractor, the Subcontractors and the Architect/Engineer to discuss Contractor's employee parking space, access, storage of equipment or materials, and use of the Owner's facilities or utilities. The Owner's decisions regarding such matters shall be final.
2. During the construction of this project, normal facility activities will continue in existing buildings until renovated areas are completed. Plumbing, fire protection, lighting, electrical, communications, heating, air conditioning, and ventilation systems will have to be maintained in service within the occupied spaces of the existing building.

B. Start-up for major plumbing and fire protection equipment shall be performed by a factory authorized technician. Such equipment shall include, but not necessarily be limited to, the following: domestic water boilers and packaged water heating systems, water softeners, ultra-pure water equipment systems, domestic water booster pumps, fire pumps, and break tank level alarm systems. Refer to other Sections of Divisions 21 and 22 for additional requirements.

3.5 DEMOLITION AND WORK WITHIN EXISTING BUILDINGS

A. In the preparation of these documents every effort has been made to show the approximate locations of, and connections to the existing piping, utilities, equipment and other apparatus related to this phase of the work. However, this Contractor shall be responsible for verifying all of the above information. This Contractor shall visit the existing site to inspect the facilities and related areas. This Contractor shall inspect and verify all details and requirements of all the Contract Documents, prior to the submission of a proposal. All discrepancies between the Contract Documents and actual job-site conditions shall be resolved by this Contractor, who shall produce drawings that shall be submitted to the Architect/Engineer for review. All labor and materials required to perform the work described shall be a part of this Contract.

B. All equipment and/or systems noted on the Drawings "To Remain" shall be inspected and tested on site to certify its working condition. A written report on the condition of all equipment to remain, including a copy of the test results and recommended remedial actions and costs shall be made by this Contractor to the Architect/Engineer for review.

C. All equipment and/or systems noted on the Drawings "To Be Removed" shall be removed including, associated pipe, supports, and hangers. Where pipe is to be capped for future or end of line use, it shall be properly tagged with its function or service appropriately identified. Where existing equipment is to be removed or relocated and has an electric motor or connection, the Electrical Contractor shall disconnect motor or connection, remove wiring to a safe point and this Contractor shall remove or relocate motor or connection along with the equipment.

D. Ensure existing piping and equipment to remain that is adjacent to and impacted by the scope of Work is properly supported, fastened, and secure.

E. During the construction and remodeling, portions of the Project shall remain in service. Construction equipment, material tools, extension cords, etc., shall be arranged so as to present minimum hazard or interruption to the occupants of the building. None of the construction work shall interfere with the proper operation of the existing facility or be so conducted as to cause harm or danger to persons on the premises. All fire exits, stairs or corridors required for proper access, circulation or exit shall remain clear of equipment, materials or debris. The General Contractor shall maintain barricades, other separations in corridors and other spaces where work is conducted.

F. Certain work during the demolition phase of construction may require overtime, night time, or weekend shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner at least seventy-two (72) hours in advance in writing.

G. Any salvageable equipment as determined by the Owner, shall be delivered to the Owner, and placed in storage at the location of his choice. All other debris shall be removed from the site immediately and disposed of lawfully.

H. Equipment, piping or other potential hazards to the working occupants of the building or the general public shall not be left overnight outside of the designated working or construction area.

I. Make every effort to minimize damage to the existing building and the Owner's property. Repair, patch or replace as required any damage that occurs as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during construction and to keep construction disrupted areas to a minimum. Coordinate with the Owner and other trades in scheduling and performance of the work.

J. Include in the contract price all rerouting of existing pipe, utilities, etc., and the reconnecting of the existing equipment and plumbing fixtures as necessitated by field conditions to allow the installation of the new systems regardless of whether or not such rerouting, reconnecting or relocating is shown on the Drawings. Provide all temporary pipe, utilities, controls, etc., as required to maintain heating, cooling, ventilation and plumbing services for the existing areas with a minimum of interruption.

K. All existing plumbing fixtures, pipe, utilities, materials, equipment, controls and appurtenances not included in the remodel or alteration areas are to remain in place.

L. Pipe, utilities, equipment and controls serving mechanical, plumbing and owner's equipment, etc., which is to remain but which is served by pipe, utilities, equipment and controls that are disturbed by the remodeling work, shall be reconnected in such a manner as to leave this equipment in proper operating condition.

M. No portion of the **fire protection systems** shall be turned off, modified or changed in any way without the express knowledge and written permission of the Owner’s representative in order to protect systems that shall remain in service.

N. It is the intention of this Section of the Specifications to outline minimum requirements to furnish the Owner with a turn-key and operating system in cooperation with other trades with a minimum of disruption or downtime.

O. Refer to Architectural Demolition and/or Alteration plans for actual locations of walls, ceiling, etc., being removed and/or remodeled.

END OF SECTION

SECTION 22 03 00

PLUMBING DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition of plumbing systems and components.

B. The drawings do not show all demolition work required. The contractor shall make himself familiar with the required scope of work to accomplish the work required by these documents. All demolition work implied or required shall be included in the scope of this contract.

C. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The contractor shall allow the Owner 2 weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

1.2 RELATED SECTIONS

A. Alteration Project Procedures (may be present under Division 01).

B. Selective Demolition (may be present under Division 02).

1.3 WORK SEQUENCE, TIMING, COORDINATION WITH OWNER

A. The Owner will corporate with the Contractor, however, the following provisions must be observed:

1. During the construction of this project, normal facility activities will continue in existing buildings until new buildings or renovated areas are completed. Plumbing, fire protection, lighting, electrical, communications, heating, air conditioning, and ventilation systems will have to be maintained in service within the occupied spaces of the existing building.
2. A meeting will be held at the project site, prior to any construction, between the Owner's Representative, the General Contractor, the Sub-Contractors and the Engineer to discuss Contractor's employee parking space, access, storage of equipment or materials, and use of the Owner's facilities or utilities. The Owner's decisions regarding such matters shall be final.

1.4 DEMOLITION AND WORK WITHIN EXISTING BUILDINGS

A. In the preparation of these documents every effort has been made to show the approximate locations of, and connections to the existing piping, systems, equipment and other apparatus related to this phase of the work. However, this Contractor shall be responsible for verifying all of the above information. This Contractor shall visit the existing site to inspect the facilities and related areas. This Contractor shall inspect and verify all details and requirements of all the Contract Documents, prior to the submission of a proposal. All discrepancies between the Contract Documents and actual job-site conditions shall be resolved by his contractor, who shall produce drawings which shall be submitted to the Architect/Engineer for review. All labor and materials required to perform the work described shall be a part of this Contract.

B. All equipment and/or systems noted on the Drawings "To Remain" shall be inspected and tested on site to certify its working condition. A written report on the condition of all equipment to remain, including a copy of the test results and recommended remedial actions and costs shall be made by this Contractor to the Architect/Engineer for review.

C. All equipment and/or systems noted on the Drawings "To Be Removed" should be removed including, associated pipe, fittings, and hangers and/or line supports. Where pipe is to be capped for future or end of line use, it shall be properly tagged with its function or service appropriately identified. Where existing equipment is to be removed or relocated and has an electric motor or connection, the Electrical Contractor shall disconnect motor or connection, remove wiring to a safe point and this Contractor shall remove or relocate motor or connection along with the equipment.

D. During the construction and remodeling, portions of the Project shall remain in service. Construction equipment, material tools, extension cords, etc., shall be arranged so as to present minimum hazard or interruption to the occupants of the building. None of the construction work shall interfere with the proper operation of the existing facility or be so conducted as to cause harm or danger to persons on the premises. All fire exits, stairs or corridors required for proper access, circulation or exit shall remain clear of equipment, materials or debris. The General Contractor shall maintain barricades, other separations in corridors and other spaces where work is conducted.

E. Certain work during the demolition and construction phases of construction may require overtime or night time shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Project Administrator at least seventy-two (72) hours in advance in writing.

F. Any salvageable equipment as determined by the Owner, shall be delivered to the Owner, and placed in storage at the location of his choice. All other debris shall be removed from the site immediately.

G. Equipment, piping or other potential hazards to the occupants of the building shall not be left overnight outside of the designated working or construction area.

H. Make every effort to minimize damage to the existing building and the owner's property. Repair, patch or replace as required any damage which might occur as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during construction and to keep construction disrupted areas to a minimum. Corporate with the Owner and other trades in scheduling and performance of the work.

I. Include in the contract price all rerouting of existing pipe, etc., and the reconnecting of the existing equipment and plumbing fixtures as necessitated by field conditions to allow the installation of the new systems regardless of whether or not such rerouting, reconnecting or relocating is shown on the drawings. Furnish all temporary pipe, duct, controls, etc., as required to maintain heating, cooling, ventilation and plumbing services for the existing areas with a minimum of interruption.

J. All existing plumbing fixtures, pipe, materials, equipment, and appurtenances not included in the remodel or alteration areas are to remain in place.

K. Pipe, duct, equipment and controls serving mechanical, plumbing and owner's equipment, etc., which is to remain but which is served by pipe, duct, equipment and controls that are disturbed by the remodeling work, shall be reconnected in such a manner as to leave this equipment in proper operating condition.

L. No portion of the **fire protection systems** shall be turned off, modified or changed in any way without the express knowledge and written permission of the Owner's representative in order to protect systems that shall remain in service.

M. It is the intention of this Section of the Specifications to outline minimum requirements to furnish the Owner with a turn-key and operating system in cooperation with other trades with a minimum of disruption or downtime.

N. Refer to Architectural "Demolition and/or Alteration" plans for actual location of walls, ceiling, etc., being removed and/or remodeled.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Field verify measurements and piping arrangements are as shown on Drawings.

B. Verify that abandoned piping and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect plumbing systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on energized equipment, use personnel experienced in such operations.

D. Existing Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING PLUMBING WORK

A. Demolish and extend existing plumbing work under related provisions of Division 1, Division 2, and this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned piping to source of supply.

D. Remove exposed abandoned piping systems, including abandoned systems above accessible ceiling finishes. Cut systems flush with walls and floors, and patch surfaces.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing installations which remain active. Modify installation or provide access panels as appropriate.

G. Extend existing installations using materials and methods compatible with existing installations, or as specified.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

3.5 INSTALLATION

A. Install relocated materials and equipment under the provisions of Alteration Project Procedures Section.

3.6 REMOVAL OF MATERIALS

A. The contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The contractor may, at his discretion and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation are found to be in damaged condition before work has been started on dismantling, the contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the contractor's responsibility and shall be repaired or replaced by the contractor as approved by the Owner, at no additional cost to the Owner.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Owner. All disconnections or

connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

E. Certain work during the demolition phase of construction may require overtime or nighttime shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner's Representative at least 72 hours in advance.

F. Make every effort to minimize damage to the existing building and the Owner's property. Repair, patch, or replace as required any damage which might occur as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during construction. Cooperate with the Owner and other trades in scheduling and performance of the work.

G. Include in the contract price all rerouting of existing conduits, wiring, outlet boxes, fixtures, etc., and the reconnecting of existing fixtures as necessitated by field conditions to allow the installation of the new systems. Furnish all temporary conduit, wiring, boxes, etc., as required to maintain lighting and power service for the existing areas with a minimum of interruption. Remove wire and conduit back to nearest accessible active junction box and extend to existing homeruns as required.

H. The contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing such loss or damage. The contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all electrical services for the new and existing facilities. The contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

I. Where existing construction is removed to provide working and extension access to existing utilities, contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

J. Where partitions, walls, floors, or ceilings of existing construction are being removed, all contractors shall remove and reinstall in locations approved by the Architect all devices required for the operation of the various systems installed in the existing construction.

END OF SECTION

SECTION 22 05 13

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

B. WORK SPECIFIED ELSEWHERE:

1. Painting.
2. Power control wiring to motors and equipment.

1.3 WARRANTY

Warrant the Work specified herein for one year and motors for five years beginning on the date of substantial completion against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

1.4 SUBMITTALS

A. SHOP DRAWINGS: Indicate size material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures variations, and accessories.

C. MOTOR NAMEPLATE INFORMATION: Manufacturer's name, address, utility and operating data.

D. Refer to Division One for additional information.

1.5 DELIVERY AND STORAGE

A. DELIVERY: Deliver clearly labeled, undamaged materials in the manufacturers' unopened containers.

B. TIME AND COORDINATION: Deliver materials to allow for minimum storage time at the project site. Coordinate delivery with the scheduled time of installation.

C. STORAGE: Store materials in a clean, dry location, protected from weather and abuse.

PART 2 - PRODUCTS

2.1 ELECTRIC MOTORS

A. APPROVED MANUFACTURERS: Provide motors by a single manufacturer as much as possible.

1. Baldor
2. Marathon
3. Siemens-Allis
4. General Electric
5. U.S. Motor

B. TEMPERATURE RATING: Provide insulation as follows:

1. CLASS B: 40 degrees C maximum.
2. CLASS F:
   a. Between 40 degrees C and 65 degrees C maximum.
   b. Totally enclosed motors.

C. STARTING CAPABILITY: As required for service indicated five starts minimum per hour.

D. PHASES AND CURRENT: Verify electrical service compatibility with motors to be used.

1. UP TO 1/2 HP: Provide permanent split, capacitor-start single phase with inherent overload protection.
2. 3/4 HP AND LARGER: Provide squirrel-cage induction polyphase motors.
3. Provide two separate windings on 2-speed polyphase motors.
4. Name plate voltage shall be the same as the circuit's normal voltage, serving the motor.

E. SERVICE FACTOR: 1.15 for polyphase; 1.35 for single phase.

F. FRAMES: U-frames 1.5 hp. and larger.

G. BEARINGS: Provide sealed re-greasable ball bearings; with top mounted zerc lubrication fittings and bottom side drains minimum average life 100,000 hours typically, and others as follows:

1. Design for thrust where applicable.
2. PERMANENTLY SEALED: Where not accessible for greasing.
3. SLEEVE-TYPE WITH OIL CUPS: Light duty fractional horsepower motors or polyphase requiring minimum noise level.

H. ENCLOSURE TYPE: Provide enclosures per applications as follows:

1. CONCEALED INDOOR: Open drip-proof (ODP).
2. EXPOSED INDOOR: Splash-proof.
3. OUTDOOR TYPICAL: Type III, totally enclosed fan-cooled (TEFC).
4. OUTDOOR WEATHER PROTECTED: Weather protected II (WPII).
5. HAZARDOUS LOCATIONS: Explosion-proof.

I. OVERLOAD PROTECTION: Built-in sensing device for stopping motor in all phase legs and signaling where indicated for fractional horse power motors.

J. NOISE RATING: "Quiet" except where otherwise indicated.

K. EFFICIENCY: Minimum full load efficiency listed in the following table, when tested in accordance with IEEE Test Procedure 112A, Method B, including stray load loss

measure.

Motor Horsepower	NEMA Efficiency INDEX Letter	Minimum Efficiency %
	1800 RPM Synchronous Speed	
7.5-10	F	89.5
15-20	E	91.0
25-30	E	92.4
40	D	93.0
50	C	93.0
60	C	93.6
75	C	94.1
100-125	B	94.5
150-200	B	95.0
	1200 RPM Synchronous Speed	
3-5	G	87.5
7.5	G	89.5
10	F	89.5
15	F	90.2
20	E	90.2
25-30	E	91.7
40-50	D	93.0
60	D	93.6
75	C	93.6
100-125	C	94.1
150-200	B	95.0

2.2 MOTOR CONTROLLERS (STARTERS)

A. All motor controllers (for equipment furnished under Division 22) shall be furnished under Division 22 and installed under Division 26 unless otherwise noted on the plans.

1. Starters shall be provided for 3 phase motors 3/4 horsepower and greater.

B. Motor starters shall be furnished as follows.

1. GENERAL: Motor starters shall be Square D Company Class 8536 across-the-line magnetic type, full-voltage, non-reversing (FAVOR) starter. All starters shall be constructed and tested in accordance with the latest NEMA standards, sizes and horsepower. ICE sizes are not acceptable. Starters shall be mounted in a general purpose dead front, painted steel enclosure and surface-mounted. Provide size and number of poles as shown and required by equipment served. Provide two speed, two winding or two speed, single winding motor starter as required for two speed motors.
2. CONTACTS: Magnetic starter contacts shall be double break solid silver alloy. All contacts shall be replaceable without removing power wiring or removing starter from panel. The starter shall have straight-through wiring.
3. OPERATING COILS: Operating coils shall be 120 volts and shall be of molded construction. When the coil fails, the starter shall open and shall not lock in the closed position.
4. OVERLOAD RELAYS: Provide manual reset, trip-free Class 20 overload relays in each phase conductor in of all starters. Overload relays shall be melting alloy type with visual trip indication. All 3 phase and single phase starters shall have

one overload relay in each underground conductor. Relay shall not be field adjustable from manual to automatic reset. Provide 6 overload relays for two speed motor starters.

5. PILOT LIGHTS: Provide a red running pilot light for all motor starters. Pilot lights shall be mounted in the starter enclosure cover. Pilot lights shall be operated from an interlock on the motor starter and shall not be wired across the operating coil.
6. CONTROLS: Provide starters with HAND-OFF-AUTOMATIC switches. Coordinate additional motor starter controls with the requirements of Division 22. Motor starter controls shall be mounted in the starter enclosure cover.
7. CONTROL POWER TRANSFORMER: Provide a single-phase 480 volt control power transformer with each starter for 120 volt control power. Connect the primary side to the line side of the motor starter. The primary side shall be protected by a fuse for each conductor. The secondary side shall have one leg fused and one leg grounded. Arrange transformer terminals so that wiring to terminals will not be located above the transformer.
8. AUXILIARY CONTACTS: Each starter shall have one normally open and one normally closed convertible auxiliary contact in addition to the number of contacts required for the "holding interlock", remote monitoring, and control wiring. In addition, it shall be possible to field-install three more additional auxiliary contacts without removing existing wiring or removing the starter from its enclosure.
9. UNIT WIRING: Unit shall be completely pre-wired to terminals to eliminate any interior field wiring except for line and load power wiring and HVAC control wiring.
10. ENCLOSURES: All motor starter enclosures shall be NEMA 1, general purpose enclosures or NEMA-3R if mounted exposed to high moisture conditions. Provide NEMA 4X when located by cooling towers, fountains, or similar locations.
11. POWER MONITOR: Provide a square "D" 8430 MPS phase failure and under-voltage relay, base and wiring required for starters serving all 3 phase motors. Set the under-voltage setting according to minimum voltage required for the motor to operate within its range.

C. APPROVED MANUFACTURERS: Controller numbers are based on first named manufacturer. Provide one of the following manufacturers.

1. Siemens.
2. Square D.
3. General Electric.
4. Eaton.

2.3 COMBINATION MOTOR STARTERS

A. GENERAL: Combination motor starters shall consist of a magnetic starter and a fusible or non-fusible disconnect switch in a dead front, painted steel NEMA 1 enclosure unless otherwise noted and shall be surface-mounted. Size and number of poles shall as shown and required by equipment served. Combination motor starters shall be as specified for motor starters in Paragraph 2.1/B, except as modified herein.

B. DISCONNECT SWITCH: Disconnect switches shall be as specified in Division 26.

C. APPROVED MANUFACTURERS: Controller numbers are based on first named manufacturer. Provide one of the following manufacturers.

1. Siemens.
2. Square D.
3. General Electric.

PART 3 - EXECUTION

3.1 All equipment shall be installed in accordance with the manufacturers' recommendations and printed installation instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Contractors' price shall include all items required as per manufacturers' requirements.

3.3 INSTALLATION

A. GENERAL: Install in a professional manner. Any part or parts not meeting this requirement shall be replaced or rebuilt without extra expense to Owner.

B. Install rotating equipment in static and dynamic balance.

C. Provide foundations, supports, and isolators properly adjusted to allow minimum vibration transmission within the building.

D. Correct objectionable noise or vibration transmission in order to operate equipment satisfactorily as determined by the Engineer.

END OF SECTION

SECTION 22 05 16

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Flexible pipe connections.

B. Expansion joints and compensators

C. Pipe loops, offsets, and swing joints.

1.2 RELATED WORK

A. Section 22 05 29 – Hangers and Support for Plumbing Piping and Equipment.

B. Section 22 10 00 – Plumbing Piping.

1.3 PERFORMANCE REQUIREMENTS

A. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.

B. Expansion Calculations:

1. Installation Temperature: 50 degrees F (10 degrees C).
2. Hot Water Heating: 210 degrees F (99 degrees C).
3. Domestic Hot Water: 140 degrees F (60 degrees C).
4. Safety Factor: 30 percent.

C. Pipe sizes indicated are to establish a minimum quality of compensator. Refer to manufacturers' literature for model series for different pipe sizes.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Division One.

B. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Design Data: Indicate selection calculations.

D. Manufacturer's Installation Instructions: Indicate special procedures, and external controls.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division One.

B. Record actual locations of flexible pipe connectors, expansion joints, anchor, and guides.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division One.

B. Maintenance Data: Include adjustment instructions.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Design expansion compensation system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the state where the project is located.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, project and handle products to site under provisions of Division One.

B. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.

C. Protect equipment from exposure by leaving factory coverings, pipe end protection, and packaging in place until installation.

1.9 WARRANTY

A. Provide five year warranty under provisions of Division One.

B. Warranty: Include coverage for leak free performance of packed expansion joints.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Division One.

PART 2 - PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS

A. Steel Piping (Based on 2" Pipe):

1. Manufacturers:
   a. Amber/Booth Metal-Flex, Model Type SS-PM or FW
   b. Triplex, Model Flexonics Series 400M
   c. Mercer Rubber Company, Model BSS-EM (Mason Industries)
2. Inner Hose: Type 321, stainless steel, corrugated metal.
3. Exterior Sleeve: Type 321, single braided stainless steel.
4. Pressure Rating: 350 psig WOG and 70 degrees F. For 4 inch pipe - 200 psig WOG and 70 degrees F.
5. Joint: Schedule 40 steel, threaded with male nipple and hex boss each end and Union. Flanged joints for pipe sizes 2½ inch and larger.
6. Size: Use pipe sized units.

7. Maximum offset: 1/2 inch on each side of installed center line.
8. Application: Air handling units cooling and heating coils.

B. Copper Piping (Based on 2" Pipe):

1. Manufacturers:
   a. Amber/Booth Metal-Flex, Model Type BR-SM
   b. Triplex, Model Flexonics Series 300
   c. Mercer Rubber Company, Type BFF (Mason Industries)
2. Inner Hose: Corrugated Bronze
3. Exterior Sleeve: Braided bronze.
4. Pressure Rating: 250 psig WOG and 70 degrees F.
5. Joint: Threaded with male nipple and hex boss each end with Union. Flanged joints for pipe sizes 2½ inch and larger.
6. Size: Use pipe sized units.
7. Maximum offset: 1/2 inch on each side of installed center line.
8. Application: Air handling units cooling and heating coils.

2.2 EXPANSION JOINTS

A. Bellows Type (Based on 4" Pipe):

1. Manufacturers:
   a. Amber/Booth, Style EB
   b. Triplex, Model Resistoflex R6905
   c. Mercer Rubber Company, Style 803 or 805 (Mason Industries)
2. Body: Monel wire reinforced molded TFE teflon bellows, multiple arch.
3. Pressure Rating: 70 psig WSP and 250 degrees F (66 degrees C).
4. Maximum Compression: 1 inch.
5. Maximum Extension: 1 inch.
6. Maximum Offset: 1/2 inch.
7. Joint: ASA standard ductile iron flanges, integral molded gasket.
8. Size: Use pipe sized units.
9. Accessories: Control rod limit bolts.
10. Application: Steel piping 8 inch and under.

2.3 ACCESSORIES

A. Pipe Alignment Guides to Direct Axial Movement:

1. Manufacturers:
   a. Triplex, Model Flexonics
   b. Metraflex, Style II
2. Two piece welded steel with shop paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Construct spool pieces to exact size of flexible connection for future insertion.

C. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provided line size flexible connectors.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Provide miscellaneous metals to rigidly anchor pipe to building structure. Provide pipe guides so that movement takes place along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

3.2 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems under provisions of Division One.

B. Provide inspection services by flexible pipe manufacturer's representative for final installing and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORT FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe, and equipment hangers, supports, and associated anchors.

B. Sleeves and seals.

C. Flashing and sealing equipment and pipe stacks.

1.2 RELATED WORK

A. Section 22 02 00 – Basic Materials and Methods

B. Section 22 07 19 – Plumbing Piping Insulation

C. Section 22 10 00 - Plumbing Piping

1.3 REFERENCES

A. ANSI/ASME B31.1 - Power Piping.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division One.

B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches Carbon steel, adjustable, clevis.

C. Hangers for Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and Over: adjustable steel yoke and cast iron roll.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel

screws, and concrete pier or steel support.

J. Roof Pipe Supports and Hangers: Galvanized Steel Channel System as manufactured by Portable Pipe Hangers, Inc. or approved equal.

For pipes 2-1/2" and smaller – Type PP10 with roller
For pipes 3" through 8" – Type PS
For multiple pipes – Type PSE - Custom

K. Copper Pipe Support and Hangers: Electro-galvanized with thermoplastic elastomer cushions; Unistrut "Cush-A-Clamp" or equal. Hangers: Plastic coated; Unistrut or equal.

L. For installation of protective shields also reference Section 22 07 19.

M. Shields for Vertical Copper Pipe Risers: Sheet lead.

N. Pipe Rough-In Supports in Walls/Chases: Provide pre-formed plastic pipe supports, Sioux Chief "Pipe Titan", Hold Rite or equal.

2.2 HANGER RODS

A. Galvanized Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.3 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

A. Metal Flashing: 20 gage galvanized steel.

B. Lead Flashing: 4 lb./sq. ft. sheet lead for waterproofing; 1 lb./sq. ft. sheet lead for soundproofing.

C. Caps: Steel, 20 gauge minimum; 16 gage at fire resistant elements.

D. Coordinate with roofing contractor/architect for type of flashing on metal roofs.

2.5 EQUIPMENT CURBS

A. Fabricate curbs of hot dipped galvanized steel.

2.6 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel, tack welded to form a uniform sleeve.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe, schedule 40.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Pre-fabricated fire rated steel sleeves including seals, UL listed.

D. Fire Stopping Insulation: Glass fiber type, non-combustible, U.L. listed.

E. Caulk: Paintable 25-year acrylic sealant.

F. Pipe Alignment Guides: Factory fabricated, of cast semi-steel or heavy fabricated steel, consisting of bolted, two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

2.7 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Design roof supports without roof penetrations, flashing or damage to the roofing material.

2.8 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Coordinate with structural engineer for placement of inserts.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

D. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. Verify with structural engineer prior to start of work.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
(Steel Pipe)		
1/2 to 1-1/4 inch	7’-0”	3/8"
1-1/2 to 3 inch	10'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(Copper Pipe)		
1/2 to 1-1/4 inch	5'-0"	3/8"
1-1/2 to 2-1/2 inch	8'-0"	3/8"

3 to 4 inch	10'-0"	3/8"
6 to 8 inch	10'-0"	1/2"
(Cast Iron)		
2 to 3 inch	5'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(PVC Pipe)		
1-1/2 to 4 inch	4'-0"	3/8"
6 to 8 inch	4'-0"	1/2"
10 and over	4'-0"	5/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow and at the vertical horizontal transition.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers. Also reference specific requirements for cast iron piping installation in Section 22 10 00, Part 3 Execution.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Install hangers with nut at base and above hanger; tighten upper nut to hanger after final installation adjustments.

J. Portable pipe hanger systems shall be installed per manufacturer's instructions.

3.3 Insulated Piping: Comply with the following installation requirements.

A. Clamps: Attach galvanized clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

B. Saddles: Install galvanized protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation. Secure the full contact area of the saddle to the pipe insulation with 1/8" thick coat of mastic.

C. Shields: Install protective shields MSS Type 40 on insulated piping that has vapor barrier. Secure the full contact area of the shield to the pipe insulation with 1/8" thick coat of mastic.

NPS (INCHES)	LENGTH (INCHES)	GAUGE THICKNESS
1/4 THROUGH 3-1/2	12	18
4	12	16
5 & 6	18	16

8 THROUGH 14	24	14
16 THROUGH 24	24	12

D. Piping 2” and larger provide galvanized sheet metal shields with calcium silicate at hangers/supports.

E. Insert material shall be at least as long as the protective shield.

F. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor shower mop sink and all other drains watertight to adjacent materials.

E. Provide curbs for mechanical roof installations 8 inches minimum high above roofing surface. Contact architect for all flashing details and roof construction. Seal penetrations watertight.

3.6 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Extend sleeves through floors minimum one inch above finished floor level. Caulk sleeves full depth with fire rated thermfiber and 3M caulking and provide floor plate.

C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with U.L. listed fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. The scope of the work shall include the furnishing and complete installation of the items covered by this Section, with all appurtenances, ready for owner's use.

B. Refer to Architectural Sections for any additional requirements.

1.3 RELATED WORK

A. Section 22 10 00 – Plumbing Piping

B. Section 22 07 19 – Plumbing Piping Insulation

1.4 REFERENCES

A. ANSI/ASME A13.1 – 2015 – Scheme for the Identification of Piping Systems

PART 2 - PRODUCTS

2.1 VALVE AND PIPE IDENTIFICATION

A. Valves:

1. All valves shall be identified with a 1-1/2" diameter brass disc wired onto the handle. The disc shall be stamped with 1/2" high depressed black filled identifying numbers. These numbers shall be numerically sequenced for all valves on the job.
2. The number and description indicating make, size, model number and service of each valve shall be listed in proper operational sequence, properly typewritten. Three copies to be turned over to Owner at completion.
3. Tags shall be fastened with approved meter seal and 4 ply 0.018 smooth copper wire. Tags and fastenings shall be manufactured by the Seton Nameplate Corporation or approved equal.
4. All valves shall be numbered serially with all valves of any one system and/or trade grouped together.

B. Pipe Marking:

1. All interior visible piping located in accessible spaces shall be provided with pipe markers. Accessible spaces shall include, but not necessarily be limited to, the

following: above accessible ceilings, inside equipment rooms and utility spaces, in attic spaces, in crawl spaces, and in chase spaces, etc. viewable via access panels.

2. All exterior visible piping shall be provided with pipe markers.
3. Peel-off, self-adhesive, sticker type labels shall not be acceptable.
4. Pipe markers shall be manufactured with rigid vinyl PVC, printed with UV resistant ink, abrasion and chemical resistant, suited for indoor or outdoor use and for a service temperature of -40 degrees F to 160 degrees F.
   a. For pipes up to 6" provide cylindrically pre-coiled markers that snap into place without the need for tape or adhesives.
   b. For pipes 6" and larger provide flat snap-around markers installed using manufacturer's heavy-duty nylon ties or stainless steel strapping.
   c. Markers shall indicate the pipe service, include flow directional arrows, and meet ANSI/ASME A13.1-2015.
5. Acceptable manufacturers:
   a. Seton Setmark Pipe Markers
   b. Brimar Industries Pipemarker System 1 Pipe Markers
   c. Brady Corporation
6. Markers shall be provided after final insulating, painting, jacketing, etc. of piping and per manufacturer's installation instructions. Strapping (applies to large diameter markers only) shall be snug but shall not compromise any insulation. All such strapping shall also be cleanly trimmed of excess material.
7. Markers shall be provided in accordance with ANSI/ASME A13.1-2015 requirements. **Specific items indicated below are not intended as a substitute for this complete standard**. Markers shall be provided:
   a. On both sides of each floor or wall penetration.
   b. On each side of each tee.
   c. On each side of each valve and/or valve group.
   d. On each side of each piece of equipment.
   e. On straight pipe runs at equally spaced intervals not to exceed 50 feet.
   f. In congested areas, on each pipe at the point it enters and exits the area.
   g. At the point of connection to each piece of equipment and automatic control valve.
   h. Where they are readily visible to personnel from the point of normal approach.
   i. With letter height and length of color field according to the size of the pipe served.
   j. For **non-potable water** not less than once per room and at equally spaced intervals not to exceed 20 feet.
8. Color scheme of markers shall be as indicated below and otherwise in accordance with ANSI/ASME color recommendations. Legend color indicates color of legend text and flow directional arrow:

SYSTEM	LABEL COLOR	LEGEND	LEGEND COLOR
Sanitary Sewer	Green	Sanitary Sewer	White
	Green	Plumbing Vent	White
Storm Drain	Green	Storm Drain	White
	Green	Overflow	White
Domestic Water	Green	Domestic Cold Water	White
Domestic Hot Water	Green	Domestic Hot Water	White
Domestic Hot Water Return	Green	Domestic Hot Water Return	White
Fire Protection	Red	Fire Protection	White
	Red	Fire Sprinkler	White
Fuel Gas	Yellow	Natural Gas	Black

	Yellow	Propane Gas	Black
Diesel	Yellow	Diesel Oil	Black
Compressed Air	Blue	Compressed Air	White
Nitrogen	Orange	Nitrogen	Black
Carbon Dioxide	Orange	Carbon Dioxide	Black
Non-Potable Water	Yellow	Caution: Non-Potable Water, Do Not Drink	Black
Deionized Water	Green	Deionized Water	White
Reverse Osmosis Water	Green	R.O. Water	White
Acid Waste	Orange	Acid Waste	Black
		Acid Vent	Black

C. Pipe Painting:

1. All piping exposed to view shall be painted as indicated or as directed by the Architect in the field. Confirm all color selections with Architect prior to installation.
2. The entire fire protection piping system shall be painted red.
3. All piping located in mechanical rooms and exterior piping shall be painted as indicated below:

System	Color
Storm Sewer	White
Sanitary Sewer Waste and Vent	Light Gray
Domestic Cold Water	Dark Blue
Domestic Hot Water Supply and Return	Orange

2.2 EQUIPMENT IDENTIFICATION

A. Plumbing equipment shall be identified by means of nameplates permanently attached to the equipment. Nameplates shall be engraved laminated plastic or etched metal. Submittals shall include dimensions and lettering format for approval. Attachment shall be with escutcheon pins, self-tapping screws, or machine screws.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. All labeling equipment shall be installed per manufacturer’s printed installation instructions.

B. All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Contractor’s price shall include all items as required per manufacturers' requirements.

C. All piping shall be cleaned of rust, dirt, oil and all other contaminants prior to painting. Install primer and a quality latex paint over all surfaces of pipe.

END OF SECTION

SECTION 22 07 16

PLUMBING EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

B. Work specified elsewhere.

1. Basic materials and methods.
2. Piping systems.
3. Air distribution equipment.

1.3 WARRANTY

A. Warrant the Work specified herein for one year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to, the following:

1. Mildewing.
2. Peeling, cracking, and blistering.
3. Condensation on exterior surfaces.

1.4 SUBMITTALS

A. SHOP DRAWINGS: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.

1.5 DELIVERY AND STORAGE

A. DELIVERY: Deliver undamaged materials in the manufacturer's unopened containers clearly labeled with flame and smoke ratings.

PART 2 - PRODUCTS

2.1 It is the intent of these specifications to secure superior quality workmanship resulting in an absolutely satisfactory installation of insulation from the standpoint of both function and appearance. Particular attention shall be given to valves, fittings, pumps, etc., requiring low

temperature insulation to insure full thickness of insulation and proper application of the vapor seal. All flaps of vapor barrier jackets and/or canvas covering must be neatly and securely smoothed and sealed down.

2.2 The type of insulation and its installation shall be in strict accordance with these specifications for each service, and the application technique shall be as recommended by the manufacturer. All insulation types, together with adhesives and finishes shall be submitted and approved before any insulation is installed.

2.3 A sample quantity of each type insulation and each type application shall be installed and approval secured prior to proceeding with the main body of the work. Condensation caused by improper installation of insulation shall be corrected by Installing Contractor. Any damage caused by condensation shall be made good at no cost to the Owner or Architect/Engineer.

2.4 Glass fiber materials as manufactured by Owens/Corning, PPG, CSG, or Johns Manville will be acceptable, if they comply with the specifications.

2.5 All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to insulation) fire and smoke hazard as tested by Procedure ASTM E084, NFPA 255 and UL 723 not exceeding:

Flame Spread 25
Smoke Developed 50

2.6 Accessories, such as adhesives, mastics and cements shall have the same component ratings as listed above.

2.7 All products or their shipping cartons shall have a label affixed, indicating flame and smoke ratings do not exceed the above requirements.

PART 3 - EXECUTION

3.1 All insulation shall be installed in accordance with the manufacturer’s recommendations and printed installation instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturers requirements.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

B. Furnish and install piping insulation to:

1. Interior domestic hot water and hot water return piping.
2. Interior domestic cold water piping located in exterior walls and to a point no less than 8'-0" inside the building.
3. Exterior domestic cold water piping.
4. Drain bodies and associated piping.
5. Condensate drainage piping.
6. All pipes subject to freezing conditions shall be insulated.

C. Work specified elsewhere.

1. Painting.
2. Pipe hangers and supports.

D. For insulation purposes, piping is defined as the complete piping system including supplies and returns, pipes, valves, automatic control valve bodies, fittings, flanges, strainers, thermometer wells, unions, pressure reducing stations, and orifice assemblies.

1.3 WARRANTY

A. Warrant the Work specified herein for one year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.

B. Defects shall include, but not be limited to, the following:

1. Mildewing.
2. Peeling, cracking, and blistering.
3. Condensation on exterior surfaces.

1.4 SUBMITTALS

A. SHOP DRAWINGS: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the

performance, fabrication procedures, project variations, and accessories.

1.5 DELIVERY AND STORAGE

A. DELIVERY: Deliver undamaged materials in the manufacturer's unopened containers. Containers shall be clearly labeled with the insulation's flame and smoke ratings.

PART 2 - PRODUCTS

2.1 It is the intent of these specifications to secure superior quality workmanship resulting in an absolutely satisfactory installation of insulation from the standpoint of both function and appearance. Particular attention shall be given to valves, fittings, pumps, etc., requiring low temperature insulation to insure full thickness of insulation and proper application of the vapor seal. All flaps of vapor barrier jackets and/or canvas covering must be neatly and securely smoothed and sealed down.

2.2 The type of insulation and its installation shall be in strict accordance with these specifications for each service, and the application technique shall be as recommended by the manufacturer. All insulation types, together with adhesives and finishes shall be submitted and approved prior to installation.

2.3 A sample quantity of each type of insulation and each type application shall be installed and approval secured prior to proceeding with the main body of the work. Condensation caused by improper installation of insulation shall be corrected by Installing Contractor. Any damage caused by condensation shall be made good at no cost to the Owner or Architect/Engineer.

2.4 All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to insulation) fire and smoke hazard as tested by Procedure ASTM E084, NFPA 255 and UL 723 not exceeding:

Flame Spread 25
Smoke Developed 50

2.5 Accessories, such as adhesives, mastics and cements shall have the same component ratings as listed above.

2.6 All products or their shipping cartons shall have a label affixed, indicating flame and smoke ratings do not exceed the above requirements.

2.7 APPROVED MANUFACTURERS

A. Calcium silicate materials shall be as manufactured by Johns Manville.

B. Glass fiber materials shall be as manufactured by Johns Manville, Owens-Corning, or Knauf and shall have the same thermal properties, density, fire rating, vapor barrier, etc., as the types specified herein, subject to review by the Engineer.

C. Adhesives shall be as manufactured by Childers, Foster, HB Fuller or Armstrong, and shall have the same adhesive properties, fire rating, vapor seal, etc., as the types specified herein, subject to review by the Engineer.

D. Armaflex elastomeric cellular thermal insulation by Armstrong.

E. Phenolic foam insulation shall be as manufactured by Kooltherm Insulation (Koolphen).

F. Metal jacketing and fitting covers shall be as manufactured by Childers or RPR Products,

Inc.

2.8 MATERIALS

A. INTERIOR DOMESTIC WATER PIPE: provide fiberglass pipe insulation with all service jackets with self sealing lap joint.

B. EXTERIOR DOMESTIC WATER PIPE: Provide elastomeric cellular thermal, or preformed phenolic foam pipe insulation with secured aluminum jacketing.

C. DRAIN BODIES AND DOWNSPOUTS: Insulate underside of roof and overflow drain bodies, associated horizontal piping, including first turn down to vertical conductor. Insulate chilled water waste lines from drinking fountain to junction with main waste stacks. Insulate branch lines including traps and exposed underside of floor drains receiving cooling coil condensate, same as water piping where exposed to building occupant view. When concealed, insulation may be same as specified for external duct wrap.

D. CONDENSATE DRAINAGE PIPING: Fire resistant fiberglass insulation; insulation not required when piping is exposed on roof.

E. ALUMINUM OR STAINLESS STEEL JACKETING: Utilize strap-on type jacketing, banding, and accessories. Provide pre-formed fitting covers for all elbows and tees.

PART 3 - EXECUTION

3.1 All insulation shall be installed in accordance with the manufacturers' recommendations and printed installation instructions, including high density inserts at all hangers and pipe supports to prevent compression of insulation.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturers requirements.

3.3 Pipes located outdoors or in tunnels shall be insulated same as concealed piping; and in addition shall have a jacket of 0.016 inch thick, smooth aluminum with longitudinal modified Pittsburg Z-Lock seam and 2 inch overlap. Jacketing shall be easily removed and replaced without damage. All butt joints shall be sealed with gray silicone. Galvanized banding is not acceptable.

3.4 All insulated piping located over driveways shall have an aluminum shield permanently banded over insulation to protect it from damage from car antennas.

3.5 WATER PIPE INSULATION INSTALLATION

A. The insulation shall be applied to clean, dry pipes with all joints firmly butted together. Where piping is interrupted by fittings, flanges, valves or hangers and at intervals not to exceed 25 feet on straight runs, an isolating seal shall be formed between the vapor barrier jacket and the bare pipe. The seal shall be by the applications of adhesive to the exposed insulation joint faces, carried continuously down to and along 4 inches of pipe and up to and along 2 inches of jacket.

B. Pipe fittings and valves shall be insulated with pre-molded or shop fabricated glass fiber covers finished with two brush coats of vapor barrier mastic reinforced with glass fabric.

C. All under lap surfaces shall be clean and free of dust, etc. before the SSL is sealed. These laps shall be firmly rubbed to insure a positive seal. A brush coat of vapor retarder shall be applied to all edges of the vapor barrier jacket.

D. At hangers and supports, provide a high density foam insulation insert that extends 2" beyond the shield on each side and a protective shield/saddle to prevent compression/damage. Secure shield/saddle to insulation using mastic. Also reference specific requirements in Section 22 05 29, Part 3 Execution.

3.6 FIRE RATED INSULATION

A. All pipe penetrations through walls and concrete floors shall be fire rated by applying USG Thermafiber in the space between the concrete and the pipe.

B. The fire rating shall be additionally sealed by using 3M brand model CP 25 or 303 fire barrier caulk and putty.

C. All fire rating material shall be insulated in accordance with manufacturer's printed instructions.

PART 4 - SCHEDULES

4.1 LOW TEMPERATURE SURFACES		**MINIMUM INSULATION THICKNESS BASED ON FIBERGLASS**
A.	Exposed exterior domestic water pipe:	1½ inch
B.	Interior domestic cold water pipe:	1 inch
C.	Condensate drain lines:	¾ inch
D.	Drains receiving condensate:	1 inch
E.	Concealed piping from roof drains:	1½ inch blanket wrap
F.	Exposed piping from roof drains:	1 inch thick rigid with all service jacket

4.2 HIGH TEMPERATURE SURFACES		**MINIMUM INSULATION THICKNESS**
A.	Domestic Hot Water and Domestic Hot Water Return Piping	
1.	Pipe sizes 1-1/4 inch and smaller with Operating temperatures of 140°F or less	1 inch
2.	Pipe sizes 1-1/2 inch and larger with Operating temperatures of 140°F or less	1-1/2 inch
3.	Pipe sizes 1-1/4 inch and smaller with Operating temperatures greater than 140°F	1-1/2 inch
4.	Pipe sizes 1-1/2 inch and larger with Operating temperatures greater than 140°F	2 inch

END OF SECTION

SECTION 22 10 00

PLUMBING PIPING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. The scope of the work shall include the furnishing and complete installation of the piping covered by this Section, with all appurtenances, ready for the Owner's use.

B. Include the following work in addition to items normally part of this Section:

1. Pipe and pipe fittings:

    a. Sanitary drainage piping system.

    b. Storm drainage piping system.

    c. Sub-surface drainage piping system.

    d. Domestic water piping system.

2. Adapters, Transitions, Unions, Couplings, Flanges, Connectors

3. Valves

4. Excavation, Bedding, and Backfill

1.3 RELATED WORK

A. Section 22 05 29 – Hangers and Support for Plumbing Piping and Equipment.

B. Section 22 05 48 – Vibration and Seismic Controls for Plumbing Piping.

C. Section 22 05 53 – Identification for Plumbing Piping and Equipment.

D. Section 22 07 19 – Plumbing Piping Insulation.

E. Section 22 11 16 – Domestic Water Piping – Cross-Linked Polyethylene (PEX)

F. Section 22 11 19 – Plumbing Specialties.

G. Section 22 30 00 – Plumbing Equipment.

H. Section 22 40 00 – Plumbing Fixtures.

1.4 REFERENCES

A. ASME – Boiler and Pressure Vessel Code.

B. ASME Section IX – Welding and Brazing Qualifications.

C. ASME B1.20.1 – Pipe Threads, General Purpose.

D. ASME B16.1 – Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

E. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

F. ASME B16.4 – Gray Iron Threaded Fittings: Classes 125 and 250.

G. ASME B16.5 – Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

H. ASME B16.9 – Factory-Made Wrought Buttwelding Fittings

I. ASME B16.14 – Ferrous Pipe Plugs, Bushings, and Locknuts with Pipe Threads.

J. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

K. ASME B16.23 – Cast Copper Alloy Solder Joint Drainage Fittings: DWV.

L. ASME B16.51 – Copper and Copper Alloy Press-Connect Pressure Fittings.

M. ASME B31.3 – Process Piping.

N. ASME B31.9 – Building Services Piping.

O. ASTM A47 – Standard Specification for Ferritic Malleable Iron Castings.

P. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

Q. ASTM A74 – Standard Specification for Cast Iron Soil Pipe and Fittings.

R. ASTM A126 – Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

S. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

T. ASTM A197 – Standard Specification for Cupola Malleable Iron.

U. ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

V. ASTM A395 – Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

W. ASTM A403 – Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings

X. ASTM A536 – Standard Specification for Ductile Iron Castings.

Y. ASTM A582 – Standard Specification for Free-Machining Stainless Steel Bars.

Z. ASTM B32 – Standard Specification for Solder Metal.

AA. ASTM B42 – Standard Specification for Seamless Copper Pipe, Standard Sizes.

BB. ASTM B43 – Standard Specification for Seamless Red Brass Pipe, Standard Sizes.

CC. ASTM B62 – Standard Specification for Composition Bronze or Ounce Metal Castings.

DD. ASTM B75 – Standard Specification for Seamless Copper Tube.

EE. ASTM B88 – Standard Specification for Seamless Copper Water Tube.

FF. ASTM B148 – Standard Specification for Aluminum-Bronze Sand Castings.

GG. ASTM B306 – Standard Specification for Copper Drainage Tube (DWV).

HH. ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications.

II. ASTM B828 – Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

JJ. ASTM C33/C33M – Standard Specification for Concrete Aggregates.

KK. ASTM C94 – Standard Specification for Ready-Mix Concrete.

LL. ASTM C150 – Standard Specification for Portland Cement.

MM. ASTM C564 – Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

NN. ASTM C1053 – Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.

OO. ASTM C1173 – Standard Specification for Flexible Transition Couplings for Underground Piping Systems.

PP. ASTM C1277 – Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

QQ. ASTM C1540 – Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

RR. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

SS. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

TT. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

UU. ASTM D2241 – Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

VV. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

WW. ASTM D2464 – Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

XX. ASTM D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

YY. ASTM D2467 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

ZZ. ASTM D2564 – Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

AAA. ASTM D2665 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

BBB. ASTM D2672 – Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.

CCC. ASTM D2729 – Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

DDD. ASTM D2774 – Standard Practice for Underground Installation of Thermoplastic Pressure Piping.

EEE. ASTM D2843 – Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.

FFF. ASTM D2846 – Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold Water Distribution Systems.

GGG. ASTM D2855 – Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.

HHH. ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

III. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

JJJ. ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

KKK. ASTM D3311 – Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns.

LLL. ASTM D4976 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

MMM. ASTM D5926 – Standard Specification for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems.

NNN. ASTM D6707 – Standard Specification for Circular-Knit Geotextile for Use in Subsurface Drainage Applications.

OOO. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

PPP. ASTM F439 – Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

QQQ. ASTM F441 – Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

RRR. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

SSS. ASTM F493 – Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

TTT. ASTM F656 – Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

UUU. ASTM F913 – Standard Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

VVV. ASTM F1336 – Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings.

WWW. ASTM F1476 – Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

XXX. ASTM F1548 – Standard Specification for Performance of Fittings for Use with Gasketed Mechanical Couplings Used in Piping Applications.

YYY. AWS A5.8 – Specification for Filler Metals for Brazing and Braze Welding.

ZZZ. AWS 5.31 – Specification for Fluxes for Brazing and Braze Welding.

AAAA. AWWA C105 – Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

BBBB. AWWA C111 – Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

CCCC. AWWA C209 – Standard for Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.

DDDD. AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe.

EEEE. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.

FFFF. AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Services.

GGGG. AWWA C651 – Disinfecting Water Mains.

HHHH. CISPI 301 – Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

IIII. CISPI 310 – Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

JJJJ. ASSE 1003 Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems.

KKKK. ASSE 1079 – Performance Requirements for Dielectric Pipe Unions.

LLLL. UL 94 Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

MMMM. UL 1285 Standard for Safety Pipe and Couplings, PVC and PVCO for Underground Fire Service.

NNNN. NSF/ANSI 61 – Drinking Water System Components – Health Effects.

OOOO. NSF/ANSI 372 – Drinking Water System Components – Lead Content.

PPPP. Federal Specifications and Standards DD-G-541B – Glass (Laboratory).

1.5 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by the same manufacturer throughout.

B. Valves: Manufacturer's name, size, and pressure rating shall be cast or marked on valve body or handle.

C. Piping shall be labeled along its entire length indicating size, class, material specification, manufacturer’s name and **country of origin**.

D. Foreign pipe, fittings or valves are unacceptable.

E. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and shall be listed by NSF International.

F. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

G. Welders Certification: In accordance with ASME Section IX.

1.6 SUBMITTALS

A. Submit under provisions of Division One.

B. Submit product data and video inspection report under provisions of Division One.

C. Include pipe materials, pipe fittings, valves, and accessories. Provide manufacturer’s catalog information, product certifications, and **country of origin**. Indicate valve data and ratings.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division One.

B. Record actual locations of valves.

C. Include written report and digital video record of waste piping inspection.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division One.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with a minimum of 5 years documented experience and must be a domestic manufacturer.

B. Installer: Company specializing in performing the work of this section with a minimum of 5 years documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. DELIVERY: Deliver clearly labeled piping and valves to; and store, protect and handle products on site in accordance with the provisions of Division One.

B. TIMING AND COORDINATION: Arrange for delivery of materials to allow for minimum storage time at the project site. Coordinate with the scheduled time of installation.

C. ACCEPTANCE: Accept product on site in original factory packaging. Receive valves on site in shipping containers with labeling in place. Inspect for damage. Damaged valves shall not be acceptable.

D. STORAGE: Store materials in a clean, dry location, protected from weather and damage.

E. Provide temporary protective coating on cast iron and steel valves.

F. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

G. Protect installed piping systems from entry of foreign materials by providing temporary covers, as completing sections of the work, and isolating parts of completed systems. Tape will not be allowed as an acceptable end cover.

1.11 EXTRA MATERIALS

A. Furnish under provisions of Division One.

1.12 REGULATORY REQUIREMENTS

A. Perform work in accordance with plumbing and building codes having jurisdiction.

B. No PVC pipe or fittings, or similar un-rated material, will be allowed in any areas where pipe is to penetrate a fire rated assembly or is to be installed in a return air plenum unless the entire length of all such piping is encased within a minimum two (2) hour fire rated enclosure.

C. Provide a water pressure regulating valve assembly at the service entry where incoming water supply pressure is greater than 70 psi.

PART 2 - PRODUCTS

2.1 SANITARY SOIL, WASTE AND VENT PIPING, BURIED BEYOND 5 FEET OUTSIDE OF BUILDING

A. PVC Pipe: ASTM D1785/D2665 schedule 40 solid wall; installed per ASTM D2321.

1. Fittings: PVC, ASTM D3311/D2665 drainage pattern, with bell and spigot ends. Furnished by the same manufacturer as pipe or approved equal.
2. Joints: solvent weld with ASTM D2564 solvent cement, installed per the requirements of ASTM D2855.

2.2 SANITARY SOIL, WASTE AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING, BELOW GRADE

A. PVC Pipe: ASTM D1785/D2665 schedule 40 solid wall; installed per ASTM D2321.

1. Fittings: PVC, ASTM D3311/D2665 drainage pattern, with bell and spigot ends. Furnished by the same manufacturer as pipe or approved equal.
2. Joints: solvent weld with ASTM D2564 solvent cement, clear, medium bodied, for sizes 3" and smaller and gray, heavy bodied, for sizes 4" and larger. Mating surfaces shall be prepared with ASTM F656 purple primer immediately prior to cement application.

2.3 GREASE WASTE AND VENT PIPING, BURIED WITHIN BUILDING AND BELOW GRADE, SERVING KITCHEN AREA AND INTO GREASE TRAP

A. PVC Pipe: ASTM D1785/D2665 schedule 40 solid wall; installed per ASTM D2321.

1. Fittings: PVC, ASTM D3311/D2665 drainage pattern, with bell and spigot ends. Furnished by the same manufacturer as pipe or approved equal.
2. Joints: solvent weld with ASTM D2564 solvent cement, clear, medium bodied, for sizes 3" and smaller and gray, heavy bodied, for sizes 4" and larger. Mating surfaces shall be prepared with ASTM F656 purple primer immediately prior to cement application.

B. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron, ASTM A74 drainage pattern.
2. Joints: Hub and spigot, ASTM C564 neoprene, compression type gaskets or lead and oakum.
3. Acceptable manufacturers (all pipe and fittings shall be from a single manufacturer):
   a. Tyler Pipe
   b. Charlotte Pipe
   c. AB&I Foundry
4. Provide ASTM D4976 polyethylene protective wrap in tubular or sheet form, minimum 8 mil nominal thickness, in accordance with manufacturer’s installation guidelines, for all piping.

2.4 SANITARY SOIL, WASTE AND VENT PIPING, WITHIN BUILDING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301 or ASTM A888, hubless.

1. Fittings: Cast iron, CISPI 301 or ASTM A888 drainage pattern.
2. Acceptable manufacturers (all pipe and fittings shall be from a single manufacturer):

a. Tyler Pipe
b. Charlotte Pipe
c. AB&I Foundry

3. Joints: No hub, ASTM C564 neoprene gaskets with ASTM C1540 heavy duty wide bodied stainless steel clamp and solid shield assembly constructed of type 300 series stainless steel. Couplings shall have four clamps for pipe sizes up to and including 4" and shall have six clamps for pipe sizes larger than 4". Clamp assemblies shall conform to FM 1680 Class 1 where required by the administrative authority. Torque all clamps per manufacturer's recommendations.

B. Copper Tubing: ASTM B306, DWV, for sizes 2" and smaller.

1. Fittings: ASME B16.23 cast copper alloy solder joint drainage fittings (DWV), or ASME B16.29, wrought copper and wrought copper alloy solder joint drainage fittings (DWV).
2. Joints between copper pipe and fittings shall be made in accordance with ASTM B828 using ASTM B32 Alloy Grade Sn 50 solder (50-50 tin-lead).
3. Joints between copper and cast iron pipe shall be made by way of copper soldered to a brass ferrule and the ferrule joined to the cast iron hub by a compression or caulked joint.

OR

UNDER DEDUCT ALTERNATE ONLY – NOT FOR BASE BID

C. PVC Pipe: ASTM D1785/D2665 schedule 40 solid wall.

1. Fittings: PVC, ASTM D3311/D2665 drainage pattern, with bell and spigot ends. Furnished by the same manufacturer as pipe or approved equal.
2. Joints: solvent weld with ASTM D2564 solvent cement, installed per the requirements of ASTM D2855.

D. Brass Pipe: ASTM B43, chrome plated

1. Fittings: ASME B16.23 cast bronze, chrome plated.
2. Joints: In accordance with ASTM B828 using ASTM B32 Alloy Grade Sn 50 solder (50-50 tin-lead) or as recommended by the manufacturer.
3. Applies to exposed piping applications (such as kitchens), wherever required by the prevailing code or by the Authority Having Jurisdiction.

2.5 STORM DRAINAGE PIPING, BURIED BEYOND 5 FEET OUTSIDE OF BUILDING

A. Pipe and fittings shall be same as specified for the sanitary soil, waste and vent piping system.

2.6 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING, BELOW GRADE

A. Pipe and fittings shall be same as specified for sanitary soil, waste and vent piping system.

2.7 STORM DRAINAGE PIPING, WITHIN BUILDING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 310 or ASTM A888, hubless.

1. Fittings: Cast iron, CISPI 310 or ASTM A888 drainage pattern.

2. Acceptable manufacturers (all pipe and fittings shall be from a single manufacturer):
   a. Tyler Pipe
   b. Charlotte Pipe
   c. AB&I Foundry
3. Joints: No hub, ASTM C564 neoprene gaskets with ASTM C1540 wide bodied stainless steel clamp and solid shield assembly constructed of type 300 series stainless steel. Couplings shall have four clamps for pipe sizes up to and including 4" and shall have six clamps for pipe sizes larger than 4". Clamp assemblies shall conform to FM 1680 Class 1 where required by the administrative authority. Torque all clamps per manufacturer's recommendations.

2.8 SUB-SURFACE DRAINAGE PIPING SYSTEM

A. PVC Pipe: ASTM D1785/D2729 schedule 40 solid wall.

1. Fittings: PVC, ASTM D3311/D2665 drainage pattern, with bell and spigot ends. Furnished by the same manufacturer as pipe or approved equal.
2. Joints: solvent weld with ASTM D2564 solvent cement, installed per the requirements of ASTM D2855.

B. Perforations

1. Piping shall be provided with perforations direct from the manufacturer, from a fabrication shop, or on the job site.
2. Piping shall be uniformly perforated, with two rows of 5/8 inch diameter holes. Holes shall be located 120 degrees apart from the center line of the pipe and spaced 5 inches apart along the length of the pipe.

C. Filter Fabric

1. A suitable geotextile filter fabric (Mifafi 140N or equivalent) meeting ASTM D6707 shall be provided in accordance with the manufacturer's requirements and consistent with the recommendations of the project geotechnical report.
2. All perforated pipe and the associated fittings shall be wrapped with filter fabric.

2.9 DOMESTIC WATER PIPE, BURIED WITHIN 5 FEET OF BUILDING EDGE, BELOW GRADE

A. Copper Tubing: ASTM B88, Type K, soft annealed. Provide for pipe sizes up to and including 2-1/2".

1. Fittings: ASTM B16.22 wrought copper pressure fittings.
2. Joints shall be as follows:
   a. No joints shall be permitted for pipe sizes 2" and smaller. All such piping must be run continuous below slab on grade and brought up to no less than 12" above the finished floor before any joint is provided.
   b. For sizes larger than 2", joints between copper pipe and fittings shall be brazed and shall be made in accordance with all the applicable portions of ASTM B828, manufacturer's recommendations, and AWS requirements. Brazing filler metal shall be in accordance with AWS A5.8 and any required flux shall meet AWS A5.31, Type FB3-A or FB3-C.
3. Beginning at no closer than the 5'-0" mark from the building, all piping buried or in contact with concrete shall be provided with one of the following, which shall also extend to a minimum of 6" above the finished floor:
   a. AWWA C209 cold-applied, integrated primer type, elastomeric adhesive, laminate polymeric tape coating, minimum 35 mil nominal thickness, in

accordance with manufacturer's installation guidelines. Chase Construction Products Tapecoat H35 or approved equivalent.

b. Continuous polyethylene lining, minimum 60 mil nominal thickness.

B. Ductile Iron Pipe: Minimum pressure class 150, ANSI/AWWA C151/A21.51. Provide for pipe sizes 3" and larger.

1. Fittings: Standard ductile iron, ANSI/AWWA C110/A21.10.
2. Joints: Rubber-gasketed and bolted mechanical joints, ANSI/AWWA C111/A21.11. Installation shall be in accordance with ANSI/AWWA C600 and approved pipe lubricant shall be used for optimum gasket sealing and long-term performance.
3. Note: A single fitting may be installed below slab on grade to facilitate underground pipe entry up to above floor from an immediately adjacent exterior building wall.
4. Provide continuous polyethylene encasement for all piping buried or in contact with concrete in accordance with ANSI/AWWA C105/A21.5, beginning at no closer than the 5'-0" mark from the building and to a minimum of 6" above the finished floor.

C. Stainless Steel Pre-Fabricated In-Building Riser (acceptable for sizes 2" through 10")

1. Corrosion resistant Type 304 stainless steel construction single, extended 90 degree fitting.
2. UL listed, FM approved and NFPA 24 compliant.
3. Lead free and NSF/ANSI 61 (372) certified.
4. Acceptable manufacturers:
   a. Ames Fire & Waterworks Series IBR (4" through 10") and IBR2 (2", 2-1/2", and 3")
   b. Zurn Wilkins Model WBR (4" through 10")
5. Note: For this application, the inlet joint for larger diameter (4" through 10") piping (which **shall not** be located below a building slab or foundation) can be rubber gasketed push-on type, ANSI/AWWA C111/A21.11. Installation shall be in accordance with ANSI/AWWA C600.
6. Provide continuous polyethylene encasement for all piping buried or in contact with concrete in accordance with ANSI/AWWA C105/A21.5, beginning at no closer than the 5'-0" mark from the building and to a minimum of 6" above the finished floor.

2.10 DOMESTIC WATER PIPING, WITHIN BUILDING, BELOW GRADE

A. Copper Tubing: ASTM B88, Type K, soft annealed.

1. No joints allowed below slab, run tubing continuous.
2. Provide AWWA C209 cold-applied, integrated primer type, elastomeric adhesive, laminate polymeric tape coating, minimum 35 mil nominal thickness, in accordance with manufacturer's installation guidelines, for all piping buried or in contact with concrete, to a minimum of 6" above finished floor. Chase Construction Products Tapecoat H35 or approved equivalent.
3. Applies to installations including services to island sinks and trap primer lines.

2.11 DOMESTIC WATER PIPING, WITHIN BUILDING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper alloy solder joint pressure fittings.
2. Joints between copper pipe and fittings shall be made in accordance with ASTM B828 using ASTM B32 Alloy HB lead-free solder.

3. Fittings and joints for pipe sizes 1/2" through 4” may be mechanical press-connect system joints with ASME B16.51 lead-free copper bodied fittings with integral ethylene-propylene diene monomer rubber (EPDM) sealing gaskets. All fittings, couplings, and adapters shall be the product of a single system manufacturer and only that manufacturer’s approved press tools, kits, and jaws shall be used.
   a. EPDM o-rings shall be pre-installed and lubricated with ANSI/NSF 61 listed lubricant.
   b. All installers of copper press-connect fittings shall be trained by the fitting manufacturer’s appointed representative and carry such credentials for the duration of the project.
   c. The fitting manufacturer’s representative shall conduct periodic inspections of the installation and shall provide written reports of such inspections to the Contractor and Engineer, including any observed deviations from the manufacturer’s recommended installation practices.
   d. Acceptable system manufacturers: Viega only.
4. Fittings and joints for pipe sizes 2-1/2 inch and larger shall be rolled groove type for copper tubing with all tools, couplings, adapters, fittings, gaskets, and **valves** the product of a single system manufacturer.
   d. Fittings shall be cast bronze using lead-free alloys per ASTM B584 or copper wrought copper constructed to ASTM B75, compliant with NSF/ANSI 61 for potable water service applications, and meet ASTM F1548.
   e. Couplings shall be epoxy/enamel (rust-inhibiting) coated ductile iron housings conforming to ASTM A536.
   f. Gaskets shall be EPDM for potable water, meeting ASTM F1476, and NSF 61/NSF 372 certified for potable water service from 30 degrees to 180 degrees F.
   g. Acceptable system manufacturers: Victaulic, Grinnell, Anvil Gruvlok.

2.12 ADAPTERS, TRANSITIONS, UNIONS, COUPLINGS, FLANGES, CONNECTORS

A. (Non-Acid Waste) Drainage Applications:

1. Provide approved listed adapter and transition fittings appropriate to the specific pipe transition and in accordance with code requirements.
2. For dissimilar piping above ground, provide stainless steel shielded, molded elastomeric couplings and adapters meeting ASTM C564 and ASTM C1460. Applies to installations including cast iron to PVC transitions immediately adjacent to building slabs on grade.
3. For dissimilar underground piping <u>not</u> below building slab, provide shear resistant .012” thick 300 series stainless steel shielded, PVC gasketed flexible couplings and adapters meeting ASTM D5926 and ASTM C1173. For direct-bury applications, provide AWWA C209 cold-applied, integrated primer type, elastomeric adhesive, laminate polymeric tape coating, minimum 35 mil nominal thickness, in accordance with manufacturer’s installation guidelines, to completely wrap the shield, banding, and screws. Chase Construction Products Tapecoat H35 or approved equivalent.
4. Acceptable manufacturers:
   a. Anaco-Husky/Cremco
   b. Mission Rubber Company LLC
   a. Fernco, Inc.
   b. Fernco, Inc. Strong Back RC 1000 Series (underground piping, not below building slab; or readily accessible underground piping transitions in backwater valve pits, etc.)
5. Adapters, couplings, bushings for copper DWV pipe shall be cast bronze or wrought copper, ASME B16.23/B16.29.

B. Domestic Water Applications:

1. Provide joints between various materials with approved adapter and transition fittings appropriate to the specific pipe transition and in accordance with code requirements and the manufacturer's instructions.
2. For copper tube and pipe: adapters, bushings, plugs, caps, and couplings shall be wrought copper or cast bronze; flanges (minimum class 150) and unions shall be cast bronze. Provide with solder or threaded connections as necessary and as produced to applicable ASME standards B16.15, B16.18, B16.22, B16.24, B16.50, B1.20.1. All such appurtenances shall be for use in above ground potable water systems.
3. Above slab transitions for water service entries:
   a. 100% fusion bonded epoxy coated ASTM A536 cast ductile iron construction coupling with acrylonitrile butadiene rubber (NBR) gaskets and EPDM insulating boot for water service. 5/8 inch high strength stainless steel bolts and nuts. Coupling shall meet AWWA C219. Romac Industries, Inc. IC501 or pre-approved equivalent.
   b. 100% fusion bonded 14 mil epoxy coated coupling with ASTM A536 cast ductile iron rings. Complete with acrylonitrile butadiene rubber (NBR) gaskets and type 304 stainless steel bridge, spacers, nuts, and bolts. Coupling shall meet AWWA C219, NSF 61, and NSF 372. Krausz USA Hymax Grip Coupling Restraint or pre-approved equivalent.
4. Dielectric connections:
   a. For pipe sizes 2 inch and smaller, provide lead-free dielectric unions, rated to 180 F at 250 psi and compliant to ASSE 1079.
   b. For pipe sizes larger than 2 inches, provide lead-free dielectric flanged pipe fittings, rated to 180 F at 175 psi and meeting ASME B16.1.
   c. For grooved copper joining systems, provide grooved end dielectric transition fitting from system manufacturer, with virgin polypropylene internal lining, meeting NSF 61.

C. General:

1. Unions for ferrous pipe shall be ASTM B16.39 galvanized malleable iron, threaded, minimum pressure class 150.
2. Plugs and bushings for ferrous pipe shall be ASME B16.14 galvanized malleable iron, threaded.
3. Nipples for ferrous pipe shall be schedule 40, galvanized, ASTM A53 welded steel pipe nipples, threaded, meeting ASTM A733.
4. Couplings for ferrous pipe shall be galvanized steel, threaded, manufactured in accordance with ASTM A865.
5. Flanges for ferrous pipe shall be galvanized forged steel construction, either socket weld or slip-on weld type, minimum pressure class 150, manufactured to ASME B16.5.
6. Bolts, nuts, and gaskets for flanged connections shall be appropriate to the pipe material, fluid type, temperature, and pressure. 1/16" thick pre-formed neoprene, typical.
7. Provide flexible stainless steel connectors at pumps and other such equipment, in accordance with manufacturer's recommendations. Connectors shall have corrugated hose and braided 300 series stainless steel jacketing. Carbon steel flanged or grooved ends as appropriate. NSF 372 lead-free for all potable water applications. Metraflex Company or pre-approved equivalent.

2.13 GATE VALVES (IRON)

A. ASTM A126 cast iron bodied, class 125 gate valve with bolted bonnet, non-rising ASTM B16 brass stem and packing gland, solid wedge, cast iron hand-wheel. Bronze wedge for sizes up through 6” and cast iron wedge with bronze bushing and wedge face rings for sizes 8” and larger.

B. Basis of design:

1. NIBCO T-619 (threaded) for sizes 2” through 4”.
2. NIBCO F-619 (flanged) for sizes 6” and larger.

C. Acceptable alternate manufacturers:

1. Apollo
2. Milwaukee

D. Applies to only to limited installations such as services from submersible pumps and ejectors. Not to be used for domestic water systems.

2.14 GATE VALVES (DUCTILE IRON)

A. Fusion bonded epoxy coated ASTM A536 ductile iron bodied, class 125 gate valve with bolted bonnet, non-rising Type 304 stainless steel stem, resilient wedge. End connections as suited for adjacent piping. Provide with square operating nut for extended handle operation or with hand-wheel as appropriate for depth of burial and access. Certified lead-free to NSF 61/NSF 372 and AWWA C509 & C515 compliant (3” and larger).

B. Basis of design:

1. NIBCO 619 series for sizes 2” through 12”.

C. Applies to outdoor, buried below grade domestic water main installations beyond 5 feet from the building edge. Not to be used inside of buildings.

2.15 BALL VALVES

A. All bronze cast construction two-piece 600 psi body, blow-out proof stem, Teflon seated, lead-free, with stainless steel trim (including ball, stem, and valve handle). Threaded connections. Certified lead-free to NSF 61/NSF 372 and suited to 180 degrees F.

B. Basis of design (bronze valves):

1. NIBCO T-585-66-LF (full port) for all sizes up through 2”.
2. NIBCO T-580-66-LF (conventional port) for sizes 2-1/2” and 3”.

C. Valves 4” and larger shall be split body stainless steel construction, 275 psi cold working pressure, blow-out proof stem, PTFE seated, type 316 stainless steel trimmed, class 150, full port design with manual gear operator. NIBCO F-515-S6-F-66-FS.

D. Acceptable alternate manufacturers:

1. Apollo 77 CLF-A series (full port) for all sizes up through 2”.
2. Milwaukee UPBA-400S (full port) for all sizes up through 2”.
3. Apollo 77 CLF-A series (full port) for size 2-1/2” and Apollo 70LF-140 series (standard port) for 3”.
4. Milwaukee UPBA-100S (standard port) for sizes 2-1/2” and 3”.

E. Applies to domestic water system installations.

F. Provide valves complete with extended lever handles as required to accommodate insulation and full valve operation.

G. Provide valves complete with memory stop kit where used for balancing applications.

2.16 CHECK VALVES (BRONZE)

A. ASTM B62/ASTM B584 bronze body and disc, minimum 200 psi (cold working pressure) Y-pattern horizontal swing type check valve with removable bronze bonnet, Type 300 series stainless steel nuts and hinge pin, and PTFE disc seat. Threaded connections. Certified lead-free to NSF 61/NSF 372 and suited to 180 degrees F.

B. ASTM A126 cast iron bodied, (minimum) class 125 globe style spring loaded (silent) check valve with ASTM B584 bronze disc and seat. Flanged connections. Certified lead-free to NSF 61/NSF 372 and suited to 200 degrees F.

C. Basis of design:

1. NIBCO T-413-Y-LF (Y-pattern swing type) for sizes up through 2”.
2. NIBCO F-910-B-LF (globe style spring loaded type) for sizes 2-1/2” and larger.

D. Acceptable alternate manufacturers:

1. Apollo (for sizes up through 2”)

E. Applies to domestic water system installations including associated pump discharge lines. Valves shall be suited for installation in both horizontal lines and vertical lines with upward flow, in accordance with manufacturer’s recommendations.

2.17 CHECK VALVES (IRON)

A. ASTM A126 cast iron bodied, (minimum) class 125 conventional horizontal swing type check valve with bronze, cast or ductile iron disc. 200 psi cold working pressure. Threaded or flanged connections.

B. Basis of design:

a. NIBCO T-918-B (threaded connections) for sizes 2” through 4”.
b. NIBCO F-918-B (flanged connections) for sizes 6” and larger.

C. Acceptable alternate manufacturers:

a. Apollo (flanged in all sizes)
b. Milwaukee F-2974A (flanged in all sizes)

D. Applies only to limited installations such as services from submersible pumps and ejectors. Not to be used for domestic water systems.

2.18 PRESSURE REGULATING VALVES (PRV’s)

A. ASTM B62/ASTM B584 bronze bodied direct acting, ASSE 1003 single diaphragm type pressure regulating valve with removable bronze bonnet, in-line stainless steel strainer and spring, and FDA approved EPDM seat disc and Buna-N diaphragm. Threaded connections. Certified lead-free to NSF 61/NSF 372 and suited to 180 degrees F.

B. NSF 61 epoxy coated ductile iron bodied pilot-operated globe style pressure regulating valve assembly. Complete with low-flow bypass and stainless steel, bronze, and copper trim and fittings. NSF 61 EPDM seat disc and diaphragm. Threaded or flanged connections. Suited to 180 degrees F.

C. Basis of design:

1. Apollo PRH-LF (36HLF series) for direct acting valves, sizes up through 3”. Provide with y-strainer. Provide threaded up through 2” and flanged for larger sizes.
2. Apollo A127-LF series for pilot operated valves, sizes 1-1/4” through 4”.

D. Acceptable alternate manufacturers:

1. Cla-Val
2. Victaulic (pilot-operated valves)

E. PRV’s shall automatically reduce inlet pressure to a steady lower downstream pressure, regardless of changing flow rate. Provide complete with inlet strainer, inlet and outlet pressure gauges, isolation valves, and unions. Provide bypass line around assembly with normally closed valve.

2.19 BALANCING VALVES

A. Self-contained, fully automatic thermally actuated balancing valve shall continuously adjust flow to maintain the desired domestic hot water temperature within the branch line, regardless of system operating pressure. Valve shall modulate between open and closed position within a 10 degrees F range. Valve body and all internal components shall be constructed of stainless steel with major components constructed of Type 303 stainless. Rated for 200 psi maximum working pressure and no less than 250 degrees F maximum working temperature. Lead-free and ANSI/NSF 61 compliant. Threaded connections.

B. Basis of design:

1. ThermOmegaTech Circuit Solver, sizes 1/2" through 2”. Provide a union and ball type shutoff valve on both sides of the balancing valve.
2. ThermOmegaTech Circuit Solver with integrated union (CSU) assembly, sizes 1/2" and 3/4". Balancing valve assembly shall come complete with union body and ball type shutoff valves on both sides.

C. Applies to circulated domestic hot water system installations including multi-branch parallel piping circuits and single-loop piping circuits.

1. Provide balancing valve at end of **each** domestic hot water supply line (after last fixture served) just prior to the hot water return line, as indicated on Drawings and in accordance with manufacturer’s installation recommendations.
2. Provide a pipe tee or elbow with bushing as appropriate, 3/4" threaded thermowell, and bi-metal adjustable angle 3 inch dial thermometer upstream of each balancing valve. Thermowell stem length and thermometer temperature probe length to be suited for pipe size, insulation thickness, and to ensure clearance for maintenance access and easy viewing of thermometer. Trerice bimetal/sensor, threaded-stepped shank thermowell (style 76) of lead-free brass (PBF) material. Trerice Model B836 thermometer with 300 stainless steel case and stem, hermetically sealed, double strength glass windowed, aluminum white-faced dial, complete with external reset and 0 to 200 degrees F range. Thermowell and thermometer face to be oriented upright for readability.

PART 3 - EXECUTION

3.1 EXCAVATION, BEDDING AND BACKFILL

A. This section shall apply for the excavation, bedding, and backfill of all buried piping unless specifically noted otherwise. All work shall be coordinated with any job site subsurface drainage/dewatering and adjusted accordingly.

B. Establish elevations of buried piping outside the building to ensure the following:

1. Not less than 2 feet of cover, or not less than maximum depth of frost penetration, whichever is the greater.
2. For water lines intended for fire protection service, the depth of cover shall be:
   a. Not less than 2'-6" in those locations where frost is not a factor.
   b. Not less than 1'-0" below the frost line for the locality.
   c. Not less than 3'-0" for piping under driveways.
   d. Not less than 1'-0" below the bottom of the building foundation/footers.
   e. In full compliance with the requirements of NFPA 13 and NFPA 24.

C. Excavation:

1. Excavate trenches for underground piping to the required depths.
2. The bottom of the trench or excavation shall be cut to a uniform grade.
3. Should rock be encountered, excavate 6 inches below grade, fill with bedding material and tamp to existing density.
4. Coordinate alignment of pipe trenches to avoid obstructions. Ensure that proposed routing of pipe will not interfere with building foundation before any trenching has begun. Should conflicts occur, contact Architect/Engineer before proceeding.
5. Should any sleeving of the building foundation be required, this shall be provided as directed by the structural engineer of record AND in accordance with the prevailing code, but in no case shall the sleeve be any less than two (2) pipe sizes greater than the pipe it serves.

D. Bedding and Backfill:

1. Backfill shall not be placed until the piping has been inspected, tested and approved. Complete backfill to the surface of natural ground or to the lines and grades indicated on drawings. **Provide 6 inch stabilized sand bed with 4 inch stabilized sand cover around each pipe**. Provide select fill up to finished surface or grade, unless indicated otherwise by project geotechnical report or specified otherwise in Division 02.
2. Compacting Backfill: Place material in uniform layers of 8 inches maximum, loose measure and compact to not less than 95% of maximum soil density as determined by ASTM D-698 Standard Proctor.
3. Restoration: Compact backfill, where trenching or excavation is required in improved areas such as pavements, walks and similar areas, to a condition equal to the adjacent undisturbed earth and restore surface of the area to the condition existing prior to trenching or excavating operation.
4. A clay fill "trench plug" extending 3 feet inside the building line and 5 feet outside the building line shall be placed to completely surround utility lines passing beneath the foundation and grade beam. The materials shall consist of on-site soils with a plasticity index (PI) between 30 and 40 percent compacted to at least 95 percent of the Standard Proctor and maximum dry density as determined by ASTM D-698.

E. Cement Stabilized Sand:

1. Materials:
   a. Cement shall be Type I Portland cement conforming to ASTM C150.
   b. Sand shall be clean, durable sand meeting grading requirements for fine aggregates of ASTM C33 and free of organic matter and deleterious substances.
   c. Water shall be potable and free of oils, acids, alkalis, organic matter, or other deleterious substances, meeting requirements of ASTM C94.
2. Mixture:
   a. Product shall consist of not less than 1.5 sacks of Portland cement per ton of dry sand.
   b. Mixture shall contain sufficient water to hydrate the cement and be thoroughly mixed in a pugmill type mixer.

F. For water lines (including In-Building Risers) intended for fire protection service, provide joint restraints by way of concrete thrust blocks in accordance with the requirements of NFPA 13 and NFPA 24.

G. Aggressive Soil Conditions: Soil shall be considered aggressive and protection of buried metallic piping shall be provided as specified if any of the following situations exist:

1. Conditions are identified as such by the project geotechnical report or project geotechnical engineer.
2. The soil environment is a landfill area, swamp, marsh, polluted river bottom, cinder bed, or has alkaline soils.
3. A score of ten or higher is tallied when applying the soil assessment tool detailed in Appendix A of AWWA C105. An excerpt of this evaluation procedure is provided below for reference but is not intended as a substitute for the complete and latest Standard:

Numerical Corrosivity Scale

Soil Parameter	Assigned Points
Resistivity (ohm-cm)	
<700	10
700 – 1,000	8
1,000 – 1,200	5
1,200 – 1,500	2
1,500 – 2,000	1
>2,000	0
pH	
0 – 2	5
2 – 4	3
4 – 6.5	0
6.5 – 7.5	0
7.5 – 8.5	0
>8.5	3
Redox Potential (mV)	
>100	0
50 – 100	3.5
0 – 50	4

<0	5
Sulfides	
Positive	3.5
Trace	2
Negative	0
Moisture	
Poor drainage continuously wet	2
Fair drainage generally moist	1
Good drainage generally dry	0

H. Building Sub-Surface Drainage System Installation:

1. The following general installation provisions are intended to complement, not conflict with, the recommendations of the project geotechnical report. In the event of a conflict with or more stringent requirements in this report, it shall govern the installation of this system.
2. Such pipe shall be bedded and surrounded by filter material of suitable gradation. Refer to the recommendations of the project geotechnical report.
3. Drainage system shall be provided directly behind and at the bottom of below grade walls, within granular drainage medium as specified and in accordance with the latest project geotechnical report.

3.2 INSTALLATION

A. General requirements for piping:

1. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
2. Remove any scale, oil and dirt, on inside and outside, before assembly.
3. Prepare piping connections to equipment with flanges or unions.
4. Confirm pipe placement, depth/elevation, and flow lines prior to any installation.

B. General requirements for valves:

1. Install valves with stems upright or horizontal, not inverted.
2. Valves shall be line-sized unless specifically noted otherwise.
3. Provide clearance for installation of insulation and access to valves and operable fittings. Valves installed beyond reasonable reach shall be provided with a chain operator.
4. Provide access doors where valves and operable fittings are not otherwise accessible. Access doors shall be of approved types set in locations pre-approved by submittal to the Architect.
5. Gate valves installed below grade shall be covered with an adjustable cast iron roadway box extended to grade. Cover shall be cast iron with 'water' cast on top of cover and shall be set flush to finished paving or 2" above finished earthen grade. Box shall be supported from undisturbed soil or concrete base and shall not introduce any stress to piping under all traffic conditions.

C. Install all materials in accordance with the manufacturer's published instructions.

D. All exposed sewer and water pipe in toilet rooms or other finished areas of the building shall be chrome plated.

E. Provide non-conducting dielectric connections wherever joining dissimilar metals.

F. Route piping in an orderly manner, parallel and perpendicular to building column grid lines, unless indicated otherwise on drawings, and maintain gradients.

G. Install piping to conserve building space and not conflict with other trades or interfere with intended use of space.

H. Group piping whenever practical at common elevations.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Provide encasement for and support for utility meters in accordance with the requirements of utility companies.

L. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.

M. Maintain uniformity in the installation of piping materials and joining methods. Do not mix material types.

N. Where connecting new underground sanitary, storm, or vent piping to existing piping of dissimilar material, provide suitable mechanical transition fittings complete with corrosion protection for metallic elements. Chase Construction Products Tapecoat H35 or approved equivalent and a final coat of coal tar to completely cover the transition.

O. Solder joints shall be wiped clean at each joint, remove excess metal while molten and flux residue when cooled.

P. Waste nipple from wall to tapped tee shall be schedule 40 threaded galvanized steel pipe or brass or copper with threaded adapter.

Q. General requirements for cast iron piping installation:

1. Install all pipe and fittings in accordance with published recommendations from the manufacturer and the Cast Iron Soil Pipe Institute (CISPI). Specific items referenced below are not intended as a substitute for the complete and latest recommendations.
2. Install bell and spigot type pipe with bell end upstream.
3. Above ground horizontal pipe (suspended) shall:
    a. Be supported at no less than at every joint, and within 18” of the hub or coupling.
    b. Be maintained in alignment. Sagging or grade reversal shall be unacceptable.
    c. Be supported at terminal ends of all runs or branches and at each change of direction or alignment.
    d. Have all closet bends, traps, trap arms, and similar branches firmly secured.
    e. Be braced to prevent movement or joint separation.
    f. Be provided with suitable sway bracing (such as clamps, rods, and hardware) where pipe and fittings are suspended in excess of 18” by means of non-rigid hangers.
4. Above ground vertical pipe shall:

a. Be secured at each stack base.
b. Be secured at each floor and riser clamps shall be provided on no greater than 15'-0" intervals.
c. Be adequately supported to keep the system (pipe and contents) in alignment.

5. Provide seismic restraints in seismically active areas, whether specifically required by the prevailing code or not.

R. For all underground non-metallic piping outside the building, provide minimum 14 AWG solid copper tracer wire (ASTM B-1, B-3) with high molecular weight polyethylene insulation (HMWPE) per ASTM D-1248. Wire shall be suited for direct bury applications to facilitate the detection and tracing of underground piping systems. THHN wire and other such nylon jacketing shall not be allowed. Insulation color shall be provided per the particular utility, in accordance with the American Public Works Association (APWA) uniform color code. Provide corrosion proof wire connectors with twist locking design and protective dielectric sealant. Copperhead Industries, LLC Snakebite or pre-approved equivalent. Tracer wire shall be placed in the same orientation as the installed pipe and laid six inches directly above the piping. One end of the tracer wire shall be brought aboveground at a building wall or riser for easy identification.

S. **No PVC pipe or fittings, or similar un-rated material, will be allowed in any areas where pipe is to penetrate a fire rated assembly or is to be installed in a return air plenum unless the entire length of all such piping is encased within a minimum two (2) hour fire rated enclosure**

T. Installations of underground thermoplastic piping systems shall be in strict conformity with the manufacturer's published instructions and the requirements of ASTM D2321 (gravity pipe) and ASTM D2774 (pressure pipe).

U. Installation of above ground thermoplastic piping systems shall be in accordance with the manufacturer's recommendations. The specific items indicated below are not intended as a substitute for the complete and latest manufacturer's recommendations.

1. Hangers and supports shall not compress, distort, cut, or abrade the piping. Nor shall they force the pipe and fittings into position.
2. Piping shall be supported at intervals sufficiently close to maintain pipe alignment and to prevent any sagging or grade reversal. System maximum operating temperature will determine support spacing.
3. Piping shall be supported at all branch ends and at all changes of direction, as close as practical to the fitting to avoid introducing excessive torsional stresses into the system.
4. Directly support (or if need be, immediately adjacent to) concentrated loads in the system, such as valves and other appurtenances.
5. Allowances must be made for thermal expansion and contraction of the piping system where temperature fluctuations can reasonably be expected to produce such movement. Provide and place hangers accordingly so as not to restrict.
6. Plastic piping systems shall not be placed alongside steam or other high temperature pipe lines or other high temperature objects.
7. Drainage piping shall be supported at trap arms as close as possible to the trap and all closet bends shall be supported and braced.

V. Installation of solvent cement joints for PVC and CPVC piping shall be in strict conformity with the requirements of ASTM D2855 and manufacturer's published instructions.

W. Provide approved heavy duty transition coupling at each transition from above ground cast iron pipe to underground PVC pipe as specified elsewhere in this section. Transition shall

be made as close as possible to the floor for sanitary DWV piping systems and at test tee “minimum 12 inches A.F.F.” for storm drainage piping. Support vertical cast iron pipe from floor anchors using riser clamp and galvanized all thread rod as specified in Section 22 05 29.

X. All grooved system tools and components (couplings, adapters, fittings, gaskets, **valves**, and specialties) shall be the product of a single domestic system manufacturer.

Y. Grooved pipe system manufacturer shall provide on-site training for contractor’s field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. Factory trained representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products at no additional cost to the owner.

3.3 APPLICATION

A. Provide union downstream of all valves at equipment or apparatus connections.

B. Provide male adapters each side of threaded valves in copper piped system. Sweat solder adapters to tube prior to make-up of threaded connections.

C. Provide approved isolation valves for shut-off and to isolate all equipment items and distinct parts of systems. Isolation valves shall be provided for both hot and cold water in locations including, but not necessarily limited to, the following:

1. At each floor for each domestic water tap branching off from a vertical riser.
2. At each domestic water branch line capped for future use.
3. At each restroom or restroom group.
4. At each hose bibb, wall hydrant, hose reel, and trap primer device (except for flush valve or tailpiece type trap primer devices).
5. At each domestic water branch line within 24” of the corresponding main.
6. At each plumbing fixture not otherwise served by a localized fixture group isolation valve.

D. Each plumbing water rough-in stub out shall be fitted with a supply stop.

E. Valves installed in insulated piping shall be fitted with extended lever operators of sufficient length to raise handle above the insulation jacket material. Where valve is used for throttling service, the valve handle shall be equipped with adjustable memory stop device.

F. Provide non-slam type check valves on discharge lines from all water pumps. Install at a minimum length of 5 times the pipe diameter from the pump and in accordance with manufacturer’s installation recommendations.

3.4 ERECTION TOLERANCES

A. All gravity drainage lines in the building shall have 1/4 inch per foot fall where possible and not less than 1/8 inch per foot fall toward the main sewer. Pipe must be laid so that the slope will be uniform and continuous. Permission shall be secured from the Architect and Engineer before proceeding with any Work where existing conditions prevent the installation at the minimum grade specified.

B. All vent and branch vent pipes shall be graded and connected as to drip back by gravity to the drainage pipe it serves. A slope of 1 inch per 40 feet will suffice for this requirement, subject to the approval of the local Authority Having Jurisdiction.

C. Slope all horizontal water piping with uniform pitch of 1/8 inch per 10 feet to low points to allow for complete system drainage. For long runs, where constant pitch cannot be maintained, provide intermediate low points and rise up again from such locations. Slope horizontal branches back to mains or risers. Provide clearly identified supplementary drain valves where hose bibbs, hydrants, or sill cocks will not suffice for this requirement.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, all domestic water systems shall be complete, thoroughly flushed clean and free of all foreign matter or erection residue.

B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. On building side of the main shut off valve, provide a 3/4" connection through which chlorine can be introduced into the water piping

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, in sufficient quantity to obtain 50 to 80 mg/L residual free chlorine solution throughout the entire domestic water piping systems.

E. Bleed water from outlets as required to ensure complete distribution and test for disinfectant residual at a minimum 15 percent of total outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.6 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services connecting to existing building services or utility lines as shown on the drawings.

B. Before commencing work, field verify invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover as required.

C. Provide new domestic water service connecting to existing building services or utility lines as shown on plans. Assure connections are in compliance with requirements of the jurisdiction having authority.

D. Extension of services to the building shall be fabricated from the same materials as the utility service lines or those materials specified herein.

E. Should points of connection vary from those indicated on the drawings contractor shall properly allow for this in the actual connections field fabricated.

3.7 RODDING SEWERS

A. All sanitary soil and waste lines, both in the building and out, shall be rodded out after completion of the installation.

B. This Work shall be done, as part of the contract, to make certain that all lines are clear, and any obstruction that may be discovered shall be removed immediately. Rodding shall be accomplished by utilizing a rotary cutter, which shall be full size of pipe being cleaned.

3.8 VIDEO INSPECTION AND DOCUMENTATION

A. It shall be the responsibility of the plumbing contractor to retain the services of a qualified, independent company (**other than the installing plumbing contractor**) with no less than ten (10) years of experience in digital video camera inspection/investigation of plumbing drainage waste and vent lines for commercial/institutional building projects.

B. The independent company shall perform a complete video camera inspection of all waste piping buried below grade inside the building. This shall include sanitary waste and any specialty waste (grease waste, oily waste, etc.) systems and shall extend from the building all the way to any associated outdoor traps/interceptors.

C. The independent company shall create a permanent digital video record of their inspection with accompanying definitive identification (audio or visual) to indicate different systems and different areas of the systems inspected.

D. The independent company shall prepare a comprehensive written report including, but not necessarily limited to, the following:

1. Complete company contact information.
2. Project name and address.
3. Date(s), time(s), and conditions during the inspection(s).
4. Name(s) of the operator(s) performing the inspection(s).
5. A general summary of the inspection results.
6. A written description of any and all material and/or installation deficiencies or irregularities found, with accompanying pictorial documentation. This shall include conditions such as:
    a. Deformed or damaged piping
    b. Full or partial blockage of piping
    c. Deleterious material or debris within the piping
    d. Slope deficiencies (inadequate, inconsistent, or absent slope)
    e. Valleys or “dips” in the piping
    f. Improper fittings in the piping including reductions in pipe size in the direction of flow

E. The written report shall be submitted under this Section but separately from other submittals of this Section. This shall occur immediately prior to substantial completion.

F. The written report and the digital video record (DVD or USB flash drive) shall also be submitted as part of the Project Record Documents.

3.9 TESTING OF PLUMBING PIPING SYSTEMS

A. During the progress of the work and upon completion, tests shall be made as specified herein and as required by Authorities Having Jurisdiction, including Inspectors, Owner or Architect. The Architect or duly authorized Construction Inspector shall be notified in writing at least 2 working days prior to each test or other Specification requirement which requires action on the part of the Construction Inspector.

B. Tests shall be conducted as part of this work and shall include all necessary instruments, equipment, apparatus, and service as required to perform the tests with qualified

personnel. Submit proposed test procedures, recording forms, and test equipment for approval prior to the execution of testing.

C. Tests shall be performed before piping of various systems have been covered or furred-in. For insulated piping systems testing shall be accomplished prior to the application of insulation.

D. All piping systems shall be tested and proved absolutely tight for a period of not less than 24 hours. Tests shall be witnessed by the Architect or an authorized representative and pronounced satisfactory before pressure is removed or any water drawn off.

E. Leaks, damage or defects discovered or resulting from test shall be repaired or replaced to a like new condition. Leaking pipe joints, or defective pipe, shall be removed and replaced with acceptable materials. Test shall be repeated after repairs are completed and shall continue until such time as the entire test period expires without the discovery of any leaks.

F. Wherever conditions permit, each piping system shall thereafter be subjected to its normal operating pressure and temperature for a period of no less than five 5 days. During that period, it shall be kept under the most careful observation. The piping systems must demonstrate the propriety of their installation by remaining absolutely tight during this period.

G. Domestic Water: Pressure test at one and one half times the normal working pressure or 125 psig, whichever is the greater, for 24 hours.

H. Sanitary Soil, Waste and Vents and Storm Sewer:

1. After the rough-in soil, waste and vent and other parts of the sanitary sewer including branch laterals have been set from the lowest level, at point of connection to existing utility lines, to above the floor line, all outlets shall be temporarily plugged or capped, except as are required for testing as described herein. Ground work shall not permit the backfill of trenches to cover any joints until the completion of testing. Back fill shall be limited to mid sections of full joints of piping only. For pipe in ground the piping shall be readied as described herein and filled with water to a verifiable and visible level to 10' above the lowest portions of the system being tested.
2. On multi-level buildings only one floor level shall be tested at a time. Each floor shall be tested from a level below the structure of the floor, or the outlet of the building in the case of the lowest level, to a level of 12 inches above the floor immediately above the floor being tested, or the top of the highest vent in the case of the highest building level. The pipes for the level being tested shall be filled with water to a verifiable and visible level as described above and be allowed to remain so for 24 hours. If after 24 hours the level of the water has been lowered by leakage, the leaks must be found and stopped, and the water level shall again be raised to the level described, and the test repeated until, after a 24 hour retention period, there shall be no perceptible lowering of the water level in the system being tested.
3. Should the completion of these tests leave any reasonable question or doubt of the integrity of the installation, additional tests including peppermint smoke, or other measures shall be performed to demonstrate the reliability of these systems to the complete satisfaction of the Owner's duly authorized representative. Such tests shall be conducted and completed before any joints in plumbing are concealed or made inaccessible.

3.10 COMPLETE FUNCTIONING OF WORK

A. All work reasonably implied as essential to the complete functioning of the systems shown on the Drawings and Specification shall be completed as part of the work of this Division, unless specifically stated otherwise. It is the intention of the Drawings and Specification to establish the type and function of systems but not to set forth each item essential to the functioning of any system. In case of doubt as to the work intended or in the event of amplification or clarification thereof, the Contractor shall call upon the Architect for Supplementary Instructions and Drawings, etc.

END OF SECTION

SECTION 22 11 19

PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. The scope of the work shall include the furnishing and complete installation of the specialties covered by this Section, with all appurtenances, ready for the Owner's use.

B. Include the following work in addition to items normally part of this Section:

1. Hose Bibbs and Hydrants
2. Backflow Preventers
3. Water Hammer Arresters
4. Strainers and Filters
5. Thermostatic Mixing Valves
6. Floor Drains and Floor Sinks
7. Cleanouts
8. Trap Primers
9. Interceptors and Separators
10. Roof Drains and Overflow Nozzles

1.3 RELATED WORK

A. Section 22 05 29 – Hangers and Support for Plumbing Piping and Equipment

B. Section 22 10 00 – Plumbing Piping

C. Section 22 30 00 – Plumbing Equipment

D. Section 22 40 00 – Plumbing Fixtures

1.4 REFERENCES

A. ANSI/ASSE 1010 – Performance Requirements for Water Hammer Arresters

B. ANSI/ASSE 1011 – Performance Requirements for Hose Connection Vacuum Breakers

C. ANSI/ASSE 1012 – Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent

D. ANSI/ASSE 1013 –- Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers

E. ANSI/ASSE 1015 – Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies

F. ANSI/ASSE 1019 – Performance Requirements for Wall Hydrants with Backflow Protection and Freeze Resistance

G. ANSI/ASSE 1057 – Performance Requirements for Freeze Resistant Sanitary Yard Hydrants with Backflow Protection

H. ASME A112.6.3 – Floor Drains and Trench Drains

I. ASME A112.6.7 – Sanitary Floor Sinks

J. ASME A112.6.4 – Roof, Deck, and Balcony Drains

K. ASME A112.14.1 – Backwater Valves

L. ASME A112.14.3 – Grease Interceptors

M. ASME/ANSI A112.26.1 – Water Hammer Arresters

N. PDI WH-201 Water Hammer Arresters

O. AWWA C506 – Standard for Backflow Prevention Devices – Reduced Pressure Principle and Double Check Valve Types

P. AWWA C510 – Standard for Double Check Valve Backflow Prevention Assembly

Q. ASSE 1069 – Performance Requirements for Automatic Temperature Control Mixing Valves

R. ASSE 1070 – Performance Requirements for Water Temperature Limiting Devices

S. PDI G-101 – Testing and Rating Procedure for Hydro Mechanical Grease Interceptors

T. NSF/ANSI Standard 61: Drinking Water System Components – Health Effects

U. NSF/ANSI 372: Drinking Water System Components – Lead Content

1.5 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by the same manufacturer throughout.

1.6 SUBMITTALS

A. Submit under provisions of Division One.

B. Submit shop drawings and product data under provisions of Division One.

C. Include component sizes, rough-in requirements, service sizes, and finishes.

D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division One.

B. Record actual locations of equipment and backflow preventers.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division One.

B. Operation Data: Indicate frequency of treatment required for interceptors and separators.

C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.9 DELIVERY, STORAGE, AND HANDLING

A. DELIVERY: Deliver clearly labeled specialties to; and store, protect and handle products on site in accordance with the provisions of Division One.

B. TIMING AND COORDINATION: Arrange for delivery of materials to allow for minimum storage time at the project site. Coordinate with the scheduled time of installation.

C. ACCEPTANCE: Accept specialties on site in original factory packaging. Inspect for damage. Damaged specialties shall not be acceptable.

D. STORAGE: Store materials in a clean, dry location, protected from weather and damage.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Division One.

B. Provide two loose keys for hose bibbs and hydrants and spare hose end vacuum breakers.

1.11 REGULATORY REQUIREMENTS

A. Conform to applicable codes for the provision and installation of all required backflow prevention devices.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

C. Provide backflow prevention assembly test and maintenance report for all devices. A printed and signed form by the licensed tester that performed the work shall be provided both to the Owner and to the Public Water System in accordance with TCEQ (Texas Commission on Environmental Quality) requirements.

PART 2 - PRODUCTS

2.1 HOSE BIBBS/HYDRANTS

A. Hose Bibb: Bronze or brass construction, replaceable stem assembly, hose thread spout, complete with vandal resistant lockshield and ASSE 1011 integral vacuum breaker. Provide chrome plated and with removable key where exposed in public areas.

B. Wall Hydrant: Bronze or brass construction, replaceable stem assembly, hose thread spout, non-freeze, self-draining type with integral vacuum breaker. ASSE 1019. Unless specifically noted otherwise, provide recessed complete with heavy cast aluminum or nickel plated brass lockable box and loose key operator.

C. Floor Hydrant: Bronze or brass construction, replaceable stem assembly, hose thread spout, non-freeze, self-draining type with ASSE 1052 approved backflow preventer and vacuum breaker. All brass pipe and stem of suitable bury depth. Provide recessed in flush-mounted nickel plated brass lockable box with loose key operator. Ensure to located out of heavy traffic area unless box is appropriately rated.

D. Roof/Post Hydrant: Free-standing, low-lead, self-draining, non-freeze hydrant with cast iron handle and hose thread brass spout atop galvanized pipe riser. Complete with ASSE 1052 anti-siphon vacuum breaker. For rooftop applications provide complete with manufacturer's recommended mounting hardware for a secure installation and coordinate with roofing contractor to ensure a watertight seal is provided per the roofing system and any local code requirements.

E. ACCEPTABLE MANUFACTURERS:

1. J.R. Smith
2. Zurn
3. Mifab
4. Watts
5. Wade
6. Josam
7. Chicago (interior use hose bibbs only)
8. Woodford
9. Prier

2.2 RECESSED VALVE BOX

A. Washing Machine: Pre-formed plastic rough-in box with brass long shank valves with wheel handles, threaded drain fitting for waste, and matching secured faceplate.

B. Refrigerator: Pre-formed plastic rough-in box with brass long shank valve with wheel or quarter-turn handle and matching secured faceplate.

C. ACCEPTABLE MANUFACTURERS:

1. Guy Gray
2. Mifab
3. Sioux Chief
4. Oatey

2.3 BACKFLOW PREVENTERS

A. General Requirements: All assemblies shall be suited for the system anticipated working pressure and temperature as well as the intended orientation (vertical or horizontal) of the installation. All assemblies shall be lead-free per NSF/ANSI 372, unless specifically noted otherwise on the Drawings.

B. Strainer Requirements: Lead-free compliant strainers shall be provided at all backflow preventers on the upstream side of each assembly. Strainer bodies shall be either bronze/cast copper alloy or of cast iron/ductile iron construction with an FDA approved epoxy coating. Screens and internal components shall be stainless steel.

C. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013; Bronze or FDA approved epoxy coated cast iron body with corrosion resistant internal parts and stainless steel springs; two independently operating, spring loaded check valves; intermediate internal pressure intermediate relief valve with water outlet; test cocks and isolation valves.

D. Double Check Valve Assemblies: ANSI/ASSE 1015; Cast copper alloy or FDA approved epoxy coated cast iron body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves, test cocks and isolation valves.

E. Dual Check Valve with Intermediate Atmospheric Vent: ANSI/ASSE 1012; Brass body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

F. ACCEPTABLE MANUFACTURERS:

1. Watts
2. Wilkins
3. Ames
4. Febco
5. Conbraco

2.4 WATER HAMMER ARRESTERS

A. Engineered water hammer arresters: ASSE 1010 listed, lead-free, pre-charged, permanently sealed, maintenance- free, suited for concealed installation, with a working temperature range of 33 to no less than 212 degrees F and a maximum working pressure of no less than 250 psi during pressure surges. Stainless steel or copper body construction. Shall be sized and located in accordance with Plumbing Drainage Institute standard PDI-WH 201.

B. ACCEPTABLE MANUFACTURERS:

1. J.R. Smith
2. Zurn
3. Mifab
4. Wade
5. Josam
6. P.P.P.
7. Sioux Chief

2.5 THERMOSTATIC MIXING VALVES

A. Provide thermostatic mixing valves in accordance with manufacturer’s recommendations and as indicated and scheduled on Drawings.

1. Unless scheduled otherwise, all units other than under-counter point of use units shall be provided complete in lockable cabinet of 16 gage (1.5 mm) prime coated steel when located in finished areas.
2. All under-counter point of use units shall be provided complete with integral checks and dual stainless steel strainers on inlets for protection against fouling.

B. ACCEPTABLE MANUFACTURERS:

1. Bradley
2. Powers
3. Symmons
4. Acorn

2.6 FLOOR DRAINS AND FLOOR SINKS

A. Provide floor drains and floor sinks in accordance with manufacturer's recommendations, as appropriate for floor construction, and as indicated and scheduled on Drawings.

B. Provide clamping devices for all drains in membrane floor areas.

C. ACCEPTABLE MANUFACTURERS:

1. J.R. Smith
2. Zurn
3. Mifab
4. Watts
5. Wade
6. Josam

D. Provide drains of suitable and compatible material for specialized piping systems conveying acid waste.

2.7 CLEANOUTS

A. General: Provide cleanouts as indicated and scheduled on Drawings and also as required by the prevailing code, whether shown on the Drawings or not.

B. Construction: All cleanouts shall have tapered bronze plugs.

C. Provide clamping devices for all cleanouts in membrane floor areas.

D. Provide cleanouts of suitable and compatible material for specialized piping systems conveying acid waste.

E. Types:

1. Finished floor cleanouts: Provide cast iron body, with adjustable floor level assembly, and round nickel bronze scoriated top.
2. Resilient or tile finished floor cleanouts: Provide cast iron body, with adjustable floor level assembly, and round nickel-bronze top with gasketed water tight cover and depressed top to receive flooring finish material.
3. Interior finished wall cleanouts: Provide cast iron tee body or cleanout ferrule as required for wall construction and provide counter-sunk bronze plug with stainless steel access cover and securing screw(s).
4. Interior unfinished accessible cleanouts: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

F. ACCEPTABLE MANUFACTURERS:

1. J.R. Smith
2. Zurn
3. Mifab
4. Watts
5. Wade
6. Josam

2.8 TRAP PRIMERS

A. General: Provide trap primers as indicated and scheduled on Drawings and in accordance with manufacturer's recommendations.

B. ACCEPTABLE MANUFACTURERS:

1. J.R. Smith
2. Zurn
3. Mifab
4. Watts
5. Wade
6. Josam
7. P.P.P.
8. Sioux Chief

2.9 INTERCEPTORS

A. Grease Interceptor – Precast Concrete

1. Construction: Refer to detail(s) on Drawings.
2. Liner: Provide complete with interior PVC liner from manufacturer.
3. Provide buried installation in accordance with manufacturer's requirements. Provide complete with traffic rated access covers at finished elevation, complete with lid liners for odor control.
4. Unit Rating: Refer to Drawings for connection sizes and grease capacity.
5. ACCEPTABLE MANUFACTURERS:
   a. Park-USA
   b. Old Castle Precast

2.10 BACKWATER VALVES

A. ASME A112.14.1; Lacquered cast iron body and cover, brass valve, access cover, extension sleeve as required and cover at finished elevation.

B. ACCEPTABLE MANUFACTURERS:

1. J.R. Smith
2. Zurn
3. Mifab
4. Watts
5. Wade
6. Josam

2.11 ROOF DRAINS, PLANTER DRAINS, AND OVERFLOW NOZZLES

A. Roof drains (RD): ASME A112.6.4; Lacquered cast iron body with sump, removable aluminum dome strainer, membrane flange and clamp with integral gravel stop, adjustable underdeck clamp, roof sump receiver, waterproofing anchor flange, adjustable extension as required for insulation, perforated or slotted ballast guard extension for inverted roof.

B. Roof overflow drains (OD): Lacquered cast iron body and features similar to roof drain, with 2 inch external water dam or pipe extended to 2 inches above flood elevation.

C. Planter drains: Lacquered cast iron body with flange, integral clamping collar, seepage openings and either adjustable perforated standpipe (length as necessary) with secured dome or dome with secured stainless steel screen.

D. ACCEPTABLE MANUFACTURERS:
1. J.R. Smith
2. Zurn
3. Mifab
4. Watts
5. Wade
6. Josam

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to provide intended performance.

B. The contractor shall provide water hammer arresters as shown on Drawings and also in accordance with PDI Standard WH-201, whether shown on Drawings or not. Water hammer arresters shall be PDI certified and sized and placed as recommended by manufacturer. Provide above lay-in ceiling, within chase or wall or above solid ceiling complete with access panel, or otherwise accessible location complete with isolation valve to facilitate replacement.

C. The use of air chambers for the control of water hammer shock shall not be acceptable.

D. Provide strainers at all backflow preventers.

E. Contractor shall certify all newly installed backflow preventers and provide proof of certification to the Owner.

F. Pipe relief line from backflow preventer via manufacturer’s air gap assembly, full size to nearest drain. Such routing shall not pose a trip hazard.

G. All backflow preventers shall be securely supported with wall supports and/or pipe stands as appropriate for the size and weight of the unit and shall be installed with sufficient access and clearance for testing and maintenance. Unless specifically noted otherwise on Drawings, all backflow preventers shall be installed at 48”-60” above finished floor.

H. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanouts for rodding of drainage system.

I. All cleanouts outside of building on grade shall be set in an 18" x 18" x 4" thick concrete pad, flush with final grade/paving.

J. All cleanouts shall be the same nominal size as the pipe they serve, up to 4 inches. For pipes larger than 4 inches, provide a 4 inch cleanout.

K. Coordinate with casework to ensure that all interceptors are readily accessible and removable for servicing and cleaning.

L. Coordinate with casework to ensure that all point of use interceptors do not interfere with required accessibility requirements. Provide offset(s) as required and in accordance with code.

M. Provide approved sampling well downstream of centralized interceptors and separators.

END OF SECTION

SECTION 22 11 21

NATURAL GAS PIPING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. Scope of the Work shall include the furnishing, complete installation and testing of the gas piping system, with all metering, valves, piping and auxiliaries, ready for owner's use.

B. Coordinate with the gas company and pay all fees and permits required for a complete and operating gas service to the project.

PART 2 - PRODUCTS

2.1 All gas piping above ground shall be Schedule 40 black steel as manufactured by National Tube, Republic, Youngstown, or approved equal domestic manufacturer.

2.2 All gas piping larger than 2” shall be of welded construction. Screwed fittings will only be permitted for size 2" and smaller. Unions and valves will not be permitted above furred ceiling areas or in walls or chases.

2.3 All pipe fittings shall be of materials as follows:

A. All welding fittings shall be factory-made and shall be full line size, for each tee, branch, elbow, etc., with reducers after fittings, if required.

B. All screwed fittings shall be Crane, or approved equal, Class 150 malleable iron. Screw joints shall be made up with graphite and oil or Teflon tape. Screwed threads shall be in accordance with American Pipe Thread Standards.

C. All piping and fittings shall be from a domestic manufacturer.

2.4 All underground gas piping with 5 pound working pressure or less shall be as follows:

A. The pipe shall be yellow polyethylene with socket heat fusion joints and fittings. Pipe sizes 1-1/2" and 2" shall be SDR 11, (PE 2406) and pipe sizes 3" and 4" shall be SDR 11.5 (PE 2406).

B. All socket heat fusion fittings shall be D.O.T. approved and meet ASTM D-2513 and ANSI B31.8 codes.

C. All gas valves shall be polyethylene ball type, doubled union, rated for natural gas use. All valves shall be placed in a cast-iron valve box of an adequate size for accessibility and maintenance.

D. All transition meter risers shall be D.O.T. approved anode-less service type, fusion coupled and PE 2406 rated.

E. The contractor shall take thermal expansion under consideration during installation. The contractor shall follow all requirements set by the manufacturer to protect the system from damage due to thermal expansion.

F. The contractor shall provide detector tape approximately 12" above all gas piping.

G. Wrap pipe with 18 gauge minimum copper tracer wire.

2.5 Gas piping installed in unventilated spaces shall be routed in properly vented continuous sleeve where required by the building code.

2.6 Gas valves shall be U.L. listed as follows:

A. Ball Valves: Nibco T585-70-UL for ¼" to 1" and T580-70-UL for 1-¼" to 3".

B. Plug Valves: DeZurick Series 425 or 435 Eccentric valves with RS 49 plug seals.

2.7 Gas pressure regulators shall be capable of reducing 75 psi pressure gas to 0.5 psi gas at capacities required by Gas Demand. Install per A.G.A. Bulletin 90. Regulators shall be as manufactured by Rockwell, Fisher-Governor or approved equal.

2.8 All gas regulators located inside the building shall be vented to atmosphere with schedule 40 black steel pipe. This includes all regulators provided with mechanical and plumbing equipment and all other regulators provided under this contract. Vent piping shall be the full size of regulatory port opening, or as recommended by regulator manufacturer, and shall run independent of any other regulator vent through to point of termination.

PART 3 - EXECUTION

3.1 All piping shall be installed in accordance with the manufacturer's recommendations and printed installation instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturer's requirements.

3.3 All underground gas piping shall be laid on 6" of wet compact banksand approximately 24" below grade. Backfill trench with wet compacted banksand to 6" above pipe. The remainder of backfill shall be selected backfill and shall meet all compaction requirements set forth by the general trenching and backfill requirements.

3.4 Provide lever handle gas valve, drip leg and union to each piece of equipment and where indicated.

3.5 All gas lines entering building shall be valved on the exterior of the building above grade.

PART 4 - TESTING

4.1 TESTING OF GAS PIPING SYSTEMS

A. All gas system testing shall be in compliance with local codes or as required in NFPA 54 National Fuel Gas Code whichever is the more stringent requirement.

B. All work shall be performed by a Journeyman Plumber holding current State and local licenses.

C. All tests shall be accomplished during normal working hours and after having given due notification to building owner, construction manager or designee, of tests to be performed. All tests shall be performed in the presence of and witnessed by the building owners representative or designee

D. All gas system piping shall be subjected to a pneumatic test pressure of 60 psig for not less than 2 hours upon completion of all rough-in work and prior to covering. While the systems are subjected to this air pressure test, all joints shall have a soapy water solution applied and shall be observed for leaks. During test period there shall be no perceptible drop in test gage pressure

E. A final test shall be performed after all portions of the piping system are completely installed and covered. The entire system shall be tested, with all system outlets plugged or capped, before any equipment or appliances are connected to the piping.

1. Final test shall be with mercury, measured with a manometer or slope gage. Test pressures shall in no case be less than one and one half times the normal operating pressure or as listed below; whichever is the greater:
   a. 10.5 inches mercury (5 psig) for 4 ounce system.
   b. 21.0 inches mercury (10 psig) for 8 ounce system.
2. Tests shall be for a period of not less than 30 minutes and shall prove absolutely tight, showing no perceptible drop, for the entire test period.

F. Purge air from test piping before connecting equipment or appliances. Purge air to outdoors or to ventilated space of sufficient volume to prevent accumulation of flammable mixtures.

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water Heaters.

B. Water softeners.

C. In-line circulator pumps.

1.2 RELATED SECTIONS

A. Section 11400 - Food Services Equipment.

B. Section 22 05 29 – Hangers and Support for Plumbing Piping and Equipment.

C. Section 22 05 48 – Vibration and Seismic Controls for Plumbing Equipment.

D. Section 22 10 00 - Plumbing Piping.

E. Section 22 11 19 - Plumbing Specialties.

F. Section 26 05 19 - Wire, Cable, and Related Materials.

1.3 REFERENCES

A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.

B. ASME Section VIIID - Pressure Vessels; Boiler and Pressure Vessel Codes.

C. ANSI/NFPA 54 - National Fuel Gas Code.

D. ANSI/NFPA 70 - National Electrical Code.

E. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings:

1. Include water heater dimensions. size of tappings, and performance data.
2. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

C. Product Data:

1. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.
2. Indicate pump type, capacity, power requirements, and affected adjacent construction.

3. Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
4. Provide electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 22.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with authorities having jurisdiction.

B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:

1. American Gas Association (AGA).
2. National Sanitation Foundation (NSF).
3. American Society of Mechanical Engineers (ASME).
4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
5. National Electrical Manufacturers' Association (NEMA).
6. Underwriters Laboratories (UL).
7. American Society of Plumbing Engineers (ASPE)

D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.7 REGULATORY REQUIREMENTS

A. Conform to AGA NSF ANSI/NFPA 54 ANSI/NFPA 70 ANSI/UL 1453 requirements for water heaters.

B. Conform to ASME Section VIIID for manufacture of pressure vessels for heat exchangers.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section Division One.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.9 WARRANTY

A. Provide five year warranty under provisions of Division One.

B. Warranty: Include coverage of domestic water heaters, water storage tanks, and packaged water heating systems.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Division One.

B. Provide two sets of electric heater elements.

1.11 OPERATIONS PERSONNEL TRAINING

A. Provide a training session for the owner's operations personnel. Training session shall be performed by a qualified person who is knowledgeable in the subject system/equipment. Submit a training agenda two weeks prior to the proposed training session for review and approval. Training session shall include at the minimum:

1. Purpose of equipment.
2. Principle of how the equipment works
3. Important parts and assemblies
4. How the equipment achieves its purpose and necessary operating conditions
5. Most likely failure modes, causes and corrections
6. On site demonstration

PART 2 - PRODUCTS

2.1 COMMERCIAL GAS FIRED WATER HEATER

A. Manufacturers:

1. A.O. Smith
2. Other acceptable manufacturers offering equivalent products.
   a. State
   b. Bock
   c. Rheem
   d. Bradford White

B. Type: Automatic, natural gas-fired, vertical storage.

C. Tank: Glass lined welded steel ASME labeled; multiple flu passages, 4 inch diameter inspection port (when applicable), thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

D. Accessories: Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve.

E. Approval: By AGA as automatic storage water heater and automatic circulating tank water heater for operation at 180 degrees F.

F. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F, gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

G. Provide training per 1.11.

2.2 COMMERCIAL ELECTRIC WATER HEATERS

A. Manufacturers:

1. A.O. Smith
2. Other acceptable manufacturers offering equivalent products.
   a. State
   b. Rheem.
   c. Bradford White.
   d. Bock.

B. Type: Factory-assembled and wired, electric, vertical storage.

C. Tank: Glass lined welded steel; 4 inch diameter inspection port (when applicable), thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.

D. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.

E. Accessories: Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve.

F. Provide training per 1.11.

2.3 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturer:

1. Taco.
2. Other acceptable manufacturers offering equivalent products.
   a. Watts.
   b. Bell and Gossett.

B. Construction: Welded steel, tested and stamped in accordance with Section 8D of ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

C. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 12 psig.

2.4 WATER SOFTENERS

A. Manufacturers:

1. Heat & Treat
2. Other acceptable manufacturers offering equivalent products.
   a. Marlo
   b. Watts
   c. R.A. Bruner Co.
   d. Unity

B. Performance:

1. Softening Capacity: 120K grains.
2. Service Flow: 25/40 gpm.
3. Electrical Characteristics:
   a. 120 volts, single phase, 60 Hz.

C. Softener Tank: Glass fiber reinforced plastic tank, 16 x 65 inches overall size, resin

capacity 4.0 cu ft.

D. Brine Tank: Glass fiber reinforced plastic tank, 18 x 40 inches overall size, salt capacity 400 lb.

E. Control: Reinforced plastic control valve cycled to regenerate after adjustable metered quantity of water flow.

F. Provide training per 1.11.

2.5 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:

1. Bell & Gossett.
2. Other acceptable manufacturers offering equivalent products.
   a. TACO.
   b. Grundfos.

B. Casing: Bronze, rated for 125 psig working pressure.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions and to AGA NSF ANSI/NFPA 54 UL requirements.

B. Coordinate with plumbing piping and related work to achieve operating system.

3.2 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Ensure shaft length allows sump pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches clearance from bottom of sump pit.

C. Provide air cock and drain connection on horizontal pump casings.

D. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.

E. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

F. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25

percent of midpoint of published maximum efficiency curve.

G. Align and verify alignment of base mounted pumps prior to start-up. Provide alignment certificate to engineer prior to start-up.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 22 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. The scope of the work shall include the furnishing and complete installation of the fixtures covered by this Section, with all appurtenances, ready for the Owner's use.

B. Include the following work in addition to items normally part of this Section:

1. Plumbing Fixtures
2. Fixture Carriers
3. Faucets, Supplies, and Trim
4. Flushometers

1.3 RELATED WORK

A. Section 22 05 29 – Hangers and Support for Plumbing Piping and Equipment

B. Section 22 10 00 – Plumbing Piping

C. Section 22 11 19 – Plumbing Specialties

D. Section 22 30 00 – Plumbing Equipment

1.4 REFERENCES

A. ASME A112.4.3 – Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System

B. ASME A112.6.1M – Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use

C. ASME A112.18.1 – Plumbing Supply Fittings

D. ASME A112.18.2 – Plumbing Waste Fittings

E. ASME A112.18.9 – Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures

F. ASME A112.19.1 – Enameled Cast Iron and Enameled Steel Plumbing Fixtures

G. ASME A112.19.2 – Ceramic Plumbing Fixtures

H. ASME A112.19.3 – Stainless Steel Plumbing Fixtures

I. ASME A112.19.7 – Hydromassage Bathtub Systems

J. NSF/ANSI 61 – Drinking Water System Components – Health Effects

K. ANSI Z358.1 – Emergency Eyewash and Shower Equipment

L. ASSE 1016 – Performance Requirements for Individual Thermostatic, Pressure Balancing, and Combination Pressure Balancing and Thermostatic Control Valves for Individual Fixture Fittings.

M. ASSE 1037 – Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures

N. ADA (Americans with Disabilities Act)

O. TAS (Texas Accessibility Standards)

1.5 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by the same manufacturer throughout.

B. Warranty: Warrant the work specified herein for one year against becoming unserviceable or causing an objectionable appearance resulting from defective or non-conforming materials and workmanship.

C. Defects shall include, but not necessarily be limited to, the following:

1. Noisy operation.
2. Noticeable deterioration of finish.
3. Leakage of water.

1.6 SUBMITTALS

A. Submit under provisions of Division One.

B. Submit product data under provisions of Division One.

C. Include component sizes, rough-in requirements, service sizes, finishes, materials, dimensions, performance information, and accessories.

D. Manufacturer’s Installation Instructions: Indicate assembly and support requirements.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division One.

B. Provide pre-printed operating and maintenance instructions for each item specified. Instruct and demonstrate the proper operation and maintenance to the Owner's designated representative.

1.8 DELIVERY, STORAGE, AND HANDLING

A. DELIVERY: Deliver clearly labeled specialties to; and store, protect and handle products on site in accordance with the provisions of Division One.

B. TIMING AND COORDINATION: Arrange for delivery of materials to allow for minimum storage time at the project site. Coordinate with the scheduled time of installation.

C. ACCEPTANCE: Accept specialties on site in original factory packaging. Inspect for damage. Damaged specialties shall not be acceptable.

D. STORAGE: Store materials in a clean, dry location, protected from weather and damage.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on the Contract Documents.

B. Confirm and field coordinate that millwork is constructed with adequate provisions for the installation of counter top lavatories and sinks.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. GENERAL: Provide plumbing fixtures in accordance with manufacturer's recommendations and as indicated and scheduled on Drawings. Acceptable manufacturers of each fixture type are as indicated below.

1. Provide floor-affixed fixture carriers as appropriate for all wall-hung plumbing fixtures unless specifically noted otherwise.
2. Fixture drilling shall match faucet spread and match any related trim and accessories.

B. WATER CLOSETS, URINALS, LAVATORIES (Vitreous China)

1. American Standard
2. Zurn
3. Sloan
4. Toto

C. SINKS – COUNTER MOUNTED (Stainless Steel)

1. Elkay
2. Just
3. Moen Commercial

D. MOP SINKS

1. Stern-Williams
2. Fiat
3. E.L. Mustee & Sons

E. DRINKING FOUNTAINS AND WATER COOLERS

1. Halsey Taylor
2. Elkay

3. Haws
4. Oasis

2.2 FAUCETS, SUPPLIES, AND TRIM

A. GENERAL: Provide faucets, supplies, and trim in accordance with manufacturer's recommendations, as appropriate for fixtures to be served, and as indicated and scheduled on Drawings. Acceptable manufacturers for each type of appurtenance are as indicated below.

1. Flushometer flush rate shall match gallon-per-flush criteria of fixtures served.
2. Strainers shall be heavy cast brass chrome plated with matching grid type strainer, with or without overflow as required, 17 gauge seamless brass tailpiece of length determined by installation requirements. Provide complete with washers and brass locknut.
3. P-traps shall be 17 gauge seamless chrome plated brass, adjustable type. Provide complete with cleanout plug, chrome plated brass slip nuts, wall bend, and wrought brass escutcheon of depth determined by installation requirements.
4. Angle stops shall be lead-free commercial pattern chrome plated brass, quarter turn ball type with loose key handles. Provide complete with chrome plated copper supply risers and wrought brass escutcheon of depth determined by installation requirements.
5. Toilet seats shall be commercial grade and provided complete with stainless steel posts and self-sustaining check hinges.
6. Pipe trim insulation shall be compliant, white molded vinyl, fade/discoloration-resistant, bacteria/fungal-resistant insulation.

B. FAUCETS

1. Chicago
2. T&S Brass
3. Zurn
4. Moen Commercial
5. Delta Commercial
6. American Standard
7. Symmons Commercial
8. Speakman

C. FLUSHOMETERS

1. Sloan
2. Zurn
3. Moen Commercial
4. Delta Commercial
5. Toto

D. SUPPLY STOPS

1. McGuire
2. Zurn
3. Chicago

E. CHROME PLATED TUBULAR BRASS

1. McGuire
2. Zurn

F. TOILET SEATS

1. Church
2. Bemis
3. American Standard
4. Zurn
5. Toto

G. PIPE TRIM INSULATION

1. Truebro
2. McGuire
3. Plumberex

2.3 FIXTURE CARRIERS

A. GENERAL: ANSI/ ASME A112.6.1M; Provide floor-affixed fixture carriers as appropriate for all wall-hung plumbing fixtures unless specifically noted otherwise. Fixture carrier foot supports shall be securely anchored to the floor with 1/2" bolts and anchors at all locations.

1. Chair type carriers shall be adjustable, with coated cast iron body with integral no hub waste and vent connections, complete with gasketed adjustable faceplate assembly, adjustable nipple with test cap, neoprene bowl gasket, lugs for floor and wall attachment, threaded fixture studs, and hardware. Provide single or double type of vertical or horizontal configuration as required and with auxiliary inlet as required.
2. Lavatory carriers shall be adjustable, with steel uprights and welded base feet, coated cast iron support brackets, cast or ductile iron concealed support arms, alignment rod, complete with leveling and support hardware. Provide single or back to back configuration as required.
3. Drinking fountain and urinal carriers shall be adjustable, with steel uprights and welded base feet, upper and lower bearing plates, threaded rods, and mounting hardware. Provide single or side-by-side configuration as required

B. ACCEPTABLE MANUFACTURERS

1. J.R. Smith
2. Zurn
3. Mifab
4. Watts
5. Wade
6. Josam

PART 3 – EXECUTION

3.1 PREPARATION

A. EXAMINATION OF CONDITIONS: Examine conditions affecting this work. Report unsatisfactory conditions to the proper authority and do not proceed until those conditions have been corrected. Commencing work implies acceptance of existing conditions as satisfactory to the outcome of this work.

B. Coordinate cutting of roof and floor construction to receive drains to required invert elevations.

3.2 INSTALLATION

A. Install fixtures in locations and heights as shown on Drawings and as directed by the Architect.

B. Install materials plumb, level, securely, and in accordance with manufacturer's recommendations.

C. All rough-in pipe openings for final connections with supply, waste, vent, and storm systems shall be closed with caps or plugs during early stages of construction and installation. Tape shall not be considered sufficient protection.

D. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

E. Provide ball valves in piping serving batteries of fixtures. Label stops "Hot" and "Cold." Valves shall be located above accessible ceilings. If ceilings are not accessible, provide access panels of adequate size to ensure valves are fully accessible and can be fully operated.

F. Provide lockable ball valves in piping serving emergency safety fixtures and clearly label such valves as to the fixtures served.

G. Plumbing fixtures shall be supported by a concealed carrier where required to properly support the fixture specified. All carriers to be securely mounted, bolted and checked prior to concealment.

H. Caulk around fixtures with best grade white silicone caulking. Do not use grout.

I. All handles on supply and drainage fittings or other brass items shall be properly lined up and adjusted. Fittings shall not be left in any haphazard manner.

J. All fixtures shall have individual chrome plated heavy pattern loose key quarter-turn cutoff stops on supply lines, complete with escutcheons. Where same are not specified as a part of the fixture trim, they shall be installed as close to fixtures as possible in the hot and cold water supply.

K. Install each fixture with trap, easily removable for servicing and cleaning.

L. All showers and similar installations shall be installed with type “L” copper pipe between shower valve and shower head rough-in. The termination point shall have a brass drop ear elbow for shower head arm connection. Contractor shall provide proper anchoring support.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Review architectural drawings. Confirm configuration and orientation of shower controls and trim prior to rough-in and installation.

3.4 ADJUSTING

A. Adjust work under provisions of Division One.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

A. Clean work under provisions of Division One.

B. At completion clean plumbing fixtures and appurtenances.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division One.

B. Do not permit use of fixtures.

3.7 ADA ACCESSIBLE FIXTURES

A. At all locations required to be accessible, such fixtures, controls, and final installations shall comply with the requirements of ADA and any applicable state accessibility standards. Install fixtures to heights, indicated on architectural drawings.

B. All exposed water supply and drain pipes under accessible lavatories and sinks shall be insulated with securely fastened pipe trim insulation kits of the proper model for the fixtures specified.

C. Wall mounted drinking fountains and coolers which protrude into passages or corridor space, whether single or paired with an adjacent accessible fixture, shall be supplied with a matching skirt or apron to lower the underside clearance of the non-accessible fixture equal to that required for accessible fixture.

END OF SECTION

SECTION 23 02 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all Work herein.

B. The Contract Drawings indicate the extent and general arrangement of the systems. If any departure from the Contract Drawings is deemed necessary by the Contractor, details of such departures and the reasons therefore, shall be submitted to the Architect/Engineer for review as soon as practicable. No such departures shall be made without the prior written approval of the Architect/Engineer.

C. Notwithstanding any reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, such reference shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect/Engineer, expressed in writing, is the equivalent of that specified.

1.2 SCOPE OF WORK

A. The Work included under this Contract consists of the furnishing and installation of all equipment and material necessary and required to form complete and functioning systems in all of their various phases, all as shown on the accompanying Drawings and/or described in these Specifications. The Contractor shall review all pertinent drawings, including those of other contracts, prior to commencement of Work.

B. This Division requires the furnishing and installing of all items as specified herein, indicated on the Drawings or reasonably inferred as necessary for safe and proper operation; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to, materials, labor, supervision, transportation, storage, equipment, utilities, all required permits, licenses and inspections. All work performed under this Section shall be in accordance with the Project Manual, Drawings and Specifications and is subject to the terms and conditions of the Contract.

C. The approximate locations of Mechanical (HVAC) items are indicated on the Drawings. These Drawings are not intended to give complete and accurate details in regard to location of outlets, apparatus, etc. Exact locations are to be determined by actual measurements at the building, and will in all cases be subject to the review of the Owner or Engineer, who reserves the right to make any reasonable changes in the locations indicated without additional cost to the Owner.

D. Items specifically mentioned in the Specifications but not shown on the Drawings and/or items shown on Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

E. All discrepancies between the Contract Documents and actual job-site conditions shall be

reported to the Owner or Engineer so that they will be resolved prior to bidding. Where this cannot be done at least 7 working days prior to bid; the greater or more costly of the discrepancy shall be bid. All labor and materials required to perform the work described shall be included as part of this Contract.

F. It is the intention of this Section of the Specifications to outline minimum requirements to furnish the Owner with a turn-key and fully operating system in cooperation with other trades.

G. It is the intent of the above "Scope" to give the Contractor a general outline of the extent of the Work involved; however, it is not intended to include each and every item required for the Work. Anything omitted from the "Scope" but shown on the Drawings, or specified later, or necessary for a complete and functioning heating, ventilating and air conditioning system shall be considered a part of the overall "Scope".

H. The Contractor shall rough-in fixtures and equipment furnished by others from rough-in and placement drawings furnished by others. The Contractor shall make final connection to fixtures and equipment furnished by others.

I. The Contractor shall participate in the commissioning process as required; including, but not limited to, meeting attendance, completion of checklists, and participation in functional testing.

1.3 SCHEMATIC NATURE OF CONTRACT DOCUMENTS

A. The Contract Documents are schematic in nature in that they are only to establish scope and a minimum level of quality. They are not to be used as actual working construction drawings. The actual working construction drawings shall be the reviewed shop drawings.

B. All duct or pipe or equipment locations as indicated on the documents do not indicate every transition, offset, or exact location. All transitions, offsets, clearances and exact locations shall be established by actual field measurements, coordination with the structural, architectural and reflected ceiling plans, and other trades. Submit shop drawings for review.

C. All transitions, offsets and relocations as required by actual field conditions shall be performed by the Contractor at no additional cost to the Owner.

D. Additional coordination with electrical contractor may be required to allow adequate clearances of electrical equipment, fixtures and associated appurtenances. Contractor to notify Architect and Engineer of unresolved clearances, conflicts or equipment locations.

1.4 SITE VISIT AND FAMILIARIZATION

A. Before submitting a bid, it will be necessary for each Contractor whose work is involved to visit the site and ascertain for himself the conditions to be met therein in installing his work and make due provision for same in his bid. It will be assumed that this Contractor in submitting his bid has visited the premises and that his bid covers all work necessary to properly install the equipment shown. Failure on the part of the Contractor to comply with this requirement shall not be considered justification for the omission or faulty installation of any work covered by these Specifications and Drawings.

B. Understand the existing utilities from which services will be supplied; verify locations of utility services, and determine requirements for connections.

C. Determine in advance that equipment and materials proposed for installation fit into the confines indicated.

1.5 WORK SPECIFIED IN OTHER SECTIONS

A. Finish painting is specified. Prime and protective painting are included in the work of this Division.

B. Owner and General Contractor furnished equipment shall be properly connected to Mechanical (HVAC) systems.

C. Furnishing and installing all required Mechanical (HVAC) equipment control relays and electrical interlock devices, conduit, wire and J-boxes are included in the Work of this Division.

1.6 PERMITS, TESTS, INSPECTIONS

A. Arrange and pay for all permits, fees, tests, and all inspections as required by governmental authorities.

1.7 DATE OF SUBSTANTIAL COMPLETION

A. The date of final acceptance shall be the date of substantial completion. Refer to Division One for additional requirements.

B. The date of final acceptance shall be documented in writing and signed by the Architect, Owner and Contractor.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Deliver products to the project at such time as the project is ready to receive the equipment, pipe or duct - properly protected from incidental damage and weather damage.

C. Damaged equipment, duct or pipe shall be promptly removed from the site and new, undamaged equipment, pipe or duct shall be installed in its place promptly with no additional charge to the Owner.

1.9 NOISE AND VIBRATION

A. The heating, ventilating and air conditioning systems, and the component parts thereof, shall be guaranteed to operate without objectionable noise and vibration.

B. Provide foundations, supports and isolators as specified or indicated, properly adjusted to prevent transmission of vibration to the building structure, piping and other items.

C. Carefully fabricate ductwork and fittings with smooth interior finish to prevent turbulence and generation or regeneration of noise.

D. All equipment shall be selected to operate with minimum of noise and vibration. If, in the opinion of the Architect, objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of the Work, the

Contractor shall rectify such conditions without extra cost to the Owner.

1.10 APPLICABLE CODES AND STANDARDS

A. Obtain all required permits and inspections for all work required by the Contract Documents and pay all required fees in connection thereof.

B. Arrange with the serving utility companies for the connection of all required utilities and pay all charges, meter charges, connection fees and inspection fees, if required.

C. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations and the applicable requirements which includes and is not limited to the following nationally accepted codes and standards:

1. Air Moving & Conditioning Association, AMCA.
2. American Standards Association, ASA.
3. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., ASHRAE.
4. American Society of Mechanical Engineers, ASME.
5. American Society of Plumbing Engineers, ASPE.
6. American Society of Testing Materials, ASTM.
7. American Water Works Association, AWWA.
8. National Bureau of Standards, NBS.
9. National Fire Protection Association, NFPA.
10. Sheet Metal & Air Conditioning Contractors' National Association, SMACNA.
11. Underwriters' Laboratories, Inc., UL.
12. International Building Code, IBC.
13. International Energy Conservation Code, IECC.
14. International Fire Code, IFC.
15. International Fuel Gas Code, IFGC.
16. International Mechanical Code, IMC.

D. Where differences existing between the Contract Documents and applicable state or city building codes, state and local ordinances, industry standards, utility company regulations and the applicable requirements of the nationally accepted codes and standards, the more stringent or costly application shall govern. Promptly notify the Engineer in writing of all differences.

E. When directed in writing by the Engineer, remove all work installed that does not comply with the Contract Documents and applicable state or city building codes, state and local ordinances, industry standards, utility company regulations and the applicable requirements of the above listed nationally accepted codes and standards, correct the deficiencies, and complete the work at no additional cost to the Owner.

1.11 DEFINITIONS AND SYMBOLS

A. General Explanation: A substantial amount of construction and Specification language constitutes definitions for terms found in other Contract Documents, including Drawings which must be recognized as diagrammatic and schematic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article, unless defined otherwise in Division 01.

B. Definitions and explanations of this Section are not necessarily either complete or

exclusive, but are general for work to the extent not stated more explicitly in another provision of the Contract Documents.

C. Indicated: The term "Indicated" is a cross-reference to details, notes or schedules on the Drawings, to other paragraphs or schedules in the Specifications and to similar means of recording requirements in Contract Documents. Where such terms as "Shown", "Noted", "Scheduled", "Specified" and "Detailed" are used in lieu of "Indicated", it is for the purpose of helping the reader locate cross-reference material, and no limitation of location is intended except as specifically shown.

D. Directed: Where not otherwise explained, terms such as "Directed", "Requested", "Accepted", and "Permitted" mean by the Architect or Engineer. However, no such implied meaning will be interpreted to extend the Architect's or Engineer's responsibility into the Contractor's area of construction supervision.

E. Reviewed: Where used in conjunction with the Engineer's response to submittals, requests for information, applications, inquiries, reports and claims by the Contractor the meaning of the term "Reviewed" will be held to limitations of Architect's and Engineer's responsibilities and duties as specified in the General and Supplemental Conditions. In no case will "Reviewed" by Engineer be interpreted as a release of the Contractor from responsibility to fulfill the terms and requirements of the Contract Documents.

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

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

H. Provide: Except as otherwise defined in greater detail, the term "Provide" is used to mean "Furnish and Install", complete and ready for intended use, as applicable in each instance.

I. Installer: Entity (person or firm) engaged by the Contractor, or its Subcontractor or Sub-subcontractor for performance of a particular unit of work at the project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protection, cleaning and similar operations, as applicable in each instance. It is a general requirement that such entities (Installers) be expert in the operations they are engaged to perform.

J. Imperative Language: Used generally in Specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor or, when so noted, by other identified installers or entities.

K. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended as minimum quality level or quantity of work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable tolerance limits. In complying with requirements, indicated or scheduled numeric values are either minimums or maximums as noted or as appropriate for the context of the requirements. Refer instances of uncertainty to Owner or Engineer

via a request for information (RFI) for decision before proceeding.

L. Abbreviations and Symbols: The language of Specifications and other Contract Documents including Drawings is of an abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in text of Specifications and Drawings. Specific abbreviations and symbols have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of Specification requirements with notations on Drawings and in Schedules. These are frequently defined in Section at first instance of use or on a Legend and Symbol Drawing. Trade and industry association names and titles of generally recognized industry standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of Contract Documents so indicate. Except as otherwise indicated, graphic symbols and abbreviations used on Drawings and in Specifications are those recognized in construction industry for indicated purposes. Where not otherwise noted symbols and abbreviations are defined by the latest ASHRAE Fundamentals Handbook, chapter 34 "Abbreviations and Symbols", ASME and ASPE published standards.

1.12 DRAWINGS AND SPECIFICATIONS

A. These Specifications are intended to supplement the Drawings and it will not be the province of the Specifications to mention any part of the Work which the Drawings are competent to fully explain in every particular and such omission is not to relieve the Contractor from carrying out portions indicated on the Drawings only.

B. Should items be required by these Specifications and not indicated on the Drawings, they are to be supplied even if of such nature that they could have been indicated thereon. In case of disagreement between Drawings and Specifications, or within either Drawings or Specifications, the better quality or greater quantity of work shall be estimated and the matter referred to the Architect or Engineer for review with a request for information and clarification at least 7 working days prior to bid opening date for issuance of an addendum.

C. The listing of product manufacturers, materials and methods in the various sections of the Specifications, and indicated on the Drawings, is intended to establish a standard of quality only. It is not the intention of the Owner or Engineer to discriminate against any product, material or method that is the equivalent of the standards as indicated and/or specified, nor is it intended to preclude open, competitive bidding. The fact that a specific manufacturer is listed as an acceptable manufacturer should not be interpreted to mean that the manufacturer’s standard product will meet the requirements of the project design, Drawings, Specifications and space constraints.

D. The Architect or Engineer and Owner shall be the sole judge of quality and equivalence of equipment, materials and methods.

E. Products by other reliable manufacturers, other materials, and other methods, will be accepted as outlined, provided they have equivalent capacity, construction, and performance. However, under no circumstances shall any substitution be made without the written permission of the Architect or Engineer and Owner. Request for prior approval must be made in writing 10 calendar days prior to the bid date without fail.

F. Wherever a definite product, material or method is specified and there is not a statement that another product, material or method will be acceptable, it is the intention of the Owner or Engineer that the specified product, material or method is the only one that shall be used without prior approval.

G. Wherever a definite material or manufacturer's product is specified and the Specification states that products of similar design and equivalent construction from the specified list of manufacturers may be substituted, it is the intention of the Owner or Engineer that products of manufacturers that are specified are the only products that will be acceptable and that products of other manufacturers will not be considered for substitution without approval.

H. Wherever a definite product, material or method is specified and there is a statement that "OR EQUIVALENT" product, material or method will be acceptable, it is the intention of the Owner or Engineer that the specified product, material or method or an "OR EQUIVALENT" product, material or method may be used if it complies with the Specifications and is submitted for review to the Engineer as outline herein.

I. Where permission to use substituted or alternative equipment on the project is granted by the Owner or Engineer in writing, it shall be the responsibility of the Contractor or Subcontractor involved to verify that the equipment will fit in the space available which includes allowances for all required Code and maintenance clearances, and to coordinate all equipment structural support, plumbing and electrical requirements and provisions with the Mechanical (HVAC) Design Documents and all other trades, including Division 26.

J. Changes in architectural, structural, electrical, mechanical, and plumbing requirements for the substitution shall be the responsibility of the bidder wishing to make the substitution. This shall include the cost of redesign by the affected designer(s). Any additional cost incurred by affected Subcontractors shall be the responsibility of this bidder and not the Owner.

K. If any request for a substitution of product, material or method is rejected, the Contractor will automatically be required to furnish the product, material or method named in the Specifications. Repetitive requests for substitutions will not be considered.

L. The Owner or Engineer will investigate all requests for substitutions when submitted in accordance with the requirements listed above; and if accepted, will issue a letter allowing the substitutions.

M. Where equipment other than that used in the design as specified or shown on the Drawings is substituted (either from an approved manufacturers list or by submittal review), it shall be the responsibility of the substituting Contractor to coordinate space requirements, building provisions and connection requirements with his trades and all other trades; and to pay all additional costs to other trades, the Owner, the Architect or Engineer, if any, due to the substitutions.

1.13 SUBMITTALS

A. Coordinate with Division 01 for submittal timetable requirements, unless noted otherwise within thirty (30) days after the Contract is awarded. The Contractor shall submit an electronic copy of a complete set of shop drawings and complete data covering each item of equipment or material. The submittal of each item requiring a submittal must be received by the Architect or Engineer within the above thirty-day period. The Architect or Engineer shall not be responsible for any delays or costs incurred due to excessive shop drawing review time for submittals received after the thirty (30) day time limit. The Architect and Engineer will retain a copy of all shop drawings for their files. All literature pertaining to items subject to Shop Drawing submittal shall be submitted at one time. Submittals shall be placed in one electronic file in PDF 8.0 format and bookmarked for individual specification sections. Individual electronic files of submittals for individual specifications shall not be permitted. Each submittal shall include the following items:

1. A cover sheet with the names and addresses of the Project, Architect, MEP Engineer, General Contractor and the Subcontractor making the submittal. The cover sheet shall also contain the section number covering the item or items submitted and the item nomenclature or description.
2. An index page with a listing of all data included in the Submittal.
3. A list of variations page with a listing of all variations, including unfurnished or additional required accessories, items or other features, between the submitted equipment and the specified equipment. If there are no variations, then this page shall state "NO VARIATIONS". Where variations affect the work of other Contractors, then the Contractor shall certify on this page that these variations have been fully coordinated with the affected Contractors and that all expenses associated with the variations will be paid by the submitting Contractor. This page will be signed by the submitting Contractor.
4. Equipment information including manufacturer's name and designation, size, performance and capacity data as applicable. All applicable Listings, Labels, Approvals and Standards shall be clearly indicated.
5. Dimensional data and scaled drawings as applicable to show that the submitted equipment will fit the space available with all required Code and maintenance clearances clearly indicated and labeled at a minimum scale of 1/4" = 1'-0", as required to demonstrate that the alternate or substituted product will fit in the space available.
6. Identification of each item of material or equipment matching that indicated on the Drawings.
7. Sufficient pictorial, descriptive and diagrammatic data on each item to show its conformance with the Drawings and Specifications. Any options or special requirements or accessories shall be so indicated. All applicable information shall be clearly indicated with arrows or another approved method.
8. Additional information as required in other Sections of this Division.
9. Certification by the General Contractor and Subcontractor that the material submitted is in accordance with the Drawings and Specifications, signed and dated in long hand. Submittals that do not comply with the above requirements shall be returned to the Contractor and shall be marked "REVISE AND RESUBMIT".

B. Refer to Division 00 and Division 01 for additional information on shop drawings and submittals.

C. Equipment and materials submittals and shop drawings will be reviewed for compliance with design concept only. It will be assumed that the submitting Contractor has verified that all items submitted can be installed in the space allotted. Review of shop drawings and submittals shall not be considered as a verification or guarantee of measurements or building conditions.

D. Where shop drawings and submittals are marked "REVIEWED", the review of the submittal does not indicate that submittals have been checked in detail nor does it in any way relieve the Contractor from his responsibility to furnish material and perform work as required by the Contract Documents.

E. Shop drawings shall be reviewed and returned to the Contractor with one of the following categories indicated:

1. REVIEWED: Contractor need take no further submittal action, shall include this submittal in the O&M manual and may order the equipment submitted on.
2. REVIEWED AS NOTED: Contractor shall submit a letter verifying that required exceptions to the submittal have been received and complied with including additional accessories or coordination action as noted, and shall include this

submittal and compliance letter in the O&M manual. The contractor may order the equipment submitted on at the time of the returned submittal providing the Contractor complies with the exceptions noted.

3. NOT APPROVED: Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is not approved. The Contractor will automatically be required to furnish the product, material or method named in the Specifications and/or Drawings. Contractor shall not order equipment that is not approved. Repetitive requests for substitutions will not be considered.
4. REVISE AND RESUBMIT: Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is marked revise and resubmit. The Contractor will automatically be required to furnish the product, material or method named in the Specifications and/or provide as noted on previous shop drawings. Contractor shall not order equipment marked revise and resubmit. Repetitive requests for substitutions will not be considered.
5. CONTRACTOR'S CERTIFICATION REQUIRED: Contractor shall resubmit submittal on material, equipment or method of installation. The Contractor's stamp is required stating that the submittal meets all conditions of the Contract Documents. The stamp shall be signed by the General Contractor. The submittal will not be reviewed if the stamp is not placed and signed on all shop drawings.
6. MANUFACTURER NOT AS SPECIFIED: Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is marked manufacturer not as specified. The Contractor will automatically be required to furnish the product, material or method named in the Specifications. Contractor shall not order equipment when submittal is marked manufacturer not as specified. Repetitive requests for substitutions will not be considered.

F. Materials and equipment which are purchased or installed without submittal review shall be at the risk of the Contractor and the cost for removal and replacement of such materials and equipment and related work which is judged unsatisfactory by the Owner or Engineer for any reason shall be at the expense of the Contractor. The responsible Contractor shall remove the material and equipment noted above and replace with specified equipment or material at his own expense when directed in writing by the Architect or Engineer.

G. Shop Drawing Submittals shall be complete and checked prior to submission to the Engineer for review.

H. Submittals are required for, but not limited to, the following items subject to project requirements:

1. Common Motor Requirements for HVAC Equipment
2. Hangers and Support for Piping and Equipment HVAC
3. Vibration and Seismic Controls for HVAC Piping and Equipment
4. Testing, Adjusting, and Balancing
5. Duct Insulation
6. HVAC Piping Insulation
7. Energy Management and Control System
8. Metal Ductwork
9. Ductwork Accessories
10. HVAC Fans
11. Air Distribution Devices
12. Air Filters
13. Flue Pipe Systems

14. Rooftop Heating and Cooling Units Electric Cooling-Gas Heating

I. Refer to other Division 23 sections for additional submittal requirements. Provide samples of actual materials and/or equipment to be used on the Project upon request of the Owner or Engineer.

1.14 COORDINATION DRAWINGS

A. Prepare coordination drawings to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of pipe, duct, equipment, and other materials. Include the following:

   a. Wall and type locations.
   b. Clearances for installing and maintaining insulation.
   c. Locations of light fixtures and sprinkler heads.
   d. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
   e. Equipment connections and support details.
   f. Exterior wall and foundation penetrations.
   g. Routing of storm and sanitary sewer piping.
   h. Fire-rated wall and floor penetrations.
   i. Sizes and location of required concrete pads and bases.
   j. Valve stem movement.
   k. Structural floor, wall and roof opening sizes and details.

2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
4. Prepare reflected ceiling plans to coordinate and integrate installations, air distribution devices, light fixtures, communication systems components, and other ceiling-mounted items.

B. This Contractor shall be responsible for coordination of all items that will affect the installation of the work of this Division. This coordination shall include, but not be limited to: voltage, ampacity, capacity, electrical and piping connections, space requirements, sequence of construction, building requirements and special conditions.

C. By submitting coordination drawings on the project, this Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified and intended, in full coordination with all other Contractors and Subcontractors.

1.15 RECORD DOCUMENTS

A. Prepare Record Documents in accordance with the requirements of Division 00 and Division 01, in addition to the requirements specified in Division 23.

B. The Contractor shall maintain a separate set of clearly and legibly marked Record Drawings on the job site to record all changes and modifications, including, but not limited to the following: work details, alterations to meet site conditions, and changes made by "Change Order" notices. Mark the drawings with colored pencil(s). These shall be available for review by the Owner, Architect or Engineer during the entire construction stage.

C. The Record Drawings shall be updated concurrently as construction progresses, and in no case less frequently than a daily basis. They shall indicate accurate dimensions for all buried or concealed work, precise locations of all concealed pipe or duct, locations of all concealed valves, controls and devices and any deviations from the work shown on the Construction Documents. All dimensions shall include at least two dimensions to permanent structure points.

D. Record Drawings shall indicate, at a minimum, the following installed conditions:

1. Duct mains and branches, size and location, for both exterior and interior; locations of dampers, fire dampers, duct access panels, and other control devices; filters, fuel fired heaters, fan coils, condensing units, and roof-top A/C units requiring periodic maintenance or repair.
2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
3. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
4. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
5. Contract Modifications, actual equipment and materials installed.

E. Engage the services of a Land Surveyor or Professional Engineer registered in the state in which the project is located as specified herein to record the locations and invert elevations of underground installations.

F. If the Contractor does not keep an accurate set of Record Drawings, the pay request may be altered or delayed at the request of the Architect. Delivery of Record Documents is a condition of final acceptance. Record Drawings shall be furnished in addition to Shop Drawings.

G. The Contractor shall submit an electronic copy of the record documents in PDF format and one (1) full size set of Record Drawing prints to the Architect or Engineer for review prior to scheduling the final inspection at the completion of the work. The drawings shall have the name(s) and seal(s) of the Engineer(s) removed or blanked out and shall be clearly marked and signed on each sheet as follows:

CERTIFIED RECORD DRAWINGS

DATE:

(NAME OF GENERAL CONTRACTOR)

BY:_____
(SIGNATURE)

(NAME OF SUBCONTRACTOR)

BY:_____
(SIGNATURE)

1.16 OPERATING AND MAINTENANCE MANUALS

A. Prepare operating and maintenance manuals in accordance with Division 00 and Division 01 and, in addition to the requirements specified in those Divisions, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

1.17 CERTIFICATIONS AND TEST REPORTS

A. Submit a detailed schedule for completion and testing of each system indicating scheduled dates for completion of system installation and outlining tests to be performed and scheduled date for each test. This detailed completion and test schedule shall be submitted at least 90 days before the projected substantial completion date.

B. Test result reporting forms shall be submitted for review no later than the date of the detailed schedule.

C. Submit 4 copies of all certifications and test reports to the Architect or Engineer for review adequately in advance of substantial completion of the Work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

D. Certifications and test reports to be submitted shall include, but not be limited to, those items outlined in Section 23 02 00.

1.18 OPERATING AND MAINTENANCE MANUALS

A. Prepare Operations and Maintenance manuals in accordance with the requirements of Division 01 and Division 23. In addition to the requirements of other Sections, this shall include the following information for equipment items:

1. Identifying names, name tags designations and locations for all equipment.
2. Valve tag lists with valve number, type, color coding, location and function.
3. Reviewed Shop Drawing submittals with exceptions noted compliance letter.
4. Fabrication drawings.
5. Equipment and device bulletins and data sheets clearly highlighted to show equipment installed on the project and including performance curves and data as applicable, i.e., description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and model numbers of replacement parts.

6. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
7. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
8. Servicing instructions and lubrication charts and schedules.
9. Equipment and motor name plate data.
10. Wiring diagrams.
11. Exploded parts views and parts lists for all equipment and devices.
12. Color coding charts for all painted equipment and conduit.
13. Location and listing of all spare parts and special keys and tools furnished to the Owner.
14. Furnish recommended lubrication schedule for all required lubrication points with listing of type and approximate amount of lubricant required.

B. Coordinate with Division 01 for Operations and Maintenance manual requirements. Unless noted otherwise, bind together in “D ring” style three-ring binders (National model no. 79-883 or equivalent). Binders shall be large enough to allow ¼” of spare capacity. Include three (3) sets with all approved Shop Drawing submittals, fabrication drawings, bulletins, maintenance instructions, operating instructions and parts exploded views and lists for each and every piece of equipment furnished under this Specification. All sections shall be typed and indexed into sections with tabbed insertable dividers, labeled for easy reference. Utilize the individual specification section numbers shown in the Mechanical Specifications as an organization guideline. Bulletins containing information about equipment that is not installed on the project shall be properly marked up or stripped and reassembled. All pertinent information required by the Owner for proper operation and maintenance of equipment supplied by Division 23 shall be clearly and legibly set forth in memoranda that shall, likewise, be bound with bulletins.

C. In addition to the bound “hard-copy” Operation and Maintenance manuals referenced above, provide an identical electronic copy in searchable PDF format, with all sections bookmarked within the file for easy reference. Provide a USB flash drive with the final manual to the Owner.

D. Operating and Maintenance Manuals shall be turned over to the Owner or Engineer for review a minimum of fourteen (14) working days prior to the beginning of the operator training period.

E. Operating and Maintenance Manuals which the Engineer deems incomplete, poorly organized, or otherwise unacceptable will be rejected in writing. The Contractor will subsequently be required to again turn over Operating and Maintenance Manuals, with all deficiencies corrected, until deemed acceptable by the Engineer.

1.19 OPERATOR TRAINING

A. The Contractor shall furnish the services of factory trained specialists to instruct the Owner's operating personnel. The Owner's operator training shall include a minimum of 12 hours of onsite training in three (3) shifts of four (4) hours each.

B. Before proceeding with the instruction of Owner Personnel, prepare a typed outline in triplicate, listing the subjects that will be covered in this instruction, and submit the outline for review by the Owner. At the conclusion of the instruction period, obtain the signature of each person being instructed on each copy of the reviewed outline to signify that he has a proper understanding of the operation and maintenance of the systems and

resubmit the signed outlines.

C. Refer to other Division 23 Sections for additional Operator Training requirements.

1.20 FINAL COMPLETION

A. At the completion of the Work, all equipment and systems shall be tested and faulty equipment and material shall be repaired or replaced. Refer to Sections of Division 23 for additional requirements.

B. Clean and adjust all air distribution devices and replace all air filters immediately prior to Substantial Completion.

C. Touch up and/or refinish all scratched equipment and devices immediately prior to Substantial Completion.

1.21 CONTRACTOR'S GUARANTEE

A. Use of the HVAC systems to provide temporary service during construction period will not be allowed without permission from the Owner in writing; and, if granted, shall not cause the warranty period to start, except as defined below.

B. Contractor shall guarantee to keep the entire installation in repair and perfect working order for a period of one year after the date of the Substantial Completion, and shall furnish (free of additional cost to the Owner) all materials and labor necessary to comply with the above guarantee throughout the year beginning from the date of Substantial Completion, Beneficial Occupancy by the Owner, or the Certificate of Final Payment as agreed upon by all parties.

C. This guarantee shall not include cleaning or changing filters except as required by testing, adjusting and balancing.

D. All air conditioning compressors shall have parts and labor guarantees for a period of not less than 5 years beyond the date of Substantial Completion.

E. Refer to Sections in Division 23 for additional guarantee or warranty requirements.

1.22 TRANSFER OF ELECTRONIC FILES

A. Project documents are not intended or represented to be suitable for reuse by Architect/Owner or others on extensions of this project or on any other project. Any such reuse or modification without written verification or adaptation by Engineer, as appropriate for the specific purpose intended, will be at Architect/Owner’s risk and without liability or legal exposure to Engineer or its consultants from all claims, damages, losses and expense, including attorney’s fees arising out of or resulting thereof.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently, or otherwise, without authorization of the data’s creator, the party receiving the electronic files agrees that it will perform acceptance tests or procedures within sixty (60) days of receipt, after which time the receiving party shall be deemed to have accepted the data thus transferred to be acceptable. Any errors detected within the sixty (60) day acceptance period will be corrected by the party delivering the electronic files. Engineer is not responsible for maintaining documents stored in electronic media format after acceptance by the Architect/Owner.

C. When transferring documents in electronic media format, Engineer makes no representations as to the long term compatibility, usability or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by Engineer at the beginning of the Project.

D. Any reuse or modifications will be at the Contractor's sole risk and without liability or legal exposure to Architect, Engineer or any consultant.

E. The Texas Board of Architectural Examiners (TBAE) has stated that it is in violation of Texas law for persons other than the Architect of record to revise the Architectural drawings without the Architect's written consent.

1. It is agreed that "MEP" hard copy or computer-generated documents will not be issued to any other party except directly to the Architect/Owner. The Contract Documents are contractually copyrighted and cannot be used for any other project or purpose except as specifically indicated in AIA B-141 Standard Form of Agreement Between Architect and Owner.
2. If the client, Architect or Owner of the project requires electronic media for "record purposes", then AutoCAD/ Revit documents will be prepared by Engineer on electronic media such as removable memory devices, flash drives or CD's. These documents can also be submitted via file transfer protocols. AutoCAD/ Revit files will be submitted with all title block references intact to permit the end user to only view and plot the drawings. Revisions will not be permitted in this configuration.
3. At the Architect/Owner's request, Engineer will assist the Contractor in the preparation of the submittals and prepare one copy of AutoCAD/ Revit files on electronic media or submit through file transfer protocols. The electronic media will be prepared with all indicia of documents ownership removed. The electronic media will be prepared in a ".rvt" or ".dwg" format to permit the end user to revise the drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials and equipment manufactured by a domestic United States manufacturer and assembled in the United States for all local and Federal Government projects. These materials and equipment shall comply with "Buy American Act."

B. Access Doors: Provide access doors as required for access to equipment, valves, controls, cleanouts and other apparatus where concealed. Access doors shall have concealed hinges and screw driver cam locks.

C. All access doors located in wet areas such as restrooms, locker rooms, shower rooms, kitchen and any other wet areas shall be constructed of stainless steel.

D. Access Doors: shall be as follows:

1. Plaster Surfaces: Milcor Style K.
2. Ceramic Tile Surface: Milcor Style M.
3. Drywall Surfaces: Milcor Style DW.
4. Install doors only in locations approved by the Architect.

2.2 EQUIPMENT PADS (See 2.4 in Section 26 02 00)

PART 3 - EXECUTION

3.1 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected via reviewed submittals.

B. Refer to equipment specifications in Divisions 2 through 48 for additional rough-in requirements.

3.2 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with architectural action markings on submittal, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, resolve conflicts and submit proposed solution to the Architect for review.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as possible, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location and label.
11. Install access doors where units are concealed behind finished surfaces. Refer to paragraph 2.1 in this section and architect for access doors specifications and location.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Provide roof curbs for all roof mounted equipment. Coordinate with roof construction for pitched roof. Provide roof curbs which match the roof slope and provides a level top for equipment installation. Refer to Architectural drawings and details.
14. The equipment to be furnished under these Specifications shall be essentially the standard product of the manufacturer. Where two or more units of the same

class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the product of the same manufacturer.

15. The Architectural and Structural features of the building and the space limitations shall be considered in selection of all equipment. No equipment shall be furnished which will not suit the arrangement and space limitations indicated.
16. Lubrication: Prior to start-up, check and properly lubricate all bearings as recommended by the manufacturer.
17. Where the word "Concealed" is used in these Specifications in connection with insulating, painting, piping, ducts, etc., it shall be understood to mean hidden from sight as in chases, furred spaces or suspended ceilings. "Exposed" shall be understood to mean the opposite of concealed.
18. Identification of Mechanical Equipment:

    a. Mechanical equipment shall be identified by means of nameplates permanently attached to the equipment. Nameplates shall be engraved laminated plastic or etched metal. Submittals shall include dimensions and lettering format for approval. Attachment shall be with escutcheon pins, self-tapping screws, or machine screws.
    b. Tags shall be attached to all valves, including control valves, with nonferrous chain. Tags shall be brass and at least 1-1/2 inches in diameter. Nameplate and tag symbols shall correspond to the identification symbols on the temperature control submittal and the "as-built" drawings.

19. Provide construction filters for all air handling units, fan coil unit, VAV boxes, and all other air handling equipment during the entire construction period.
20. Provide temporary construction strains for all strainers in the hydronic systems during the initial flushing of the systems.

3.3 CUTTING AND PATCHING

A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed Work.
2. Remove and replace defective Work.
3. Remove and replace Work not conforming to requirements of the Contract Documents.
4. Remove samples of installed Work as specified for testing.
5. Install equipment and materials in existing structures.
6. Upon written instructions from the Engineer, uncover and restore Work to provide for Engineer/Owner's observation of concealed Work, without additional cost to the Owner.
7. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers; refer to the materials and methods required for the surface and building components being patched; Refer to Paragraph 1.11 I for definition of "Installer."

C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, mechanical ducts and HVAC units, and other mechanical items made obsolete by the new Work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

3.4 WORK SEQUENCE, TIMING, COORDINATION WITH OWNER, ARCHITECT AND ENGINEER

A. The Owner will cooperate with the Contractor, however, the following provisions must be observed:

1. A meeting will be held at the project site, prior to any construction, between the Owner's Representative, the General Contractor, the Sub-Contractors and the Engineer to discuss Contractor's employee parking space, access, storage of equipment or materials, and use of the Owner's facilities or utilities. The Owner's decisions regarding such matters shall be final.
2. During the construction of this project, normal facility activities will continue in existing buildings until renovated areas are completed. Plumbing, fire protection, lighting, electrical, communications, heating, air conditioning, and ventilation systems shall be maintained in service within the occupied spaces of the existing building.
3. Contractor shall not start-up any of the HVAC equipment unless the Owner, Architect and Engineer are signed off.
4. Start-up for major HVAC equipment such as chillers, cooling towers, variable frequency drives and hot water boilers shall be performed by a factory technician. The start-up shall include a written report signed off by Contractor, Engineer and Owner.

3.5 DEMOLITION AND WORK WITHIN EXISTING BUILDINGS

A. In the preparation of these documents every effort has been made to show the approximate locations of, and connections to, the existing piping, duct, equipment and other apparatus related to this phase of the Work. However, this Contractor shall be responsible for verifying all of the above information. This Contractor shall visit the existing site to inspect the facilities and related areas. This Contractor shall inspect and verify all details and requirements of all the Contract Documents, prior to the submission of a proposal. All discrepancies between the Contract Documents and actual job-site conditions shall be resolved by the contractor, who shall produce drawings that shall be submitted to the Architect/Engineer for review. All labor and materials required to perform the work described shall be a part of this Contract.

B. All equipment and/or systems noted on the Drawings "To Remain" shall be inspected and tested on site to certify its working condition. A written report on the condition of all equipment to remain, including a copy of the test results and recommended remedial actions and costs shall be made by this Contractor to the Architect/Engineer for review.

C. All equipment and/or systems noted on the Drawings "To Be Removed" shall be removed including, associated pipe and duct, pipe and duct hangers and/or line supports. Where duct or pipe is to be capped for future or end of line use, it shall be properly tagged with its function or service appropriately identified. Where existing equipment is to be removed or relocated and has an electric motor or connection, the Electrical Contractor shall disconnect motor or connection, remove wiring to a safe point and this Contractor shall remove or relocate motor or connection along with the equipment.

D. During construction and remodeling, portions of the Project shall remain in service.

Construction equipment, material, tools, extension cords, etc., shall be arranged so as to present minimum hazard or interruption to the occupants of the building. None of the construction work shall interfere with the proper operation of the existing facility; or be so conducted as to cause harm or danger to persons on the premises. All fire exits, stairs or corridors required for proper access, circulation or exit shall remain clear of equipment, materials or debris. The General Contractor shall maintain barricades, other separations in corridors and other spaces where work is conducted.

E. Certain work during the demolition and construction phases may require overtime or night time shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner at least seventy-two (72) hours in advance in writing.

F. Any salvageable equipment as determined by the Owner, shall be delivered to the Owner, and placed in storage at the location of his choice. All other debris shall be removed from the site immediately.

G. Equipment, piping or other potential hazards to the occupants of the building shall not be left overnight outside of the designated working or construction area.

H. Make every effort to minimize damage to the existing building and the Owner's property. Repair, patch or replace as required any damage that occurs as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during construction and to keep construction disrupted areas to a minimum. Coordinate with the Owner and other trades in scheduling and performance of the work.

I. Include in the contract price all rerouting of existing pipe, duct, etc., and the reconnecting of the existing equipment as necessitated by field conditions to allow the installation of the new systems regardless of whether or not such rerouting, reconnecting or relocating is shown on the Drawings. Furnish all temporary pipe, duct, controls, etc., as required to maintain heating, cooling, and ventilation services for the existing areas with a minimum of interruption.

J. All existing pipe, duct, materials, equipment, controls and appurtenances not included in the remodel or alteration areas are to remain in place.

K. Pipe, duct, equipment and controls serving mechanical and other Owner's equipment, etc., which is to remain but is served by pipe, duct, equipment and controls that are disturbed by the remodeling work, shall be reconnected in such a manner as to leave this equipment in proper operating condition.

L. No portion of the **fire protection systems** shall be turned off, modified or changed in any way without the express knowledge and written permission of the Owner’s representative in order to protect systems that shall remain in service.

M. It is the intention of this Section of the Specifications to outline minimum requirements to furnish the Owner with a turn-key and operating system in cooperation with other trades with a minimum of disruption or downtime.

N. Refer to Architectural Demolition and/or Alteration plans for actual location of walls, ceilings, etc., being removed and/or remodeled.

END OF SECTION

SECTION 23 03 00

MECHANICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Mechanical demolition.

B. The Drawings do not show all demolition work required. The Contractor shall make himself familiar with the required scope of work to accomplish the work required by these documents. All demolition work implied or required shall be included in the scope of this contract.

C. Utility service outages required by the new installation will be permitted but only at a time approved by the Owner. The Contractor shall allow the Owner 2 weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

1.2 RELATED SECTIONS

A. Section 02 40 00 - Demolition and Structure Moving.

1.3 WORK SEQUENCE, TIMING, COORDINATION WITH OWNER

A. The Owner will cooperate with the Contractor; however, the following provisions must be observed:

1. During the construction of this project, normal facility activities will continue in existing buildings until new buildings or renovated areas are completed. Plumbing, fire protection, lighting, electrical, communications, heating, air conditioning, and ventilation systems shall be maintained in service within the occupied spaces of the existing building.
2. A meeting will be held at the project site, prior to any construction, between the Owner's Representative, the General Contractor, the Subcontractors and Sub-subcontractors, and the Engineer to discuss Contractor's employee parking space, access, storage of equipment or materials, and use of the Owner's facilities or utilities. The Owner's decisions regarding such matters shall be final.

1.4 DEMOLITION AND WORK WITHIN EXISTING BUILDINGS

A. In the preparation of these documents every effort has been made to show the approximate locations of, and connections to the existing piping, duct, equipment and other apparatus related to this phase of the Work. However, this Contractor shall be responsible for verifying all of the above information. This Contractor shall visit the existing site to inspect the facilities and related areas. This Contractor shall inspect and verify all details and requirements of all the Contract Documents, prior to the submission of a proposal. All discrepancies between the Contract Documents and actual job-site conditions shall be resolved by the contractor, who shall produce drawings which shall be submitted to the Architect/Engineer for review. All labor and materials required to perform the work described shall be a part of this Contract.

B. All equipment and/or systems noted on the Drawings "To Remain" shall be inspected and tested on site to certify its working condition. A written report on the condition of all equipment to remain, including a copy of the test results and recommended remedial actions and costs shall be made by this Contractor to the Architect/Engineer for review.

C. All equipment and/or systems noted on the Drawings "To Be Removed" should be removed including, associated pipe and duct, pipe and duct hangers and/or line supports. Where duct or pipe is to be capped for future or end of line use, it shall be properly tagged with its function or service appropriately identified. Where existing equipment is to be removed or relocated and has an electric motor or connection, the Electrical Contractor shall disconnect motor or connection, remove wiring to a safe point and this Contractor shall remove or relocate motor or connection along with the equipment.

D. During construction and remodeling, portions of the Project shall remain in service. Construction equipment, material, tools, extension cords, etc., shall be arranged so as to present minimum hazard or interruption to the occupants of the building. None of the construction work shall interfere with the proper operation of the existing facility; or be so conducted as to cause harm or danger to persons on the premises. All fire exits, stairs or corridors required for proper access, circulation or exit shall remain clear of equipment, materials or debris. The General Contractor shall maintain barricades, other separations in corridors and other spaces where work is conducted.

E. Certain work during the demolition and construction phases may require overtime or night time shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner at least seventy-two (72) hours in advance in writing.

F. Any salvageable equipment as determined by the Owner, shall be delivered to the Owner, and placed in storage at the location of his choice. All other debris shall be removed from the site immediately.

G. Equipment, piping or other potential hazards to the occupants of the building shall not be left overnight outside of the designated working or construction area.

H. Make every effort to minimize damage to the existing building and the Owner's property. Repair, patch or replace as required any damage which occurs as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during construction and to keep construction disrupted areas to a minimum. Coordinate with the Owner and other trades in scheduling and performance of the work.

I. Include in the contract price all rerouting of existing pipe, duct, etc., and the reconnecting of the existing equipment as necessitated by field conditions to allow the installation of the new systems regardless of whether or not such rerouting, reconnecting or relocating is shown on the drawings. Furnish all temporary pipe, duct, controls, etc., as required to maintain heating, cooling, and ventilation services for the existing areas with a minimum of interruption.

J. All existing pipe, duct, materials, equipment, controls and appurtenances not included in the remodel or alteration areas are to remain in place.

K. Pipe, duct, equipment and controls serving mechanical and other Owner's equipment, etc., which is to remain but which is served by pipe, duct, equipment and controls that are disturbed by the remodeling work, shall be reconnected in such a manner as to leave this equipment in proper operating condition.

L. No portion of the **fire protection systems** shall be turned off, modified or changed in any way without the express knowledge and written permission of the Owner's representative in order to protect systems that shall remain in service.

M. It is the intention of this Section of the Specifications to outline minimum requirements to furnish the Owner with a turn-key and operating system in cooperation with other trades with a minimum of disruption or downtime.

N. Refer to Architectural Demolition and/or Alteration plans for actual location of walls, ceilings, etc., being removed and/or remodeled.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Field verify measurements, and piping arrangements are as shown on Drawings.

B. Verify that abandoned piping and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and existing Record Documents. Report discrepancies to Architect and Engineer before disturbing existing installation.

D. Beginning of demolition means that the contractor accepts existing conditions.

3.2 PREPARATION

A. Disconnect mechanical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary connections, if required, to maintain existing systems in service during construction. When work must be performed on energized equipment, use personnel experienced in such operations.

D. Existing Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

A. Demolish and extend existing mechanical work under provisions of Division 02 and this Section.

B. Remove, relocate, and extend existing systems to accommodate new construction.

C. Remove abandoned piping to source of supply.

D. Remove exposed abandoned piping systems, including abandoned systems above accessible ceiling finishes. Cut systems flush with walls and floors, and patch surfaces.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing systems which remain active. Modify installation or provide access doors as appropriate.

G. Extend existing systems using materials and methods compatible with existing systems, or as specified.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

3.5 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 02.

3.6 REMOVAL OF MATERIALS

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the Drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operating condition. The Contractor may, at his discretion and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the Drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

E. Certain work during the demolition and construction phases may require overtime or nighttime shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner's Representative at least 72 hours in advance in writing.

F. Make every effort to minimize damage to the existing building and the Owner's property. Repair, patch, or replace as required any damage which occurs as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during construction. Cooperate with the Owner and other trades in scheduling and performance of the work.

G. See Paragraph I on page 23 02 00 – 18

H. The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all electrical services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

I. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

J. Where partitions, walls, floors, or ceilings of existing construction are being removed, all contractors shall remove and reinstall in locations approved by the Architect all devices required for the operation of the various systems installed in the existing construction.

END OF SECTION

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 23 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

B. WORK SPECIFIED ELSEWHERE:

1. Painting
2. Automatic temperature controls.
3. Power control wiring to motors and equipment.

1.3 WARRANTY

Warrant the Work specified herein for one year and motors for five years beginning on the date of substantial completion.

1.4 SUBMITTALS

A. SHOP DRAWINGS: Indicate size material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures variations, and accessories.

C. MOTOR NAMEPLATE INFORMATION: Manufacturer's name, address, utility and operating data.

D. Refer to Division One for additional information.

1.5 DELIVERY AND STORAGE

A. DELIVERY: Deliver clearly labeled, undamaged materials in the manufacturers' unopened containers.

B. TIME AND COORDINATION: Deliver materials to allow for minimum storage time at the project site. Coordinate delivery with the scheduled time of installation.

C. STORAGE: Store materials in a clean, dry location, protected from weather and abuse.

PART 2 - PRODUCTS

2.1 ELECTRIC MOTORS

A. APPROVED MANUFACTURERS: Provide motors by a single manufacturer as much as possible.

1. Baldor
2. Marathon
3. Siemens-Allis
4. General Electric
5. U.S. Motor

B. TEMPERATURE RATING: Provide insulation as follows:

1. CLASS B: 40 degrees C maximum.
2. CLASS F:
   a. Between 40 degrees C and 65 degrees C maximum.
   b. Totally enclosed motors.

C. STARTING CAPABILITY: As required for service indicated five starts minimum per hour.

D. PHASES AND CURRENT: Verify electrical service compatibility with motors to be used.

1. UP TO 3/4 HP: Provide electronically commutated brushless DC single phase motors with built-in inverter and microprocessor-based control.
2. 1 HP AND LARGER: Provide squirrel-cage AC induction polyphase motors.
3. Name plate voltage shall be the same as the circuit's nominal voltage, serving the motor.

E. SERVICE FACTOR: 1.15 for polyphase; 1.35 for single phase.

F. FRAMES: U-frames 1.5 hp. and larger.

G. BEARINGS: Provide sealed re-greaseable ball bearings; with top mounted zerc lubrication fittings and bottom side drains minimum average life 100,000 hours typically, and others as follows:

1. Design for thrust where applicable.
2. PERMANENTLY SEALED: Where not accessible for greasing.
3. SLEEVE-TYPE WITH OIL CUPS: Light duty fractional hp. motors or polyphase requiring minimum noise level.

H. ENCLOSURE TYPE: Provide enclosures as follows:

1. CONCEALED INDOOR: ODP (Open Drip Proof).
2. EXPOSED INDOOR: Guard Protected.
3. OUTDOOR TYPICAL: Type II. TEFC.
4. OUTDOOR WEATHER PROTECTED: Type I. WPI.
5. EXPLOSION PROOF, XP: For use in hazardous locations.

I. OVERLOAD PROTECTION: Built-in sensing device for stopping motor in all phase legs and signaling where indicated for fractional horse power motors.

J. NOISE RATING: "Quiet" except where otherwise indicated.

K. EFFICIENCY: Minimum full load efficiency listed in the following table, when tested in accordance with IEEE Test Procedure 112A, Method B, including stray load loss measure.

Motor Horsepower	NEMA Efficiency INDEX Letter	Minimum Efficiency %
	1800 RPM Synchronous Speed	
3-5	G	89.5
7.5	G	91.0
10	F	91.7
15-20	E	93.0
25-30	E	93.6
40	D	94.1
50	C	94.5
60	C	95.0
75	C	95.0
100-125	B	95.4
150-200	B	95.8
	1200 RPM Synchronous Speed	
3-5	G	89.5
7.5	G	90.2
10	F	91.7
15	F	91.7
20	E	92.4
25-30	E	93.6
40-50	D	94.1
60	D	94.5
75	C	94.5
100-125	C	95.0
150-200	B	95.4

2.2 MOTOR CONTROLLERS (STARTERS)

A. All motor controllers (for equipment furnished under Division 23) shall be furnished under Division 23 and installed under Division 26 unless otherwise noted on the plans.

1. Starters shall be provided for 3 phase motors 1 horsepower and greater.

B. Motor starters shall be furnished as follows.

1. GENERAL: Motor starters shall be Square D Company Class 8536 across-the-line magnetic type, full-voltage, non-reversing (FAVOR) starter. All starters shall be constructed and tested in accordance with the latest NEMA standards, sizes and horsepower. ICE sizes are not acceptable. Starters shall be mounted in a general purpose dead front, painted steel enclosure and surface-mounted. Provide size and number of poles as shown and required by equipment served. Provide two speed, two winding or two speed, single winding motor starter as required for two speed motors.
2. CONTACTS: Magnetic starter contacts shall be double break solid silver alloy. All contacts shall be replaceable without removing power wiring or removing starter from panel. The starter shall have straight-through wiring.
3. OPERATING COILS: Operating coils shall be 120 volts and shall be of molded construction. When the coil fails, the starter shall open and shall not lock in the closed position.
4. OVERLOAD RELAYS: Provide manual reset, trip-free Class 20 overload relays in each phase conductor in of all starters. Overload relays shall be melting alloy

type with visual trip indication. All 3 phase and single phase starters shall have one overload relay in each underground conductor. Relay shall not be field adjustable from manual to automatic reset. Provide 6 overload relays for two speed motor starters.

5. PILOT LIGHTS: Provide a red running pilot light for all motor starters. Pilot lights shall be mounted in the starter enclosure cover. Pilot lights shall be operated from an interlock on the motor starter and shall not be wired across the operating coil.
6. CONTROLS: Provide starters with HAND-OFF-AUTOMATIC switches. Coordinate additional motor starter controls with the requirements of Division 23. Motor starter controls shall be mounted in the starter enclosure cover.
7. CONTROL POWER TRANSFORMER: Provide a single-phase 480 volt control power transformer with each starter for 120 volt control power. Connect the primary side to the line side of the motor starter. The primary side shall be protected by a fuse for each conductor. The secondary side shall have one leg fused and one leg grounded. Arrange transformer terminals so that wiring to terminals will not be located above the transformer.
8. AUXILIARY CONTACTS: Each starter shall have one normally open and one normally closed convertible auxiliary contact in addition to the number of contacts required for the "holding interlock", remote monitoring, and control wiring. In addition, it shall be possible to field-install three more additional auxiliary contacts without removing existing wiring or removing the starter from its enclosure.
9. UNIT WIRING: Unit shall be completely pre-wired to terminals to eliminate any interior field wiring except for line and load power wiring and HVAC control wiring.
10. ENCLOSURES: All motor starter enclosures shall be NEMA 1, general purpose enclosures or NEMA-3R if mounted exposed to high moisture conditions. Provide NEMA 4X when located by cooling towers.
11. POWER MONITOR: Provide a square "D" 8430 MPS phase failure and under-voltage relay, base and wiring required for starters serving all 3 phase motors. Set the under-voltage setting according to minimum voltage required for the motor to operate within its range.

C. APPROVED MANUFACTURERS: Controller numbers are based on first named manufacturer. Provide one of the following manufacturer's.

1. Siemens.
2. Square D.
3. General Electric.
4. Eaton.

2.3 COMBINATION MOTOR STARTERS

A. GENERAL: Combination motor starters shall consist of a magnetic starter and a fusible or non-fusible disconnect switch in a dead front, painted steel NEMA 1 enclosure unless otherwise noted and shall be surface-mounted. Size and number of poles shall as shown and required by equipment served. Combination motor starters shall be as specified for motor starters in Paragraph 2.2-B, except as modified herein.

B. DISCONNECT SWITCH: Disconnect switches shall be as specified in Section 26 28 16.

C. APPROVED MANUFACTURERS: Controller numbers are based on first named manufacturer. Provide one of the following manufacturer's.

1. Siemens.
2. Square D.

3. General Electric.

PART 3 - EXECUTION

3.1 All equipment shall be installed in accordance with the manufacturers' recommendations and printed installation instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Contractors' price shall include all items required as per manufacturers' requirements.

3.3 INSTALLATION

A. GENERAL: Install in a professional manner. Any part or parts not meeting this requirement shall be replaced or rebuilt without extra expense to Owner.

B. Install rotating equipment in static and dynamic balance.

C. Provide foundations, supports, and isolators properly adjusted to allow minimum vibration transmission within the building.

D. Correct objectionable noise or vibration transmission in order to operate equipment satisfactorily as determined by the Engineer.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT – HVAC

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. Section 23 02 00 - Basic Materials and Methods is included as a part of this Section as though written in full in this document.

1.2 WORK INCLUDED

A. Pipe, and equipment hangers, supports and associated anchors.

B. Sleeves and seals.

C. Flashing and sealing equipment and pipe stacks.

1.3 RELATED WORK

A. Section 22 10 00 – Plumbing Piping and Pumps.

B. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 07 19 – HVAC Piping Insulation.

1.4 REFERENCES

A. ANSI/ASME B31.1 - Power Piping.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems.

C. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.

1.5 QUALITY ASSURANCE

A. Supports for Sprinkler Piping: In conformance with NFPA 13.

B. Supports for Standpipes: In conformance with NFPA 14.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division One.

B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipes Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipes Sizes 2 to 4 Inch: Carbon steel, adjustable clevis.

C. Hangers for Pipes Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roller, double hanger.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers, pre-formed manufactured saddles and hanger rods; cast iron roller and stand for pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and over: adjustable steel yoke and cast iron roller.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roller and stand, steel screws, and concrete pier or steel support.

J. Roof Pipe Supports and Hangers: Galvanized Steel Channel System as manufactured by Portable Pipe Hangers, Inc. or approved equal.

1. For pipes 2-1/2” and smaller – Type PP10 with roller
2. For pipes 3” through 8” – Type PS
3. For multiple pipes – Type PSE - Custom

K. Copper Pipe Support and Hangers: Electro-galvanized with thermoplastic elastomer cushions; Unistrut “Cush-A-Clamp” or equal. Hangers: Plastic coated; Unistrut or equal.

L. Shields for Vertical Copper Pipe Risers: Sheet lead.

M. Pipe Rough-In Supports in Walls/Chases: Provide preformed plastic pipe supports, Sioux Chief “Pipe Titan” or equal.

2.2 HANGER RODS

A. Galvanized Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.3 INSERTS

A. Inserts: Malleable iron case with galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

A. Metal Flashing: 20 gage galvanized steel.

B. Lead Flashing: 4 lb. /sq. ft. sheet lead for waterproofing; 1 lb. /sq. ft. sheet lead for soundproofing.

C. Caps: Steel, 20 gage minimum; 16 gage at fire resistant elements.

D. Coordinate with roofing contractor/Architect for type of flashing on metal roofs.

2.5 EQUIPMENT CURBS

A. Fabricate curbs of hot dipped galvanized steel.

B. For metal roof construction, roof curbs shall be made of aluminum or stainless steel. Coordinate with Architectural Drawings and details.

2.6 SLEEVES

A. Sleeves for Pipes through Non-fire Rated Floors: Form with 18 gage galvanized steel, tack welded to form a uniform sleeve.

B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe, Schedule 40.

C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated steel sleeves including seals, UL listed.

D. Sleeves for Round Ductwork: Form with galvanized steel.

E. Sleeves for Rectangular Ductwork: Form with galvanized steel.

F. Fire Stopping Insulation: Glass fiber type, non-combustible, U.L. listed.

G. Caulk: Paintable 25-year acrylic sealant.

H. Pipe Alignment Guides: Factory fabricated, of cast semi-steel or heavy fabricated steel, consisting of bolted, two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

2.7 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Design roof supports without roof penetrations, flashing or damage to the roofing material.

2.8 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Coordinate with Structural Engineer for placement of inserts.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4

inches.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

D. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. Verify with Structural Engineer prior to start of work.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
(Steel Pipe)		
1/2 to 1-1/4 inch	7'-0"	3/8"
1-1/2 to 3 inch	10'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(Copper Pipe)		
1/2 to 1-1/4 inch	5'-0"	3/8"
1-1/2 to 2-1/2 inch	8'-0"	3/8"
3 to 4 inch	10'-0"	3/8"
6 to 8 inch	10'-0"	1/2"
(Cast Iron)		
2 to 3 inch	5'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(PVC Pipe)		
1-1/2 to 4 inch	4'-0"	3/8"
6 to 8 inch	4'-0"	1/2"
10 and over	4'-0"	5/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow, and at the vertical to horizontal transition.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Install hangers with nut at base and above hanger; tighten upper nut to hanger after final installation adjustments.

J. Portable pipe hanger systems shall be installed per manufacturer's instructions.

K. Distances between supports are maximum distance. Supports shall be provided to carry the pipe/equipment load.

3.3 INSULATED PIPING: Comply with the following installation requirements.

A. Clamps: Attach galvanized clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

B. Saddles: Install galvanized protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation. Secure the full contact area of the saddle to the pipe insulation with 1/8" thick coat of mastic.

C. Shields: Install protective shields MSS Type 40 on cold and chilled water piping that has vapor barrier. Secure the full contact area of the shield to the pipe insulation with 1/8" thick coat of mastic.

D. Shields shall span an arc of 180 degrees and shall have dimensions in inches not less than the following:

NPS	LENGTH	THICKNESS
1/4 THROUGH 3-1/2	12	0.048
4	12	0.060
5 & 6	18	0.060
8 THROUGH 14	24	0.075
16 THROUGH 24	24	0.105

E. Piping 2" and larger: provide galvanized sheet metal shields with calcium silicate insulation at hangers/supports.

F. Insert material shall be at least as long as the protective shield.

G. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk. Provide metal counter flash and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor, shower, mop sink, and all other drains watertight to adjacent materials.

E. Provide curbs for mechanical roof installations 8 inches minimum high above roofing surface. Contact Architect for all flashing details and roof construction. Seal penetrations watertight.

3.6 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Extend sleeves through floors minimum one inch above finished floor level. Caulk sleeves full depth with fire rated thermafiber and 3M caulking and provide floor plate.

C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with U.L. listed fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Fire protection sleeves may be flush with floor of stairways.

END OF SECTION

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. This Section and Section 23 02 00 – Basic Materials and Methods are part of each Division 23 Section which references the vibration control products specified herein.

1.2 WORK INCLUDED

A. Vibration and sound control products.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration control products of type, size, and capacity required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Vibration and sound control products shall conform to ASHRAE criteria for average noise criteria curves for all equipment at full load conditions.

C. Unless otherwise indicated, sound and vibration control products shall be provided by a single manufacturer.

1.4 SUBMITTALS

A. SHOP DRAWINGS: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Amber/Booth Company, Inc.

B. Mason Industries, Inc.

C. Kinetics Noise Control, Inc.

D. Vibration Eliminator Co., Inc.

2.2 GENERAL

A. Provide vibration isolation supports for equipment, piping and ductwork, to prevent transmission of vibration and noise to the building structure that may cause discomfort to the occupants.

B. Model numbers of Amber/Booth products are included for identification. Products of the additional manufacturers will be acceptable provided they comply with all the requirements of this specification.

2.3 FLOOR MOUNTED AIR HANDLING UNITS

A. Provide Amber/Booth CAL-2 aluminum housed isolators sized for 2" static deflection. Cast iron or steel housings may be used provided they are hot-dip galvanized after fabrication

B. If floor mounted air handling units are furnished with internal vibration isolation option, provide 2" thick Amber/Booth NRC ribbed neoprene pads to address high frequency breakout and afford additional unit elevation for condensate drains. Ribbed neoprene pads shall be located in accordance with the air handling unit manufacturer's recommendations.

2.4 SUSPENDED FANS AND FAN COIL UNITS

A. Provide Amber/Booth HS spring hangers sized for 1'' static deflection.

2.5 PIPING

A. Provide spring and rubber-in-shear hangers, Amber/Booth HRS in mechanical equipment rooms, for a minimum distance of 50 feet from isolated equipment for all chilled water and hot water piping 1-1/2'' diameter and larger. Springs shall be sized for 1'' deflection.

B. Floor supported piping is required to be isolated with Amber/Booth AW-1 open springs sized for 1'' deflection.

C. All condenser water piping shall be supported with Amber/Booth AW-1 with 1" deflection for floor or roof mounted piping and Amber/Booth HRS isolators with 1" deflectors for suspended piping.

D. Furnish line size flexible connectors at supply and return of pumps, Amber/Booth style 2800 single sphere EPDM construction, connector shall include 150 lb. cadmium plated carbon steel floating flanges.

2.6 CORROSION PROTECTION

A. All vibration isolators shall be designed and treated for resistance to corrosion.

B. Steel components: PVC coated or phosphate coated and painted with industrial grade enamel. Nuts, bolts, and washers: zinc-electroplated.

PART 3 - EXECUTION

3.1 All equipment shall be installed in accordance with the manufacturer's recommendations and printed installation instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturer's requirements.

3.3 If internal isolation option is used on air handling units, the mechanical contractor shall verify proper adjustment and operation of isolators prior to start-up. All shipping brackets and temporary restraint devices shall be removed.

3.4 The vibration isolation supplier shall certify in writing that he has inspected the installation and that all external isolation materials and devices are installed correctly and functioning properly.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. Section 23 02 00 – Basic Materials and Methods is included as a part of this Section as though written in full in this document.

1.2 SCOPE

Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

1.3 Refer to Architectural Sections for additional requirements.

PART 2 - PRODUCTS

2.1 VALVE AND PIPE IDENTIFICATION

A. Valves:

1. All valves shall be identified with a 1-1/2" diameter brass disc wired onto the handle. The disc shall be stamped with 1/2" high depressed black filled identifying numbers. These numbers shall be numerically sequenced for all valves on the job.
2. The number and description indicating make, size, model number and service of each valve shall be listed in proper operational sequence, properly typewritten. Three copies to be turned over to Owner at completion.
3. Tags shall be fastened with approved meter seal and 4 ply 0.018 smooth copper wire. Tags and fastenings shall be manufactured by the Seton Name Plate Company or approved equal.
4. All valves shall be numbered serially with all valves of any one system and/or trade grouped together.

B. Pipe Marking:

1. All interior visible piping located in accessible spaces such as above accessible ceilings, equipment rooms, attic space, under floor spaces, etc., shall be identified with all temperature pipe markers as manufactured by W.H. Brady Company, 431 West Rock Ave., New Haven, Connecticut, or approved equal.
2. All exterior visible piping shall be identified with UV and acid resistant outdoor grade acrylic plastic markers as manufactured by Set Mark distributed by Seton (Name plate Company Factory location 20 Thompson Road, Branford, Connecticut) or approved equal.
3. Generally, markers shall be located on each side of each and every partition, on each side of every tee, on each side of every valve and/or valve group, on each side of every piece of equipment, and, for straight runs, at equally spaced intervals not to exceed 75 feet. In congested area, marks shall be placed on each pipe at the points where it enters and leaves the area and at the point of connection of each piece of equipment and automatic control valve. All markers

shall have directional arrows.

4. Markers shall be installed after final painting of all piping and equipment and in such a manner that they are visible from the normal maintenance position. Manufacturer's installation instructions shall be closely followed.
5. Markers shall be colored per ANSI/OSHA Standards.

C. Pipe Painting:

1. All piping exposed to view shall be painted as indicated or as directed by the Architect in the field. Confirm all color selections with Architect prior to installation.

2.2 EQUIPMENT IDENTIFICATION

A. Mechanical equipment shall be identified by means of nameplates permanently attached to the equipment. Nameplates shall be engraved laminated plastic or etched metal. Submittals shall include dimensions and lettering format for approval. Attachment shall be with escutcheon pins, self-tapping screws, or machine screws.

PART 3 - EXECUTION

3.1 All labeling equipment shall be installed as per manufacturer’s printed installation instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Contractors price shall include all items required as per manufacturer’s requirements.

3.3 All piping shall be cleaned of rust, dirt, oil and all other contaminants prior to painting. Refer to Division 9 for Architect’s required paint system(s).

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. Section 23 02 00 – Basic Materials and Methods is included as a part of this Section as though written in full in this document.

1.2 RELATED DOCUMENTS

Approved submittal date on equipment installed, to accomplish the test procedures, outlined under paragraph 3.1 of this Section, will be provided by the Contractor.

1.3 DESCRIPTION

A. The TAB of the air conditioning systems shall be performed by an impartial technical firm hired by Owner whose operations are limited only to the field of professional TAB. The TAB work will be done under the direct supervision of a qualified engineer employed by the TAB firm.

B. The TAB firm will be responsible for inspecting, adjusting, balancing, and logging the date on the performance of fans, dampers in the duct system, and air distribution devices. The Contractor and the various Subcontractors of the equipment installed shall cooperate with the TAB firm to furnish necessary data on the design and proper applications of the system components and provide labor and material required to eliminate deficiencies or malperformance.

1.4 QUALITY ASSURANCE

A. QUALIFICATIONS OF CONTRACTOR PERSONNEL: Submit evidence to show that the personnel who shall be in charge of correcting deficiencies for balancing the systems are qualified. The Owner and Engineer reserve the right to require that the originally approved personnel be replaced with other qualified personnel if, in the Owner and Engineer's opinion, the original personnel are not qualified to properly place the system in condition for balancing.

B. QUALIFICATIONS OF TAB FIRM PERSONNEL:

1. A minimum of one registered Professional Engineer licensed in the State, is required to be in permanent employment of the firm.
2. Personnel used on the jobsite shall be either Professional Engineers or technicians, who shall have been permanent, full time employees of the firm for a minimum of six months prior to the start of Work for that specified project.
3. Evidence shall be submitted to show that the personnel who actually balance the systems are qualified. Evidence showing that the personnel have passed the tests required by the Associated Air Balance Council (AABC) shall be required.

C. CALIBRATION LIST: Submit to the Engineer for approval, a list of the gauges, thermometers, velometer, and other balancing devices to be used in balancing the system. Submit evidence to show that the balancing devices are properly calibrated

before proceeding with system balancing.

1.5 OPERATIONS PERSONNEL TRAINING

A. Provide a training session for the owner's operations personnel. Training session shall be performed by a qualified person who is knowledgeable in the subject system/equipment. Submit a training agenda two (2) weeks prior to the proposed training session for review and approval. Training session shall include at the minimum:

1. Purpose of equipment.
2. Principle of how the equipment works.
3. Important parts and assemblies.
4. How the equipment achieves its purpose and necessary operating conditions.
5. Most likely failure modes, causes and corrections.
6. On site demonstration.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SERVICES OF THE CONTRACTOR

A. The Drawings and Specifications have indicated valves, dampers, and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions. Install these devices in a manner that leaves them accessible, and provide access as requested by the TAB firm.

B. Have systems complete and in operational readiness prior to notifying the TAB firm that the project is ready for their services, and certify in writing to the Architect and Owner that such a condition exists.

C. As a part of the Work of this Section, make changes in the sheaves, belts, and dampers or the addition of dampers required for correct balance of the new work as required by the TAB firm, at no additional cost to the Owner.

D. Fully examine the existing system to be balanced, to determine whether or not sufficient volume dampers, balancing valves, thermometers, gauges, pressure and temperature taps, means of reading static pressure and total pressure in duct systems, means of determining water flow, and other means of taking data needed for proper water and air balancing are existing. Submit to the Engineer in writing a listing of omitted items considered necessary to balance existing systems. Submit the list and proposal as a cost add item.

E. Verify that fresh air louvers are free of blockage, coils are clean and fresh air ducts to each air handling unit have individually adjustable volume regulating dampers.

F. Provide, correct, repair, or replace deficient items or conditions found during the testing, adjusting, and balancing period.

G. In order that systems may be properly tested, balanced, and adjusted as specified, operate the systems at no expense to the Owner for the length of time necessary to properly verify their completion and readiness for TAB period.

H. Project construction schedules shall provide time to permit the successful completion of TAB services prior to Substantial Completion. Complete, operational readiness, prior to commencement of TAB services, shall include the following services of the Contractor:

1. Construction status of building shall permit the closing of doors, windows, ceilings installed and penetrations complete, to obtain project operating conditions.
2. AIR DISTRIBUTION SYSTEMS:
   a. Verify installation for conformity to design. Supply, return, and exhaust ducts terminated and pressure tested for leakage as specified.
   b. Volume and fire dampers properly located and functional. Dampers serving requirements of minimum and maximum outside air, return and relief shall provide tight closure and full opening, smooth and free operation.
   c. Supply, return, exhaust and transfer grilles, registers and diffusers shall be installed.
   d. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be blanked and sealed to eliminate excessive bypass or leakage of air.
   e. Fans (supply and exhaust) operating and verified for freedom from vibrations, proper fan rotation and belt tension; overload heater elements shall be of proper size and rating; record motor amperage and voltage and verify that these functions do not exceed nameplate ratings.
   f. Furnish or revise fan drives or motors as necessary to attain the specified air volumes.
   g. Verify exhaust and outside air flow values such that positive building pressure is achieved and maintained.
3. AUTOMATIC CONTROLS:
   a. Verify that control components are installed in accordance with project documents and functional, electrical interlocks, damper sequences, air and water resets, fire and freeze stats.
   b. Controlling instruments shall be functional and set for design operating conditions. Factory precalibration of room thermostats and pneumatic equipment will not be acceptable.
   c. The temperature regulation shall be adjusted for proper relationship between the controlling instruments and calibrated by the TAB Contractor. Advise Engineer of deficiencies or malfunctions.

I. Contractor shall repair any insulation removed from piping system by TAB Contractor during water balancing.

3.2 SERVICES OF THE TAB FIRM

A. The TAB firm will act as liaison between the Owner, Engineer, and the Contractor and inspect the installation of mechanical piping system, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems being retrofitted, repaired, or added under this Contract. The reinspection of the Work will cover that part related to proper arrangement and adequate provision for the testing and balancing and will be done when the Work is 80 percent complete.

B. Upon completion of the installation and start-up of the mechanical equipment, to check, adjust, and balance system components to obtain optimum conditions in each conditioned space in the building. Prepare and submit to the Engineer complete reports on the balance and operations of the systems.

C. Measurements and recorded readings of air, water, and electricity that appear in the reports will be done by the permanently employed technicians or engineers of the TAB firm.

D. Make an inspection in the building during the opposite season from that in which the initial adjustments were made. At the time, make necessary modifications to the initial adjustments required to produce optimum operation of system components to affect the proper conditions as indicated on the Drawings. At time of opposite season check-out, the Owner's representative will be notified before readings or adjustments are made.

E. In fan systems, the air quantities indicated on the Drawings may be varied as required to secure a maximum temperature variation of two degrees within each separately controlled space, but the total air quantity indicated for each zone must be obtained. It shall be the obligation of the Contractor to furnish or revise fan drive and motors if necessary, without cost to the Owner, to attain the specified air volumes.

F. Contractor shall utilize ultrasonic flow meter to balance water flow of existing water system if the original pressure drop data is not available. Contractor shall remove insulation as necessary to use flow meter.

G. Participate in the commissioning process, which shall include but not be limited to attending commissioning meetings, coordinating work with and completing checklists as required by the commissioning team.

3.3 PROFESSIONAL REPORT

A. Before the final acceptance of the report is made, the TAB firm will furnish the Engineer the following data to be approved by the Owner and Engineer:

1. Summary of main supply, return and exhaust duct pitot tube traverses and fan settings indicating minimum value required to achieve specified air volumes.
2. A listing of the measured air quantities at each outlet corresponding to the temperature tabulation as developed by the Engineer and TAB firm.
3. Air quantities at each return and exhaust air handling device.
4. Static pressure readings entering and leaving each supply fan, exhaust fan, filter, coil, balancing dampers and other components of the systems. Including the retrofit Work. These readings will be related to performance curves in terms of the CFM handled if available.
5. Motor current readings at each equipment motor on load side of capacitors. The voltages at the time of the reading shall be listed.
6. The final report shall certify test methods and instrumentation used, final velocity reading obtained, temperatures, pressure drops, RPM of equipment, amperage of motors, air balancing problems encountered, recommendations and uncompleted punch list items. The test results will be recorded on standard forms.
7. A summary of actual operating conditions shall be included with each system outlining normal and ventilation cycles of operation. the final report will act as a reference of actual operating conditions for the Owner's operating personnel.

3.4 BALANCING AIR CONDITIONING SYSTEM

A. GENERAL:

1. Place all equipment into full operation, and continue operating during each working day of balancing and testing. If the air conditioning system is balanced during Off-Peak cooling season Contractor shall return to rebalance air side system as required to put system in proper balance at that season.
2. The Contractor shall submit detailed balancing and recording forms for approval. After approval by the Engineer, prepare complete set of forms for recording test data on each system. All Work shall be done under the supervision of a

Registered Professional Engineer. All instruments used shall be accurately calibrated to within 1% of scale and maintained in good working order.

3. Upon completion of the balancing and testing, the TAB Contractor shall compile the test data in report forms, and forward five copies to the Engineer for evaluation.
4. The final report shall contain logged results of all tests, including such data as:
   a. Tabulation of air volume at each outlet.
   b. Outside dry bulb and wet bulb temperature.
   c. Inside dry bulb and wet bulb temperatures in each conditioned space room or area.
   d. Actual fan capacities and static pressures. Motor current and voltage readings at each fan.

B. AIR SYSTEMS: Perform the following operations as applicable to balance and test systems:

1. Check fan rotation.
2. Check filters (balancing shall be done with clean filters).
3. Test and adjust blower rpm to design requirements.
4. Test and record motor full load amperes.
5. Test and record system static pressures, suction and discharge.
6. Test and adjust system for design cfm, return air and outside air (±2%). Change-out fan sheaves as required to balance system.
7. Test and record entering air temperatures, db and wb.
8. Test and record leaving air temperatures, db and wb.
9. Adjust all zones to design cfm (±2%).
10. Test and adjust each diffuser, grille, and register to within 5% of design.

C. AIR DUCT LEAKAGE: (From SMACNA Duct Standards latest edition) Test all ductwork (designed to handle over 1000 CFM) as follows:

1. Test apparatus
   The test apparatus shall consist of:
   a. A source of high pressure air--a portable rotary blower or a tank type vacuum cleaner.
   b. A flow measuring device consisting of straightening vanes and an orifice plate mounted in a straight tube with properly located pressure taps. Each orifice assembly shall be accurately calibrated with its own calibration curve. Pressure and flow readings shall be taken with U-tube manometers.
2. Test Procedures
   a. Test for audible leaks as follows:
      1) Close off and seal all openings in the duct section to be tested. Connect the test apparatus to the duct by means of a section of flexible duct.
      2) Start the blower with its control damper closed.
      3) Gradually open the inlet damper until the duct pressure reaches 1.5 times the standard designed duct operating pressure.
      4) Survey all joints for audible leaks. Mark each leak and repair after shutting down blower. Do not apply a retest until sealants have set.
   b. After all audible leaks have been sealed, the remaining leakage should be measured with the orifice section of the test apparatus as follows:
      1) Start blower and open damper until pressure in duct reaches 50% in excess of designed duct operating pressure.
      2) Read the pressure differential across the orifice on manometer

No. 2. If there is no leakage, the pressure differential will be zero.

3) Total allowable leakage shall not exceed one (1) percent of the total system design air flow rate. When partial sections of the duct system are tested, the summation of the leakage for all sections shall not exceed the total allowable leakage.

4) Even though a system may pass the measured leakage test, a concentration of leakage at one point may result in a noisy leak which must be corrected.

D. DX SYSTEMS:

1. Test and record suction and discharge pressures at each compressor and record ambient air temperature entering the condensing coils.
2. Test and record unit full load amps and voltage.
3. Test and record staging and unloading of unit required by sequence of operation or drawing schedule.

E. Automatic temperature controls shall be calibrated; and all thermostats and dampers adjusted so that the control system is in proper operating condition, subject to the approval of the Engineer/Owner.

F. The TAB Contractor shall report to Engineer all air distribution devices or other equipment that operate noisily so that corrective measures may be implemented by the Contractor at no additional cost to the Owner or Architect/Engineer.

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. Section 23 02 00 - Basic Materials and Methods is included as a part of this Section as though written in full in this document.

1.2 WORK INCLUDED

A. Ductwork system insulation.

1.3 RELATED SECTIONS

A. Section 23 05 29 - Hangers and Support for HVAC Piping and Equipment

B. Section 23 05 53 – Identification for HVAC Piping and Equipment

C. Section 23 31 13 – Metal Ductwork

1.4 REFERENCE STANDARDS

A. ASTM International. (ASTM)

B. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE).

C. North American Insulation Manufacturers Association (NAIMA).

D. National Fire Protection Association (NFPA).

E. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

F. Underwriter's Laboratories (UL).

G. Underwriter's Laboratories Environmental (UL Environment).

1.5 QUALITY ASSURANCE

A. Installer’s Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.

B. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) that is UL Classified per UL 723 or with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

1. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.

C. Duct and plenum insulation shall comply with minimum R-value requirements of 2015 International Energy Conservation Code and ASHRAE 90.1 - 2013.

D. Adhesive and other material shall comply with NFPA and NBFU Standards No. 90A and 90B.

1.6 WARRANTY

A. Warrant the Work specified herein for one year against becoming unserviceable or causing an objectionable appearance resulting from either defective, or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to, the following:

1. Mildewing.
2. Peeling, cracking, and blistering.
3. Condensation on exterior surfaces.

1.7 SUBMITTALS

A. SHOP DRAWINGS: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in unopened containers with manufacturer's stamp, clearly labeled with flame and smoke rating, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water and chemical and mechanical damage. Do not install damaged or wet insulation; remove such from project site.

PART 2 - PRODUCTS

2.1 GENERAL DESCRIPTION

A. The type of insulation and its installation shall be in strict accordance with these specifications for each service, and the application technique shall be as recommended by the manufacturer. All insulation types, together with adhesives and finishes shall be submitted and approved before any insulation is installed.

B. A sample quantity of each type of insulation and each type of application shall be installed and approval secured prior to proceeding with the main body of the Work.

2.2 ACCEPTABLE MANUFACTURERS

A. Glass mineral wool materials shall be as manufactured by Knauf Insulation, Certain-Teed, Johns-Manville or Owens-Corning and shall have the same thermal properties, density, fire rating, vapor barrier, etc., as the types specified herein, subject to review by the Engineer. All glass mineral wool insulation shall be UL GREENGUARD Gold certified.

B. Adhesives shall be as manufactured by Minnesota Mining, Arabol, Benjamin-Foster, Armstrong or Insulmastic, Inc., and shall have the same adhesive properties, fire rating,

vapor seal, etc., as the types specified herein, subject to review by the Engineer.

C. Ceramic fiber materials shall be as manufactured by Primer Refractories, A.P. Green Refractories or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. All insulation shall be installed in accordance with the manufacturer's recommendations and printed installation instructions.

B. All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturer's requirements.

3.2 EXTERNAL DUCT INSULATION

A. Fasten all longitudinal and circumferential laps with outward clinching staples 3" on center. On rectangular ducts over 24" wide apply as above and hold insulation in place on bottom side with mechanical pins and clips on 12" centers.

B. Seal all joints, fastener penetrations and other breaks in vapor barrier with 3-inch wide strips of white glass fabric embedded between two coats of vapor barrier mastic, Childers CP-30 or approved equal.

C. All external duct insulation shall be Knauf Insulation Atmosphere Duct Wrap with ECOSE Technology, Johns Manville Microlite EQ duct wrap insulation with reinforced aluminum facing or approved equal.

D. External duct wrap is required on all outside air ducts, supply and return air ducts that are not internally insulated. External duct wrap is also required on all exhaust and relief air ducts that are used in airside energy recovery systems. Any exhaust ductwork located in an unconditioned space shall also be provided with external duct wrap. Duct wrap shall be provided as follows:

1. 1½” thick, 1.0 PCF density minimum; minimum installed R-value of 4.2 when ducts are located in conditioned spaces.
2. 2” thick with a minimum installed R-value of 6 when ducts are located in unconditioned spaces, such as ceiling plenum space.

E. Any ductwork located in an air plenum that is comprised of materials that do not comply with the 25/50 flame and smoke rating per ASTM E 84 testing requirements shall be provided with a single layer of duct wrap to establish a noncombustible rating per ASTM E 136. Duct wrap products which are approved for such non-compliant combustible duct materials located in air plenums shall be 3M Fire Barrier Plenum Wrap 5A+ or Unifrax FyreWrap 0.5 Plenum. Insulation products for this application shall be installed in strict accordance with the manufacturer’s instructions.

3.3 DUCT LINER

A. Duct liner shall be kept clean and dry during transportation, storage, installation, and throughout the construction process care should be taken to protect the liner from exposure to the elements or damage from mechanical abuse.

B. All portions of duct designed to receive duct liner shall be completely covered with liner

as specified. The smooth, black, mat facing or acrylic-coated surfaces with flexible glass cloth reinforcement shall face the airstream. All duct liner shall be cut to assure tight, overlapped corner joints. The top pieces shall be supported by the sidepieces. Duct liner shall be installed following the guidelines in the NAIMA “Duct Liner Installation Standard”.

C. The duct liner shall be tested according to erosion test method in ASTM C 1071 and shall be guaranteed to withstand velocities in the duct system up to 6000 fpm without surface erosion.

D. Duct liner shall be adhered to the sheet metal with full coverage of an approved adhesive that conforms to ASTM C 916, and all exposed leading edges and transverse joints shall be coated with Permacote factory-applied or field-applied edge coating and shall be neatly butted without gaps. Shop or field cuts shall be liberally coated with Johns Manville SuperSeal® duct butter and Edge Treatment or approved adhesive.

E. Metal nosings shall be securely installed over transversely oriented liner edges facing the airstream at forward discharge and at any point where lined duct is preceded by unlined duct.

F. When velocity exceeds 4000 fpm (20.3 m/sec), use metal nosing on every leading edge. Nosing may be formed on duct or be channel or zee attached by screws, rivets or welds.

G. The liner shall further be secured with Graham welding pins and washers on not more than 18 inch centers both vertical and horizontal surfaces, and the pins and washers shall be pointed up with adhesive.

H. Duct liner shall be Knauf Insulation Atmosphere Duct Liner with ECOSE Technology, Johns Manville Linacoustic RC duct liner with factory-applied edge coating and acrylic coating on the mat surface of airstream side or approved equal. The liner shall meet the Life Safety Standards as established by NFPA 90A and 90B, FHC 25/50 and Limited Combustibility and the air stream surface coating should contain an immobilized, EPA-registered, anti-microbial agent so it will not support microbial growth as tested in accordance with ASTM G21 and G22. The duct liner shall conform to the requirements of ASTM C 1071, UL 2824, with an NRC not less than .70 as tested per ASTM C 423 using a Type “A” mounting, and a thermal conductivity no higher than 0.24 BTU•in/(hr•ft^2•°F) at 75°F mean temperature.

I. Line supply and return ductwork at connection of HVAC unit to a point of 15 feet upstream and downstream of the equipment and in return air boots. Attach with full cover coat of cement, duct dimensions up to 16 inches; provide stick clips or screws and cap for dimensions over 16 inches, spaced 16 inches o.c. maximum. Provide sheet metal liner cap over all leading edges of internal insulation exposed to air stream.

J. Duct liner shall be provided as follows:

1. 1” Thick, 1.5 PCF density minimum; minimum installed R-value of 4.2 when ducts are located in conditioned spaces.
2. 1 ½” Thick with a minimum installed R-value of 6 when ducts are located in unconditioned spaces, such as ceiling plenum space.
3. 2” Thick with a minimum installed R-value of 8 when ducts are located outdoors.

3.4 AIR DEVICE AND MISCELLANEOUS DUCT INSULATION

A. The backside of all supply air devices shall be insulated with taped and sealed 1½ inch thick external duct wrap.

B. The contractor shall install an additional layer of 1-½ inch thick external glass mineral wool duct wrap on any portion of the supply air, return air, outside air, or exhaust air system that has condensation forming during any period of operation. The insulation shall be taped and vapor-sealed and located until all evidence of the condensation has been eliminated, at no additional cost to the Owner.

3.5 KITCHEN GREASE HOOD EXHAUST DUCT

A. All type I kitchen range hood exhaust duct shall be enclosed with 2-hour fire rated enclosure.

B. The duct enclosure shall be sealed around the duct at the points of penetration with an approved fire barrier sealant per ASTM E 1966. Sealant shall be 3M CP 25WB+ or 303 fire barrier caulk and putty.

C. The enclosure shall be separated from the duct by at least 3 inches and not more than 12 inches.

D. Cleanout openings at exhaust duct with access openings at the fire rated enclosure and access doors shall be provided at each duct offset and as required for proper operation and maintenance.

E. As an alternate method, the contractor may use two layers of 2-hour fire rated duct wrap such as 3M Fire Barrier Duct Wrap 615+ or Unifrax FyreWrap Elite 1.5 in lieu of the fire rated enclosure, provided that all the following constraints are satisfied:

   a. Duct wrap system shall be tested per ASTM E 2336 internal fire testing and have an achieved minimum fire resistance rating of 2 hours.
   b. Product shall be approved by the local Authority Having Jurisdiction (AHJ).
   c. Duct wrap system shall be mechanically attached to the duct using steel banding and/or weld pins per manufacturer's instructions.
   d. Duct wrap system shall be installed in strict accordance with the manufacturer's instructions, including but not limited to zero clearance to combustibles at all locations on the wrap surface.

F. Insulation and all other requirements shall be provided per local codes.

3.6 DRYER VENT DUCT

A. All dryer vent duct routed within an air plenum shall be enclosed within a 1-hour fire rated enclosure.

B. The duct enclosure shall be sealed around the duct at the points of penetration with an approved fire barrier sealant per ASTM E 1966. Sealant shall be 3M CP 25WB+ or 303 fire barrier caulk and putty.

C. The enclosure shall be separated from the duct by at least 3 inches and not more than 12 inches.

D. Cleanout openings at exhaust duct with access openings at the fire rated enclosure and access doors shall be provided at each duct offset and as required for proper operation and maintenance.

E. As an alternate method, the contractor may use a single layer of 1-hour fire rated duct wrap such as 3M Fire Barrier Duct Wrap 615+ or Unifrax FyreWrap Elite 1.5 in lieu of the

fire rated enclosure, provided that all the following constraints are satisfied:

a. Duct wrap system shall be tested per ASTM E 2336 internal fire testing and have an achieved minimum fire resistance rating of 1 hour.
b. Product shall be approved by the local Authority Having Jurisdiction (AHJ).
c. Duct wrap system shall be mechanically attached to the duct using steel banding and/or weld pins per manufacturer's instructions.
d. Duct wrap system shall be installed in strict accordance with the manufacturer's instructions, including but not limited to zero clearance to combustibles at all locations on the wrap surface.

F. Insulation and all other requirements shall be provided per local codes.

END OF SECTION

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. Section 23 02 00 – Basic Materials and Methods is included as a part of this Section as though written in full in this document.

1.2 SCOPE

A. Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for Owner's use.

B. Furnish and install piping insulation to:

1. Chilled water and heating hot water piping.
2. Condensate drain piping.
3. Refrigerant piping.
4. All pipes subject to freezing conditions shall be insulated.

C. Work specified elsewhere.

1. Painting.
2. Pipe hangers and supports.

D. For insulation purpose piping is defined as the complete piping system including supplies and returns, pipes, valves, automatic control valve bodies, fittings, flanges, strainers, thermometer well, unions, reducing stations, and orifice assemblies.

1.3 RELATED SECTIONS

A. Section 23 05 29 - Hangers and Support for HVAC Piping and Equipment

B. Section 23 05 53 – Identification for HVAC Piping and Equipment

1.4 REFERENCE STANDARDS

A. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE).

B. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

C. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

D. ASTM C1126 - Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

E. ASTM C1136 - Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

F. North American Insulation Manufacturers Association (NAIMA).

G. National Fire Protection Association (NFPA).

H. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

I. Underwriter's Laboratories (UL).

J. Underwriter's Laboratories Environmental (UL Environment).

1.5 WARRANTY

A. Warrant the Work specified herein for one year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.

B. Defects shall include, but not be limited to, the following:

1. Mildewing.
2. Peeling, cracking, and blistering.
3. Condensation on exterior surfaces.

1.6 SUBMITTALS

A. SHOP DRAWINGS: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, project variations, and accessories.

1.7 DELIVERY AND STORAGE

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in unopened containers with manufacturer’s stamp, clearly labeled with flame and smoke rating, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water and chemical and mechanical damage. Do not install damaged or wet insulation; remove such from project site.

PART 2 - PRODUCTS

2.1 It is the intent of these specifications to secure superior quality workmanship resulting in an absolutely satisfactory installation of insulation from the standpoint of both function and appearance. Particular attention shall be given to valves, fittings, pumps, etc., requiring low temperature insulation to insure full thickness of insulation and proper application of the vapor seal. All flaps of vapor barrier jackets and/or canvas covering must be neatly and securely smoothed and sealed down.

2.2 The type of insulation and its installation shall be in strict accordance with these specifications for each service, and the application technique shall be as recommended by the manufacturer. All insulation types, together with adhesives and finishes shall be submitted and reviewed prior to installation.

2.3 A sample quantity of each type of insulation and each type application shall be installed and accepted prior to proceeding with the main body of the work. Condensation caused by improper installation of insulation shall be corrected by Installing Contractor. Any damage caused by condensation shall be made good at no cost to the Owner or Architect/Engineer.

2.4 All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to insulation) fire and smoke hazard as tested by Procedure ASTM E 84, NFPA 255 and UL 723 not exceeding:

Flame Spread 25
Smoke Developed 50

2.5 All HVAC piping insulation shall comply with minimum requirements of 2015 International Energy Conservation Code and ASHRAE 90.1 - 2013.

2.6 Accessories, such as adhesives, mastics and cements shall have the same component ratings as listed above.

2.7 All products or their shipping cartons shall have a label affixed, indicating flame and smoke ratings do not exceed the above requirements.

2.8 Any piping located in an air plenum that is comprised of materials that do not comply with the 25/50 flame and smoke rating per ASTM E 84 testing requirements shall be provided with a single layer of high-temperature insulation to establish a noncombustible rating per ASTM E 136. Insulation products which are approved for such non-compliant combustible piping materials located air plenums shall be 3M Fire Barrier Plenum Wrap 5A+ or Unifrax FyreWrap 0.5 Plenum. Insulation products for this application shall be installed in strict accordance with the manufacturer's instructions.

2.9 APPROVED MANUFACTURERS

A. Calcium silicate materials shall be as manufactured by Johns Manville.

B. Glass mineral wool materials shall be as manufactured by Knauf Insulation, Johns Manville or Owens-Corning and shall have the same thermal properties, density, fire rating, vapor barrier, etc., as the types specified herein, subject to review by the Engineer. All glass mineral wool insulation shall be UL GREENGUARD Gold certified.

C. Adhesives shall be as manufactured by Childers, Foster, HB Fuller or Armacell, and shall have the same adhesive properties, fire rating, vapor seal, etc., as the types specified herein, subject to review by the Engineer.

D. Flexible elastomeric cellular thermal insulation by Armacell.

E. Phenolic foam insulation shall be as manufactured by Resolco, Inc. (Insul-Phen) or Polyguard (Poly-phen).

F. Metal jacketing and fitting covers shall be as manufactured by Childers or RPR Products.

2.10 MATERIALS

A. CONDENSATE DRAINAGE PIPING: Provide flexible elastomeric cellular thermal insulation in accordance with ASTM C534, model "AP-2000", fire rated for use in environmental air plenums; insulation not required when piping is exposed on roof.

B. METAL JACKETING: Utilize Childers "Strap-On" jacketing. Provide preformed fitting covers for all elbows and tees.

C. ALL SERVICE JACKETING (ASJ): Vapor retarder jacket for interior applications shall be composed of an aluminum foil layer, reinforced with glass scrim, bonded to a layer of

white kraft paper, interleaving with an outer polymer film leaving no paper exposed; complying with ASTM C 1136. Vapor retarder jacket for exterior applications shall be composed of a 3-ply composite membrane consisting of a white 0.5 mil polyester film, 1.0 mil aluminum foil, and one 0.5 mil clear polyester film; complying with ASTM C 1136.

PART 3 - EXECUTION

3.1 All insulation shall be installed in accordance with the manufacturer's recommendations and printed installation instructions, including high density inserts at all hangers and pipe supports to prevent compression of insulation.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturer's requirements.

3.3 All heat recovery piping between air conditioning equipment and hydronic or domestic hot water piping shall be insulated per the High Temperature Surfaces Schedule in Part 4.

3.4 All condenser water piping located in a ceiling plenum shall be insulated per the Low Temperature Surfaces Schedule in Part 4.

3.5 Pipes located outdoors or in tunnels shall be insulated same as concealed piping and shall have a jacket of 0.016 inch thick, smooth aluminum with longitudinal modified Pittsburg Z-Lock seam and 2 inch overlap. Jacketing shall be easily removed and replaced without damage. All insulation butt joints shall be sealed with gray silicone. Galvanized banding is not acceptable.

3.6 All insulated piping located over driveways shall have an aluminum shield permanently banded over insulation to protect it from damage from car antennas.

3.7 WATER PIPE INSULATION INSTALLATION

A. The insulation shall be applied to clean, dry pipes with all joints firmly butted together. Where piping is interrupted by fittings, flanges, valves or hangers and at intervals not to exceed 25 feet on straight runs, an isolating seal shall be formed between the vapor barrier jacket and the bare pipe. The seal shall be by the applications of adhesive to the exposed insulation joint faces, carried continuously down to and along 4 inches of pipe and up to and along 2 inches of jacket.

B. Pipe fittings and valves shall be insulated with pre-molded or shop fabricated glass mineral wool covers finished with two brush coats of vapor barrier mastic reinforced with glass fabric.

C. All under lap surfaces shall be clean and free of dust, etc. before the Joint is sealed. These laps shall be firmly rubbed to insure a positive seal. A brush coat of vapor retarder shall be applied to all edges of the vapor barrier jacket.

3.8 FIRE RATED INSULATION

A. All pipe penetrations through walls and concrete floors shall be fire rated by applying USG Thermafiber in the space between the concrete and the pipe.

B. The penetration shall be additionally sealed by using 3M brand model CP 25 or 303 fire barrier caulk and putty.

C. All fire rating material shall be insulated in accordance with manufacturer's printed instructions.

PART 4 - SCHEDULES

4.1 Provide all HVAC piping insulation to comply with the ASHRAE 90.1 Minimum Thickness Schedule.

4.2 LOW TEMPERATURE SURFACES	**MINIMUM INSULATION THICKNESS**
A. Condensate drain lines:	1 inch

END OF SECTION

SECTION 23 09 63

ENERGY MANAGEMENT AND CONTROL SYSTEM (EMCS)

PART 1 - GENERAL

1.1 GENERAL

A. The Energy Management and Control System **(EMCS)** shall be comprised of a Local Area Network **(LAN)** infrastructure, Operator Workstations **(OWS)**, Engineering Workstations **(EWS)**, a Primary Network Server **(PNS)**, Network Area Controllers **(NAC)**, Application Specific Controllers **(ASC)**, Unitary System Controllers **(USC)**, and Field Devices installed within the facility.

B. The Workstations, Primary Network Server, and Network Area Controllers shall be connected by a EMCS Contractor supplied and installed Local Area Network. The LAN shall comply with all IEEE Standards as outlined in: IEEE STD 802-1990: IEEE Standards for Local and Metropolitan Networks, Overview and Architecture.

C. If the EMCS contractor wishes to connect to the Owner's Wide Area/Local Area Network as part of the control system network, the EMCS contractor shall acquire permission in writing and include the letter in the submittal. Any system that requires connection to the owner's network for communication between NAC, ASC, USC and/or field devices that is submitted without the written permission from the owner shall be rejected. The EMCS Contractor shall coordinate with the Owner and supply all required information.

D. Access to the system, either locally in the building, or remotely from a central site or sites, shall be accomplished through standard web browsers, via the Internet and/or a local area network.

E. All EMCS controllers and workstations shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2010, latest revision. Management level TCP/IP Ethernet network speeds shall be 1 Gbps minimum and the Automation Level MS/TP network speeds shall be 76.8 Kbps minimum.

F. The Server shall gather data from the system and generate HTML pages accessible through a conventional web browser from all personal computers (PCs) connected to the network. System shall include any and all software and hardware to support at least 50 simultaneous users. The EMCS shall be compatible with all common web browsers.

G. Facility Operators shall be able to view and configure systems through the standard web browser and all graphical/data representations shall appear identical, whether the user is on site or viewing via the Internet at a remote location. Standard operator functions such as control point manipulation, configuration and viewing of trends, schedules and alarms shall be performed through the standard browser. Each mechanical system and building floor plan shall be depicted on the operator workstation by point-and-click graphics.

H. The EMCS shall directly control HVAC equipment as specified in the Sequence of Operations. Furnish Energy Conservation features such as Optimal Start/Stop, Night Setback, Setpoint Reset logic, and Demand Control Ventilation.

I. The EMCS vendor shall provide the following additional services as part of this specification: warranty and service during the warranty period; submittals, samples and record documentation; comprehensive startup and testing of the EMCS with documentation; training services for the owner and facility operators; coordination with

other contractors and suppliers; operator and technician training program, and shall cooperate fully with the Project Commissioning Agent.

J. Products furnished under this specification but installed by other.

1. Mechanical devices installed under Division 23 by the mechanical contractor or other suppliers: temperature sensing thermowells; automatic control valves; pipe taps for flowmeters; water pressure sensors and switches; automatic control dampers not installed in air handling unit mixing boxes or louver schedules; damper actuators for variable air volume (VAV) terminal units; mounting cost of controller and actuator for VAV terminal units.
2. Electrical devices installed under Division 26 by the electrical contractor:

    a. 120 VAC power to controllers and control panels at locations indicated on the drawings. Review and verify that these locations are adequate for the proposed EMCS.
    b. Interlock wiring to duct mounted smoke detector or fire alarm shutdown relays to HVAC equipment motor starters and variable frequency drives (VFD).

K. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.

1.2 RELATED DOCUMENTS & REFERENCES

A. Drawings and general provisions of the contract documents, apply to this section including:

1. Division 01 for General Conditions and Supplementary Conditions.
2. Division 21 for fire protection equipment.
3. Division 22 for plumbing equipment and domestic water systems.
4. Division 23 for mechanical equipment, ductwork, and piping systems.
5. Division 26 for electrical equipment, lighting control, and fire alarm systems.

B. The latest edition of the following standards and codes in effect as approved by the authority having jurisdiction and amended as of supplier's proposal date, and any applicable subsections thereof, shall govern design and selection of equipment and material supplied:

1. ANSI MC85.1 - Terminology for Automatic Control.
2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
3. ANSI/ASHRAE Standard 135-2010, BACnet.
4. BTL Mark by the BACnet Testing Laboratories.
5. Uniform Building Code (UBC), including local amendments.
6. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
7. National Electrical Code (NEC).
8. FCC Part 15, Subpart J, Class A.
9. National Institute of Standards and Technology (NIST).
10. IEEE STD 802-1990: IEEE Standards for Local and Metropolitan Networks, Overview and Architecture.

1.3 RELATED WORK IN OTHER SECTIONS

A. Refer to Division 00 and Division 01 for allowances and related contractual requirements.

B. Refer to Division 21 for General Fire Protection Provisions and fire suppression pump.

1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP acceptable if IP interface is not available from equipment manufacturer.
2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.

C. Refer to Division 22 for General Plumbing Provisions, domestic water heating systems, domestic water pumping systems, and domestic water metering.

1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP acceptable if IP interface is not available from equipment manufacturer.
2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.

D. Refer to Division 23 for General Mechanical Provisions for equipment such as chillers, cooling towers, boilers, pumps, air-handling units, terminal units, ventilation fans, variable frequency drives, unitary AC units, etc.

1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP acceptable if IP interface is not available from equipment manufacturer.
2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.

E. Refer to Section 26 for General Electrical Provisions for equipment such as electrical switchgear control, electrical power monitoring, emergency generators, lighting control system, etc.

1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP acceptable if IP interface is not available from equipment manufacturer.
2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.

1.4 ELECTRICAL POWER PROVISIONS

A. Primary power will be provided under Division 26 by the electrical contractor to the panel locations indicated on the mechanical & electrical drawings. Provide step down transformers within panel enclosures. Provide all necessary fuses and circuit protection devices.

B. Power will be provided to the controllers serving fan powered terminal units with electric heat via the control transformer provided with the unit.

C. All components of the EMCS shall be powered from the sources above. Provide final terminations from the locations indicated on the Division 23 Drawings.

D. The EMCS Contractor shall provide any additional control power that is required as part of this contract and not indicated by other. This shall include all conduit, cabling, circuit breakers, etc.

1.5 CONTRACTOR QUALIFICATIONS

A. The EMCS Contractor shall:

1. Have a local staff of trained personnel capable of giving instructions and providing routine and emergency maintenance on the EMCS, all components and software/firmware and all other elements of the EMCS.
2. Have a proven record of experience in the supply and installation of equivalent BACnet systems over a minimum period of five years. Provide documentation of at least three equal and complexity, if so requested by the Owner's Representative.
3. Be a factory certified representative of the native BACnet EMCS manufacturer for design, installation, and service of the proposed system.
4. Have comprehensive local service, training and support facilities for the total EMCS as provided. Maintain local, supplies of essential expendable parts.

1.6 SUBMITTALS

A. ALL DOCUMENTS SUBMITTED SHALL BE IN NATIVE PDF FORMAT. NO SCANS.

B. Shop Drawings:

1. The following information shall be included on the cover page for each shop drawing and equipment documentation submittal:

    a. Project name with date. Refer to the applicable specifications by name and number.
    b. Provide submittal number and re-submittal number and date as applicable.
    c. Provided name and address of Consulting Engineer, Mechanical Contractor, General Contractor

2. Shop drawings shall be CAD generated, plot size of 8-1/2" x 11" or 11" x 17". Drawings shall include diagrams, mounting instructions, installation procedures, equipment details and software descriptions for all aspects of the system to be installed.
3. Provide schematic of systems indicating instrumentation locations, all interconnecting cables between supplied cabinets on a mechanical floor plan.
4. Software specifications and descriptions including operating sequences.
5. Provide a bill of material that indicates specific manufacturer, part number, part description and quantity of each device for all system components.
6. Provide a list of the wire labels to be installed on each end of the control wiring, at the device and the control panel terminal. Labels shall be machine generated, typed and legible with a maximum of 17 characters. The label description "AHU-1 SAT" shall indicate the supply air temperature of AHU-1.
7. Equipment Schematic: Provide an electronic equipment schematic for each piece of mechanical equipment. The schematic shall display all mechanical equipment characteristics including fans, dampers, valves, sensors and other applicable control devices. The schematic shall show wiring terminations to each control

device as shown in the submittal and as-build documentation. Control devices shall be labeled by a symbol that can easily be identified in a bill of material that is shown on this graphic. The bill of material shall show the device symbol, description, manufacture and part number.

8. Sequence of Operations: The control sequences shall be viewable for each piece of mechanical equipment and be in a text format as shown in the as built documentation. The sequence of operations shall be selectable at the applicable location for the control program.

C. Control component submittals:

1. Component technical data sheets with mounting and installation details.
2. The documentation shall include comprehensive and complete details of the BIBB and automation level documentation including address, associated controller type, etc. as required and for the interface to the EMCS.
3. Details of networks/communications equipment, cabling and protocols proposed. Provide schedule of cabling including details of proposed cable types.
4. Module Drawing: Provide an electronic wiring diagram of each control module (as shown in submittal documentation). Diagram shall display wiring schematic and terminations to end devices. Diagram shall display each input and output terminals and label those that are used for the control application. Diagram shall display module type/name and network address.
5. Field sensor and instrumentation specification sheets. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
6. Schedule and specification sheets for dampers, valves and actuators.
7. Design and provide layout of all components of panel mounted control devices, terminal strips and power supplies.

D. Colorgraphics: Provide sample layout of color graphic representations of the systems for review. The submittal shall indicate the quality of the graphic to be provided with the system with a sample of the specific control points to be included. Control points shall as a minimum include points indicated in the input/output summary, control schematic and primary controlling points defined in the sequences of operation. Provide a sample of a floor plan layout, typical AHU, terminal unit, outside air pretreatment unit, variable frequency drive, exhaust/supply fan, chiller plant and hot water plant. For control points to be provided by equipment BACnet integration provide sample of the control points, up to 25 total.

E. Verification Reports. The submittal shall include a sample of the verification reports to be utilized during the verification section of this specification. Sample reports shall be approved as submitted or be modified by the engineer or owner's representative. The verification reports shall be included in the final Operation & Maintenance Manuals. Reports shall be provided in electronic PDF format.

1. Project Systems Verification Form for each controller.

   a. General information for each form shall include: project name; associated equipment with mark number; control panel number and location; controller number and model number; controller device instance number (address); MS/TP LAN segment number; verifying technician and date.
   b. Each connected control point and device shall contain the following columns with a separate line for each connected physical point: point description (same as device label); input/output number for each connected control device (AI-XX, AO-XX, DI-XX, or DO-XX).
   c. Check boxes confirming that the verification tasks have been completed:

device location, proper termination at device; proper termination at control panel; sequence is verified; point trend is enabled.

d. Data entry boxes indicating measured/confirmed values: preliminary control point value on the graphic; observed control point value; calibration or adjustment value to correct offset; final displayed point value on the color-graphic; date of verification; engineer or owner's representative verification.

2. Control Panel Verification Form for each control panel.

a. General information: panel location and identification number; panel dimensions and NEMA rating; panel properly installed; Class 1 and Class 2 wiring are properly separated; correct voltage to the panel; no shorts or grounds in panel; no induce voltages in panel wiring; point to point termination match submittal; devices are mounted in the correct location; controller software revision number; address of controllers; panel device checkout is complete; panel startup is complete.

3. **Sequence of Operation Verification Form** per piece of equipment (AHU, VAV, chiller, boiler, etc.).

a. General information: project name; system identifier; building area served; control panel and controller numbers; controller model number and instance number (address); MS/TP LAN segment number; name of verifying technician and date.

b. Each step of the sequence of operation for each piece of equipment shall be documented shall include a "description of test", "input to trigger test" and "expected outcome". A pass/fail checkbox shall indicate each of these actions. Provide space for technician approval with associated date.

F. Operating and Maintenance (O&M) manuals: Provide O&M manual with full information to allow the owner to operate, maintain and repair installed products. Include trade names with model numbers, color, dimensions and other physical characteristics.

1. Format: Produce on 8-1/2 x 11-inch pages, and bind in 3-ring/binders with durable plastic covers. Label binder covers with printed title "OPERATION AND MAINTENANCE MANUAL", title of project, and subject matter and "Number _ of _" of binder. Provide substantial dividers tabbed and titled by section/component number.

2. Table of Contents for each volume:

a. Part 1: Directory with name, address and telephone number of Designer, Contractor and Subcontractors and Suppliers for each Project Manual section.

b. Part 2: Operation and maintenance instructions, arranged by Project Manual Section number where practical and where not, by system. Include:

3. Product design criteria, functions, normal operating characteristic and limiting conditions. Installation, alignment, adjustment, checking instructions and troubleshooting guide. Operating instructions for start-up, normal operation, regulation and control, normal shutdown and emergency shutdown. Test data and performance curves.

4. Spare parts list for operating products, prepared by manufacturers including detailed drawings giving location of each maintainable part, lists of spares recommended for user- service inventory and nearest source of in-stock spares.

G. Record Documentation:

1. Details of all alarm, diagnostic, error and other messages. Detail the Operator action to be taken for each instance.
2. Detail special programs provided and provide a complete programming instruction manual. Detail operation of all software applications.
3. Detailed list of the database for all installed devices.
4. Record drawings shall be CAD generated and shall include final locations and point ID for each monitored and controlled device.
5. In additional to the required hard-copies, provide a CD-ROM with all of the record documentation in PDF format and a CD-ROM containing backup copies of all installed software and graphics.
6. Online as-built documentation: provide digital replications of as-builts that shall be accessible from each equipment graphic controlled or monitored by the EMCS.

1.7 WARRANTY

A. Warranty work and the equipment provided under this contract shall be for a period of one year from the date of Substantial Completion. Warranty shall cover all components, system software, parts and assemblies supplied by this contractor and shall be guaranteed against defects in materials and workmanship for one (1) year from the date of Substantial Completion. Labor to troubleshoot, repair, reprogram or replace system components that have failed due to defects in materials and workmanship shall be provided by this contractor at no charge to the owner during the warranty period. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks. All warranty work shall be performed by the EMCS contractor's local service group.

B. Warranty shall not include routine maintenance, e.g., equipment cleaning, mechanical parts lubrication, pilot lamp replacement, operational testing, etc. Warranty shall not cover repair or replacement of equipment damaged by under- or over-voltage, misuse, lack of proper maintenance, lightning, water damage from weather or piping failure.

C. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the EMCS contractor. The maximum acceptable response time to provide this service at the site shall be 24 hours, during normal working hours.

1.8 OPERATIONS PERSONNEL TRAINING

A. Provide a training session for the owner's operations personnel. Training session shall be performed by a qualified person who is knowledgeable in the subject system/equipment. Submit a training agenda two (2) weeks prior to the proposed training session for review and approval. Training session shall include at the minimum:

1. Purpose of equipment.
2. Principle of how the equipment works.
3. Important parts and assemblies.
4. How the equipment achieves its purpose and necessary operating conditions
5. Most likely failure modes, causes and corrections.
6. On site demonstration that includes hands-on demonstration of the manipulation of setpoints, schedules and other adjustable elements of the system.
7. The demonstration shall be on the actual, completed graphic interface pages for the specific project.

B. Provide a second training session 3 months after initial session for any follow-up or additional training requested by owner's personnel. Allow 3 hours for the second training session.

1.9 OPERATOR WORKSTATION (OWS)

A. The Operator Workstation shall be any personal computer, connected to the LAN, with appropriate web browser software installed.

1.10 ENGINEERING WORKSTATION (EWS)

A. The Engineering Workstation shall be any personal computer, connected to the LAN, with a registered copy of the EMCS contractor supplied engineering and/or programming software installed. The EMCS contractor shall provide at least one copy of all required software(s), to enable the Owner complete editing/programming functions of all controllers, graphics, and control logic.

B. The EMCS shall provide one personal computer (PC) which is compatible with the performance required by the EMCS Engineering Software if an engineering workstation is specified for the system.

PART 2 - PRODUCTS

2.1 ACCEPTABLE EMCS VENDORS

A. ALERTON - Climatec

2.2 PRIMARY NETWORK SERVER (PNS)

A. The EMCS Contractor shall provide and install the Primary Network Server as part of this system. The PNS shall utilize the Internet and provide efficient integration of standard open protocols. The PNS shall maintain comprehensive database management, alarm management and messaging services, and graphical user interface as follows:

1. Support an unlimited number of users over the Internet/intranet with a standard web browser to access alarms, trend logs, graphics, schedules and configuration data. Access to the PNS shall be password protected utilizing authentication and encryption techniques. An audit trail of database changes indicating user, time stamp, and audit action shall be provided.
2. Enterprise level information exchange using an SQL database and HTTP/HTML/XML text formats.
3. Synchronize controller databases, database storage scheduling, control and energy management routines
4. Alarm processing and routing which includes email, SMS text messages and paging.
5. HTML based help system that includes comprehensive online system documentation.
6. Support of multiple Network Area Controllers (NAC) connected to a Local Area Network.

B. Server Functions

1. It shall be possible to access all Network Area Controllers (NAC) via a single connection to the server through the Ethernet LAN. In this configuration, each Network Area Controller can be accessed from a single user login.

2. The PNS shall provide the following functions, at a minimum:

    a. The server shall provide complete access to distributed global data. The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
    b. The server shall include a master clock service for its subsystems and provide time synchronization for all NACs.
    c. The server shall provide scheduling for all NACs and their underlying field control devices.
    d. The server shall provide demand limiting control that operates across all NACs. The network server shall be capable of multiple demand limiting programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
    e. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to NACs. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
    f. The server shall provide central alarm management for all NACs supported by the server. Alarm management shall include: routing of alarms to a video display, a printer, an email and pager; view and acknowledge alarms; query alarm logs based on user-defined parameters
    g. The server shall provide central management of logged data for all NACs supported by the server. Logged data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include: viewing and printing log data; exporting log data to other software applications; query log data based on user-defined parameters

3. The Primary Network Server shall be capable of supporting the following open system drivers;

    a. BACnet/IP
    b. Modbus TCP

C. Network Server Platform Requirements

1. Rack-Mounted Server Computer Hardware: DELL PowerEdge R220 or equal, Intel Pentium Core 2 Duo 2.0 GHz or higher, 8GB RAM, 500GB hard drive, video card, 22” color monitor, and Ethernet adapter 1Gbps or higher.
2. Operating system software shall be Microsoft Windows 7 Professional or higher.

2.3 NETWORK AREA CONTROLLER (NAC)

A. Provide one or more Network Area Controllers (NAC) to meet the sequence of operations and the type and quantity of devices being integrated into the system. The NAC shall provide the interface between the local area network and the field controllers. The NAC shall provide global supervisory control functions over the associated controllers and shall be capable of executing application control programs to provide: calendar functions; scheduling; trending; alarm monitoring and routing; time synchronization; integration of controller data for each applicable protocol; network management functions for all network devices. The user may view real-time information via web-based data.

B. The Network Area Controller shall provide the following hardware features as a minimum: Ethernet Ports 100Mbps or higher, BACnet MS/TP ports, battery backup, DDR RAM

memory, flash memory for long term data backup.

C. Provide an uninterruptible power source (UPS) per network controller to maintain operation for 1 hours.

D. The NAC shall be capable of operation over a temperature range of 32 to 122 °F and operation over a humidity range of 5 to 95% RH, non-condensing; storage temperatures of between 32 and 158 °F.

E. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

F. The NAC shall be capable of supporting the following open system drivers;

1. BACnet/IP
2. BACnet MS/TP
3. Modbus TCP
4. Modbus RTU

G. Event Alarm Notification and actions: The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers. Alarm conditions shall be routed to any defined user location whether connected to a local or wide-area network.

1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to: alarm; return to normal; fault.
2. Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc. Allow timed routing of alarms by class, object, group, or node.
3. Provide alarm generation from binary object “runtime” and/or event counts for equipment maintenance (i.e. filter status, fan run status). Authorized users shall be able to reset runtime or event count values with appropriate password control.
4. Control equipment and network failures shall be treated as alarms and annunciated.
5. Alarms shall be annunciated in any of the following manners as defined by the user: screen message text; e-mail of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on: day of the week, time of day and recipient.
6. Color-graphic shall have flashing alarm object(s). Printed message may be routed directly to a dedicated alarm printer.
7. The following shall be recorded by the NAC for each alarm (at a minimum): time and date; location (building, floor, zone, office number, etc.); associated equipment. Upon acknowledgement of the alarm the NAC shall document the time, date and authorized user. The number of alarm occurrences since the last acknowledgement shall be recorded.
8. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user. Alarm actions may be initiated by user defined programmable objects created for that purpose.
9. Alarm archiving: A log of all alarms shall be maintained by the NAC and/or a server and shall be available for review by the user. Provide a “query” feature to allow review of specific alarms by user defined parameters. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

H. Data Collection and Storage: The NAC shall have the ability to collect data for any property of any object and store this data for future use.

1. The user shall designate the log as an interval log or deviation log. For an interval log, the object shall be configured for time of day, day of week and the sample collection interval. For deviation log, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
2. All log data shall be stored in a relational database in the NAC and the data shall be accessed from the server or a standard web browser. All log data, when accessed from the server, shall be capable of being manipulated using standard SQL statements.
3. All log data shall be available to the user in the following data formats: HTML, XML, plain text, comma separated values, as a minimum.
4. The NAC shall have the ability to archive its log data either locally or remotely to the server or other NAC on the network.

I. Local Access: The NAC shall provide redundancy of system access to the local controllers at the remote building if the Primary Network Server should lose communication or be off-line. The NAC shall maintain setpoint and scheduling features, access to the color-graphic displays, maintain trend logs and reports. Upon restoration of communication with the PNS the archived information shall be transmitted to the server for archiving.

2.4 SOFTWARE FOR THE NAC

A. The distributed architecture of the operating system for the PNS and NACs shall provide the operator a comprehensive interface to allow the operator to configure and customize the EMCS to optimize the HVAC system to save energy, schedule and maintain equipment and provide occupant comfort. The provided graphical toolset shall allow the operator to create applications in a drag and drop environment.

1. Input/output capability shall allow the operator to request the current value or status of the control point; command/override equipment to a specific state; add, change or delete control points, alarm limits and controllers; change descriptors to control points and equipment; modify parameters; create or modify DDC loops.

B. Operator System Access: Via software password with five access levels at workstations and at each control unit.

C. Color graphic tools shall allow the user to create equipment and floor plan graphics from a standard library of symbols; allow custom generation of symbols; utilize over 64 or more colors; create real-time dynamic data for the graphics. Up to 60 control points may be displayed on each graphic.

1. Provide a link between compatible graphics to minimize the paths to additional information. For example, provide the link from the zone sensor to the VAV terminal to the air handling unit and to the central plant. Web pages shall be provided to allow the operator to zoom into specific areas of the facility and then link the space to the floor plan to the overall building and then to the facility site plan.
2. Graphical tools shall allow the creation of bar graphs, pie graphs and other tools to visualize control information such as run time hours, energy consumed and

occupant comfort.

D. Alarm processing tools shall allow the operator to create alarm messages that include as a minimum: time of alarm, point descriptor, alarm condition and remote annunciation. Critical alarms shall be displayed, archived to a storage device or printed on a alarm printer. Alarms shall be displayed in order of occurrence and have an optional audible alarm indicator.

1. Print alarm messages, up to 60 characters in length, for each alarm point specified.
2. Alarms may be routed to other devices including web-enabled cell phones, pagers, tablet PCs and designated personal computers on the network or Internet.
3. Operator specifies when alarm requires acknowledgment. Continue to indicate unacknowledged alarms after return to normal. An alarm log shall be maintained to archive alarms for future reference with the above specified parameters as well as indicating the person acknowledging the alarm.
4. The graphical display shall indicate the number of the current unacknowledged alarms by individual building site or by sum of all campus-wide facilities.
5. The operator may create and forward an e-mail message to another user directly from the graphical interface so that the message can be read when the second user logs on to the system.

E. Upon a power failure to equipment in the facility, the EMCS shall automatically start equipment upon the restoration of power. Program a time delay between individual equipment restart on a schedule to minimize demand charges from the utility company.

F. Custom reports may be created by the operator with a requested time and date manually or automatically. All reports may be logged to a storage device for future reference. The data reports shall allow customization and scaling of the X-Y coordinates; plotting of tabular reports; provide multi-point graphical reports with not less than eight variables on the same report. Print reports on daily, weekly, monthly, yearly or scheduled basis as scheduled.

G. The network server current operating system, database, color-graphics, custom reports shall be backed up automatically to a remote server or storage device as directed by the owner’s representative.

H. Maintenance Management capability shall allow the system to monitor and log the run-time for HVAC equipment; schedule maintenance reports that include recommended material and labor for the assigned task.

2.5 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. All devices required for single loop control shall be terminated on a single controller. (for example, CHW loop pressure control. The differential pressure sensor and the pump VFD ramp signal.)

B. ASCs shall be capable of implementing control strategies for the system based on information from any or all connected inputs. The AC shall utilize factory pre-programmed global strategies that may be modified by field personnel on-site. Global control algorithms and automated control functions should execute via a 32-bit processor

C. Programming shall be object-oriented using control program blocks that will support a minimum of 500 Analog Values and 500 Binary Values. Analog and binary values shall

support standard BACnet priority arrays. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing.

D. Controller shall have adequate data storage to ensure high performance and data reliability. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1 year (cumulative). Battery shall be a field-replaceable (non-rechargeable) lithium type. The onboard, battery-backed real time clock must support schedule operations and trend logs.

E. The base unit of the ASC shall host various I/O combinations including universal inputs, binary outputs, and switch selectable analog outputs (0-10V or 0-20 mA). Inputs shall support thermistors, 0-5VDC, 0-10VDC, 4-20mA, dry contacts and pulse inputs directly.

F. All binary outputs shall have onboard Hand-Off-Auto switches and a status indicator light. HOA switch position shall be monitored. The position of each HOA switch shall be available system wide as a BACnet object.

G. Controller shall be capable of BACnet communication. BACnet Conformance:

1. Standard BACnet object types supported shall include as a minimum: Analog Input, Binary Input, Analog Output, Binary Output, Analog Value, Binary Value, Device, File, Group, Event Enrollment, Notification Class, Program and Schedule object types. All necessary tools shall be supplied for working with proprietary information.

H. Schedules: Each ASC shall support a minimum of 10 BACnet schedule objects.

I. Logging Capabilities: Each controller shall support a minimum of 100 trend logs. Sample time interval shall be adjustable at the operator's workstation. Controller shall periodically upload trended data to system server for long term archiving if desired. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

J. Alarm Generation: Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures. Alarm logs shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications. Controller must be able to handle up to 200 alarm setups stored as BACnet event enrollment objects – system destination and actions individually configurable.

2.6 UNITARY SYSTEM CONTROLLERS (USC)

A. All devices required for single loop control shall be terminated on a single controller. (for example, cooling coil control valve control. The temperature sensor and the valve control signal.)

B. The EMCS Contractor shall provide all Unitary System Controllers. USCs shall be fully programmable or applications specific controllers with pre-packaged operating sequences maintained in Flash RAM.

C. The USC shall be a node on the automation network and shall control its own communications so that the failure of any one node, shall not inhibit communications on the network between the remaining nodes. USCs shall be totally independent of other network nodes for their monitoring and control functions.

D. Provide each USC with a battery back-up for the protection of volatile memory for a minimum of 72 hours. Batteries shall be rated for a seven-year life.

E. All associated applications programs shall reside at the USC. The USC shall not require communication to any other panel for normal operating sequences other than time scheduled base commands.

F. Control shall be based on algorithms, i.e. proportional plus integral plus derivative (PID), proportional plus integral (PI), or proportional to comply with the sequences of operation PID algorithms shall maintain the system operation within +/- 2% of setpoint.

G. The USC shall be configured with sufficient input/output capacity to achieve the required control points to meet the sequence of operations.

2.7 AIR HANDLING UNIT CONTROLLER

A. All devices required for single loop control shall be terminated on a single controller. (for example, AHU static pressure control. The differential pressure sensor and the VFD ramp signal.)

B. The EMCS Contractor shall provide controllers required for chilled/hot water and DX/electric heat air handling units and fan coil units. Provide an enclosure to house the controller and associated components including suitable mounting brackets shall be NEMA 1 rated and located outside the FCUs.

C. The controller shall be capable of monitoring and controlling the following parameters per the sequences of operation and input/output summary; space temperature; space relative humidity sensor; cooling/heating stage control or modulating valve control; fan on/off control and status; supply air sensor; occupancy sensor; carbon dioxide sensor; VFD control and monitoring.

2.8 EMCS CONTROLLER LEVEL NETWORK

A. EMCS Automation Level Network shall consist of BACnet MS/TP (76.8 Kbps minimum). Data transfer rate and data throughput as required to meet the alarm annunciation requirements.

2.9 SOFTWARE OVERVIEW

A. **Dynamic Colored Floor plans:** Dynamic colored floor plans that compare actual space conditions to setpoints shall be provided on all floorplan graphics displayed on the front-end. Floorplan enlargements shall also use the thermographs to display space conditions. Zones within the set point range shall appear transparent white. As the space gets warmer the zone color shall gradually modulate from transparent white to transparent red to identify a hot zone. As the space conditions get cooler the zone color shall gradually modulate from transparent white to transparent blue to identify a cold zone. Each zone shall indicate the current actual zone temperature within the zone. The floor plans shall use a dynamic scheduling icon to indicate schedule occupancy for each zone and provide direct one-click access to that zones unique schedule. Provide a designated icon or symbol indicating that the zone is in the occupied/unoccupied condition. From the floorplan graphic, the operator shall be able to click on any zone and go directly to the graphic for the piece of equipment controlling that zone. All dynamic floor plans shall be visible via web interface as well as on the LAN. The authorized system operator shall be able to change the zone or system identifier (or name) on the graphic and that change shall be distributed to other associated graphics and to the

equipment controller.

B. **Pop up Trends:** Provide trend logs that automatically pop up when the operator mouse clicks on the point from the graphic. Provide pop up trends for all dampers, control valves, temperature sensors, carbon dioxide sensors, humidity sensors, airflows, static pressures, flow meters, VFD speeds, etc. The EMCS contractor shall set up all trends for the owner. The pop-up trend shall include a trend tool that allows the operator to modify the trend time scale and sample interval for up to 10 sample values. The trends shall be graphical on the computer screen but shall provide an output as an .xls, .csv, .pdf, HTML, r text file.

C. **Interactive Maps:** Implement JAVA SCRIPT API 3.0 or newer, such as Google Interactive maps depicting the facility location to indicate the site plan. This is not a static image and must be completely interactive.

D. **Custom User HTML applications**: The EMCS shall utilize HTML applications as an extra feature. At minimum, provide 7-day forecast, weather radar, traffic map and hurricane tracker. All of these features shall be imbedded into the EMCS system.

E. Provided a web-based EMCS platform; contractor shall provide an Open License software. Licenses that are not open are not acceptable. There shall be no per seat or per user licensing fee charged to the owner by the contractor.

F. System shall use the **BACnet** protocol for communication to the operator workstation or web server and for communication between control modules. Schedules, setpoints, trends, and alarms shall be BACnet Objects.

G. **User access** shall include 50 assigned operators that shall include five levels of access within the web system. Each operator log-in shall have an expiration date to allow for temporary access to the system. The operator's access description shall include his e-mail address and cell/phone numbers. The operator access can be limited from 5 minutes to permanent access. The user shall be limited to eight bad login attempts before being locked out of the system.

H. **Global modification:** Provide the capability for global modification of user definable parameters of all points shall be provided. Global modification is defined as the mass adjustment of user definable parameters across a defined group, area, facility, campus, or network. Parameters shall include, but not be limited to temperature set point (VAV boxes, AHU Discharge, VAV AHU Static Pressure Setpoints etc.), equipment start/stop, equipment status, valve output signal, VFD speed control signal, and damper position signal. User shall be able to lock the definable parameter to a set value, or adjust a set point to an operator adjustable value. This function shall be accomplished through the standard graphical user interface/workstation and is to be selectively applicable by the user to all controllers on the network, all controllers in a specific facility or all controllers in a specific zone within a specific facility.

I. The system operator shall be able to override the output signal to the valves, dampers, variable frequency drives, etc. with the use of the PC mouse click on the device. The system override shall include a **Hand-Off-Auto (HOA)** capability. If the output is commanded to the hand position the operator shall designate an output value of 0-100% in 1% increments. The hand override position shall be permanent or expire after a designated time period and revert to the auto position. The color-graphic shall indicate the device that has been overridden by a color change of the output value.

J. For non-emergency in-warranty events the system operator may submit a **Service**

Request directly from the floor plan or system graphic. The web interface shall include the EMCS suppliers contact information including phone numbers and e-mail address. The service request will be logged into the EMCS suppliers service department. A non-response by the assigned technician shall elevate the request to the next highest manager or supervisor until the system operator receives an response that their request has been received and is scheduled for a resolution. All requests for service shall be maintained in the customer's database for future reference. The service request capability may be extended after the expiration of the warranty as part of a service agreement.

K. The web-based system shall be accessible from **Tablet PCs** and provide the same functionality that is available from personal computers connected through the LAN or WAN to the system operator. The tablet PCs as a minimum shall include an Apple iPad and Google Android based tablet PC. Operation shall include touch screen capability and use of the tablet keyboard screen. The operator shall be able to view color-graphics, system trends, override setpoints, change time schedules, and override damper and valve positions.

2.10 ENERGY SAVING PROGRAMS

A. Demand Limiting: Monitor total power consumption for each power meter and shed associated loads automatically to reduce power consumption to an operator set maximum demand level.

B. Duty Cycling: Periodically stop and start loads, based on space temperature, and according to various on/off patterns.

C. Automatic Time Scheduling: Self-contained programs for automatic start/stop/scheduling of building loads. Support up to seven (7) normal day schedules, seven (7) "special day" schedules and two (2) temporary schedules.

D. Optimal Start/Stop: Perform optimized start/stop as function of outside conditions, inside conditions, or both. Optimization shall be adaptive and self-tuning, adjusting to changing conditions by modifying occupancy period based upon the desired temperature at beginning and end of the occupancy period. Base optimization on occupancy schedules, outside air temperature, seasonal requirements, and interior room temperature. Employ adaptive model prediction for how long building takes to warm up or cool down under different conditions.

E. Night-Setback Program: Reduce heating space temperature setpoint or raise cooling space temperature setpoint during unoccupied hours in conjunction with scheduled start/stop and optimum start/stop programs.

F. Setpoint Reset: Setpoints for control of variable load systems shall be reset based on load demand, as described in the Sequence of Operations.

G. Calculated Points: Define calculations and totals computed from monitored points (analog/digital points), constants, or other calculated points.

H. Event Initiated Programming: Any data point capable of initiating event, causing series of controls in a sequence.

I. Holiday Scheduling

J. Direct Digital Control: Furnish software so operator is capable of customizing control

strategies and sequences of operation by defining appropriate control loop algorithms and choosing optimum loop parameters.

K. Trend logging shall be provided for all points per the input/output summary where there is a change in the analog or binary signal. Each controller shall be capable of storing trend values and then automatically transfer data to the NAC or the NS hard disk. Trend data shall be updated continuously per the operator assigned interval at intervals as low as one minute. Collect samples at intervals specified in minutes, hours, days, or month. Output trend logs as line-graphs or bar graphs. Binary points (input and output) shall only be logged upon a change of value (COV). Display trend samples on workstation in graphic format. Automatically scale trend graph with minimum 60 samples of data in plot of time versus data.

2.11 FIELD INSTRUMENTATION

A. Temperature Sensors: All temperature sensors shall be thermistor type, factory-calibrated to within 0.5 °F, interchangeable with housing appropriate for application. Sensors shall have a temperature curve rated for the application. Sensor wiring terminations shall be in a galvanized box.

1. Outside air temperature sensors shall be installed in weather proof enclosure with ventilated sun-shied
2. Duct mounted temperature sensors shall be averaging type for supply air, mixed air and low temperature applications for air handling units. Duct probe temperature sensor shall be acceptable for terminal units.
3. Space temperature sensors shall contain a backlit LCD digital display and user function keys along with temperature sensor, setpoint adjustment and after-hours override use. Override time may be set in one-hour increments.
4. Thermowell temperature sensors shall be stainless steel probe of length that is equivalent to a minimum of 50% of the pipe diameter. End-to-end accuracy shall be ± 0.5 deg. F. Connection box shall be moisture/water proof with conduit fitting. Furnish the stainless steel thermowell to the mechanical contractor for installation. A thermal conducting grease shall be installed in the thermowell to provide uniform temperature sensing.
5. Provide flat plate stainless steel space temperature sensors with no local setpoint adjustment as indicated on the drawings.

B. Carbon Dioxide Sensors: The sensor shall be capable of monitoring carbon dioxide concentration with an accuracy of +/- 30 parts per million (PPM). The sensor shall produce a linear 0-10 VDC or 4-20 mA signal over the range of 0 to 2000 PPM. The sensor shall measure using non-dispersed infrared (NDIR) technology to measure carbon dioxide gas and shall be;

1. Wall mounted carbon dioxide sensors shall be Veris CWE series or equivalent.
2. Duct mounted carbon dioxide sensor shall be Veris CWD series or equivalent.
3. The EMCS contractor shall utilize the required calibration devices to properly commission and calibrate the sensors per the manufacturer's requirements.

C. Relative Humidity Sensors: relative humidity sensors shall be a two-wire type, 4-20 mA output proportional to the relative humidity range of 0-100%. The accuracy of the sensors shall be +/- 2% over a range of 10-90% RH.

1. Outdoor relative humidity sensors: provide non-corroding outdoor shield to minimize wind effects and solar heating. Install wall-mount weather proof enclosure with conduit fitting. Sensor shall be Veris HO series, or equivalent.
2. Wall-mounted relative humidity sensor: sensor shall be installed in a wall-

mounted enclosure with white cover. Sensor shall be Veris HEW series or equivalent.

3. Duct-mounted relative humidity sensor: sensor shall be provided with a moisture resistant enclosure with conduit fitting. The probe length shall be 8" minimum. Sensor shall be Veris HED series or equivalent.

D. Pressure Transducers:

1. Air pressure sensor: The pressure sensors shall have an input range compatible with the medium being measured. The proportional output signal shall be 0-10 VDC or 4-20 mA. Sensor shall be SETRA Model 264 or equivalent.
2. Water pressure sensors: The pressure sensors shall have an input range compatible with the medium being measured. The proportional output signal shall be 0-10 VDC or 4-20 mA. Sensor shall be SETRA Model 230 or equivalent. Sensor shall be installed with a valved piping bypass and bleed off for each port.

E. Freezestat: Provide freezestats for all chilled water air handling systems that receive more than 10% untreated outside air. Freezestats shall provide vapor tension elements, which shall serpentine the inlet face on all coils. Provide additional sensors, wired in series, to provide one linear foot per square foot of coil surface area. Freezestat shall be manually reset at the switch. Interlock to the associated fan so that fan will shut down when HOA switch is in hand or auto position. Provide time delay relays with a 0-10 minute time delay relay duration to minimize nuisance freezestat trips. Time delay relay shall be adjustable at the associated control panel.

F. Air differential pressure switch: For fan shutdown, provide air differential pressure switches for all fans controlled by a variable frequency drive (VFD) to shut down the associated fan in the event of sensing high differential pressure. Air differential pressure switches shall have an adjustable setpoint with a range of 0-10 inches w.g. with manual reset at the switch. Provide ¼ inch copper tubing with compression fittings to mount to the side of the duct. Sensor shall be DWYER Series 1620 or equivalent.

G. Momentary control relays: Provide momentary control relays as indicated. Relays shall have coil ratings of 120 VAC, 50 mA or 10-30 VAC/VDC, 40 mA as suitable for the application. Contact ratings shall be 10 amp. Provide complete isolation between the control circuit and the digital output. Relays shall be located in the UC or other local enclosures and have pin-type terminals. Relays shall have LED indication of status.

H. Current sensing relay: Current sensing relays shall be rated for the applicable load. The output relay shall have an accessible trip adjustment over its complete operating range. Enclosure shall have an LED to indicate relay status.

I. Photocell: Ambient light level shall by a photocell in a non-corroding in a weatherproof housing with sun shield suitable for exterior installation. The control signal output shall be 4-20 ma or binary contact closure as specified in the sequences of operation. Mount the photocell on the north side of the building on the roof. The sensor reading shall be 0-750 foot-candles.

J. Occupancy Sensors

1. The dual-technology occupancy ceiling mounted sensor shall be capable of detecting presence in the control area by via Doppler shifts in transmitted ultrasound and passive infrared (PIR) heat changes. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to

activate lighting systems. Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off. The sensor shall operate at 24 VDC/VAC. WattStopper DT-300 or approved equal.

2. Sensors shall have a time delay that is adjustable with configuration software or shall have a fixed time delay of 5 to 30 minutes, set by a DIP switch. Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.
3. The sensor shall have an additional single-pole, double throw isolated relay with normally open, normally closed and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options. The sensor shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled.

2.12 WATER FLOW METERS

A. Inline nutating-disk type flow meters shall be provided for domestic water and cooling tower metering applications. The meter shall include a pulse output for monitoring by the EMCS. Provide meter to be installed by Division 23. Meter shall be Badger RCDL series or approved substitution.

2.13 AIRFLOW MEASURING STATIONS (AFMS)

A. Duct mounted airflow measuring stations with combination airflow and air temperature measurement devices shall have the following features:

1. Multi-point sensors in one or more probe assemblies with a maximum of one to sixteen sensor nodes per location, and a single remotely mounted microprocessor-based transmitter for each measurement location. Each sensor node shall consist of two hermetically sealed bead-in-glass thermistors. Each sensing point shall independently determine the airflow rate and temperature at each node, which shall be equally weighted in calculations by the transmitter prior to output as the cross-sectional average. Each ducted sensor probe shall have an integral, U.L. Listed, plenum rated cable. Each independent temperature sensor shall have a calibrated accuracy of +/-0.14° F (0.08° C) over the entire operating temperature range of -20° F to 160° F (-28.9° C to 71° C) and shall be calibrated at 3 temperatures against standards that are traceable to NIST. Acceptable manufacturer shall be EBTRON, Inc. GTx116-PC.
2. Each transmitter shall have a display capable of simultaneously displaying both airflow and temperature. Airflow rate shall be field configurable to be displayed as velocity or volumetric rates, selectable as IP or SI units. Each transmitter shall operate on 24 VAC and be fused and protected from over voltage, over current and power surges.
3. Each independent airflow sensor shall have a laboratory accuracy of +/-2% of Reading over the entire calibrated airflow range of 0 to 5,000 fpm (25.4 m/s) and shall be wind tunnel calibrated at 16 points against air velocity standards that are traceable to NIST.

2.14 DAMPERS:

A. Provide motorized volume control and shutoff dampers as detailed in 23 33 00 Ductwork Accessories.

2.15 DAMPER ACTUATORS:

A. Outside and exhaust air damper actuators shall be mechanical spring return. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the damper as required.

B. Outside and return air modulating actuators shall utilize analog (proportional) control 0-10 VDC. Actuators shall be driven in both the open and closed directions.

C. Electric damper actuators shall be direct shaft mounted and use a V-bolt and toothed V-clamp causing a cold weld effect for positive gripping. Single bolt or setscrew type fasteners are not acceptable.

D. Single section dampers shall have one electronic actuator direct shaft mounted.

E. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft mounted per damper section.

F. Damper actuators shall be BELIMO or equivalent.

2.16 PANELS AND ENCLOSURES

A. Provide panels and enclosures for all components of the EMCS, which are susceptible to physical or environmental damage.

B. Interior panels and enclosures shall meet be NEMA 1 rated painted steel panels with locking door.

C. Exterior mounted panels and enclosures shall be NEMA 4 painted steel panels with locking door.

D. Panels for USCs shall be mounted on the outside of all unit ventilators and fan coil units with three feet of wall clearance in front of them and no higher than 7 feet to the bottom of the panel.

2.17 LABELING and WARNING NOTICES

A. Provide labeling for all control panels and enclosures.

B. Provide labeling of all control wires and input/output points at the controller and at the control device; the label at each end of the wire shall be the same Labels shall be machine generated, typed and clearly legible with a maximum of 17 characters. Hand written labels or labels written on the control wire jacket will not be acceptable. Each label shall be unique to its function and shall reference the applicable system. For example “AHU-1 SAT” will indicate the supply air temperature sensor for AHU-1. Improper labeling shall be removed and shall require re-commissioning of the control device and controller to document correct functionality.

C. Provide high voltage warning notices at all equipment controlled by the EMCS and at all associated motor starters when used by equipment controller.

2.18 TUBING AND PIPING

A. Provide tubing and piping as required for the field instrumentation.

B. Tubing within equipment rooms, vertical risers, and penetrations to ductwork shall be either copper pipe or shall be plastic tubing within conduit. Tubing for all water-based instrumentation shall be copper pipe. Identify the type of tubing proposed in the shop drawing submittal.

C. Provide suitable bulk head fittings for duct and panel penetrations.

D. Tubing in plenum rated areas may be plastic tubing. Polyethylene tubing shall meet, at minimum, the following requirements: flame retardant; crack resistant; 300 psi burst pressure.

2.19 CONDUIT AND FITTINGS

A. Provide all conduits, raceways and fittings for the EMCS monitoring, communication and control cabling. All work shall meet all applicable codes.

B. Conduit, where required, shall meet, the requirements specified within Division 26.

C. EMCS monitoring and control cable shall not share conduit with cable carrying voltages in excess of 90 VAC.

2.20 CABLING

A. Provide all cables for the EMCS. Cable shall meet, at minimum, the following requirements:

1. Minimum 98% conductivity stranded copper.
2. Proper impedance for the application as recommended by the EMCS component manufacturer.
3. Monitoring and control cable shall be #18 AWG or larger, dependent on the application. Analog input and output cabling shall be shielded.
4. Management Level Network cable shall be CAT 6, 24 gauge unshielded.
5. Automation Level Network cable shall be #24 AWG shielded.
6. Shield shall be grounded at the CCP, UC, or control panel. Ground at one end only to avoid ground loops.
7. Identification of each end at the termination point. Identification should be indicated on and correspond to the record drawings.

B. 120 VAC power wiring shall be of #12 AWG solid conductor or larger as required.

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION

A. The EMCS supplier shall provide a pre-construction coordination meeting with the affected trades to ensure a cooperative efficient process of installation. The invited trades shall include the general contractor, mechanical contractor, electrical contractor, test and balance contractor, owner's representative, consulting engineer and others with a direct interest in the coordination of the affected systems. The EMCS contractor shall provide an outline of the meeting agenda highlighting the construction schedule, coordination with mechanical and electrical trades. Provide a sign-in sheet and submit it through the attendees along with a summary of the meeting notes for future reference.

3.2 INSPECTION DURING INSTALLATION

A. Provide a technician to assist the Engineer or Owner's Representative with inspections made during the installation period that are required to review the progress and quality of ongoing work. The engineer/owner's representative shall generate field observation reports on the findings of the inspection. The engineer or owner's representative shall advise the EMCS contractor during the inspection of any concerns noted with respect to the installation and shall repeat the concerns in writing as soon as possible after the inspection is completed. The EMCS contractor shall take corrective action to meet the requirements of the specifications. Upon correction, the EMCS contractor shall submit written documentation through the contractors to the engineer.

3.3 INSTALLATION OF COMPONENTS

A. Provide all interlock and control wiring. All wiring shall be installed in a neat and professional manner in accordance with specification Division 26 and all national, state and local electrical codes.

B. Provide wire and wiring techniques recommended by equipment manufacturers. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the Owner's Representative prior to rough-in. Provide auxiliary pilot duty relays on motor starters as required for control function.

C. Electrical Contractor shall provide 120 or 277 volt power at a junction box within 48" of the controller. The BAS Contractor shall coordinate with the Electrical Contractor to identify locations of power requirements prior to the installation of the controls.

D. Conduit for control wiring shall be provided whenever one of the following conditions exists:

1. Conduit is indicated on the drawings or specifically required by the specifications.
2. Cabling runs through inaccessible areas such as within partitions/walls, above closed in ceilings, under floor; within trenches and underground; on the exterior of the building; exposed on the surface of the building; when encased in concrete or other material that makes the cable inaccessible or when located such that access to the cable is not readily obtained.
3. Cable within mechanical, telecommunications and electrical equipment rooms and control rooms.
4. Conduit shall be installed, inside wall from sensor box to above the wall, for all wall mounted temperature, humidity and CO2 sensors.

E. Control wiring located above an accessible ceiling space may be plenum rated cable. Plenum rated wire shall be bundled and routed at right angles to the building lines and secured to the building structure every 15 feet.

F. Control wiring located in underground conduits shall be provided with direct-burial-rated insulation.

G. When communication bus enters or exits a building, a surge suppressor shall be installed. The surge suppressor shall be installed according to the controls manufacturer's instructions.

H. Provide sleeves for all cable and conduit passing through walls, partitions, structural

components, floors and roof

I. All sensor wiring shall be labeled to indicate the origination (at the device) and destination of data (at the control panel). The description shall indicate the type and location of the control device such as “AHU-1 SA temp” or “VAV 1-1 space temp”.

J. Wall temp sensors at 48” above the finished floor to comply with ADA requirements and to match the height of the light switches. Mount humidity sensor at equal height to wall temperature sensor.

3.4 VERIFICATION REQUIREMENTS

A. Verification shall be provided by the EMCS contractor to demonstrate and confirm that the installed system complies with the specifications and the control sequences of operation herein specified. upon completion of the verification process the EMCS contractor shall demonstrate to the engineer or owner’s representative the functionality of the control system devices are in compliance with the contract documents.

B. Technicians provided by the EMCS contractor shall be factory trained and qualified in the operation of the provided control system. The EMCS contractor shall provide, if requested, the factory training certificates of the individuals providing the verification services on this project.

C. Verification tools, applicable to the system provided, shall be utilized by the factory-trained technicians for proper verification of system operation and functionality. Temperature verification sensors shall be NIST certified within the last 12 months. Meters such as Fluke 52 series or better shall be utilized. Use of non-certified meters may require the system to be re-verified with certified meters at no cost to the owner.

D. Documentation of the verification process shall be provided per the project general conditions in electronic PDF format as required. Documentation shall include the following forms:

1. **Project System Verification Forms** for each controller provided on the project to verify the proper function of each controller, control device and system component provided.
2. **Panel Verification Forms** for each control panel to document the proper installation and function of each control panel provided.
3. **Sequence of Operation Verification Forms** for each piece of controlled equipment to confirm compliance of the control system with the specified sequences of operation.
4. Not providing proper documentation for each control devices, panel, or system, upon request by the engineer or owner’s representative, may require the EMCS contractor to re-verify the applicable systems at no additional cost to the owner.

E. After completion of the verification, the EMCS contractor shall be able to demonstrate the sequence of operations for each system to the engineer and the owner’s representative.

F. Equipment checkout sheets are to be produced by this contractor showing checkboxes and compliance with the following procedures for each piece of equipment and turned over to the owner and/or mechanical engineer.

3.5 COLORGRAPHICS

A. The colorgraphics shall be provided for the EMCS system prior to system acceptance

and owner training.

B. The colorgraphics provided shall include the following as a template. Provide forward and backward links on the graphic.

1. Site plan with link to overall building plan including detached buildings. The site plan shall be referenced to an automatically updated aerial view or map view of the area such as Google Maps or Bing Maps. Provide link to proceed to the overall building floor plan.
2. The overall building plan shall indicate space temperature conditions referenced by the color of the zone. Specific details of the zone temperatures and equipment are not required. Provide a link to the floor plan wings, upper floors and remote buildings.
3. The floor plan colorgraphics shall indicate the space temperatures by color references. Additional information shall indicate the space temperature, the occupancy of the zone, air handling units, VAV terminals and ductwork with diffusers. A link at each terminal unit or AHU shall automatically connect the system operator to the equipment colorgraphic.
4. The colorgraphics for the equipment shall as a minimum be equal to the points from the input/output summary or control schematic. Primary control devices as required by the sequences of operation shall also be provided.
5. Control points from equipment that are integrated into the EMCS via BACnet shall be provided to convey the operating conditions of the attached equipment. Coordination of the integration points shall be accomplished during the submittal phase. The EMCS contractor shall provide a list of all integrated points on their submittal.

3.6 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Startup testing documentation: Prepare the checklist documenting startup testing of each input and output device, with technician's initials and date certifying each device has been tested and calibrated prior to acceptance testing. This document shall indicate proof that the following functions have been commissioned and shall be included in the as-built documentation: short to ground check, configuration of trends, confirmation that color-graphics are accurately representing actual systems, point to point checkout, all damper and valve actuators respond to input change, control modules are addressed and have functional descriptors, specified interlocks are functional, calibration report of all sensors, discrete outputs respond to time schedule or manual enable command.

B. Demonstration. Prior to acceptance, demonstrate the following performance tests to demonstrate system operation and compliance with specifications.

1. Engineer, owner’s representative and mechanical contractor shall be invited to observe and review system demonstration. Provide attendees at least 10 days notice.
2. Demonstration shall follow process approved as part of the submittal and shall include complete checklists and forms for each system as part of system demonstration.
3. Demonstrate actual field operation of each sequence of operation as specified. Demonstrate calibration and response of any input and output points requested by engineer or owner’s representative.
4. Demonstrate complete operation of operator interface including review of color-graphics, time schedules, trend logs, alarm notification, functionality of tablet PC operation.

    a. PID loop response. Supply graphical trend data output showing each PID

loop's response to a set point change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be selectable from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show set point, actuator position, and controlled variable values.

b. Demand limiting. Supply trend data output showing demand-limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand limiting setpoint, and status of set points and other affected equipment parameters.

c. Trend logs for each system. Trend data shall indicate set points, operating points, valve positions, and other data as specified. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.

5. Alarms and Interlocks. Check each alarm with an appropriate signal at a value that will trip the alarm. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction. Alarm verification shall include temperatures exceeding alarm threshold (high and low), fan failure safety, duct high static pressure switch, freezestat, and smoke detector shutdown.

6. Tests that fail to demonstrate proper system operation to the engineer shall be repeated after contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

C. Owner Acceptance.

1. After tests described in this specification are performed to the satisfaction of both engineer and owner’s representative, the engineer shall accept the control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot be performed due to circumstances beyond EMCS contractor's control. Engineer shall provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.

2. System shall not be accepted until completed demonstration forms and checklists are submitted and approved by the engineer.

3.7 DEMONSTRATION AND OWNER TRAINING

A. Furnish basic operator training for multiple persons on data display, alarm and status descriptors, requesting data, execution commands and log requests. Include a minimum of 16 hours: 8 hours instructor time for onsite training and 8 hours of hands on class environment training. Training sessions may be provided in 4-hour increments as approved by the owner’s representative.

1. Change/modify temperature setpoints.
2. Change/modify time of day, holiday and override schedules.
3. Display, create, and modify trends of system points.
4. Update room numbers on the color-graphics.

B. Demonstrate complete and operating system to Owner. Provide written documentation listing the attendees of the specified training with sign-in sheet and training time and date.

PART 4 - SEQUENCE OF OPERATIONS

4.1 Refer to the Mechanical Drawings for project control schematics and sequence of operations.

END OF SECTION 23 09 63

SECTION 23 31 13

METAL DUCTWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Low pressure ductwork.

B. Medium and high pressure ductwork.

C. Casings.

D. Kitchen hood ductwork.

E. Duct leakage testing.

F. Duct system protection.

G. Duct system cleaning.

1.2 RELATED SECTIONS

Division 9 - Finishes: Weld priming, weather resistant, paint or coating.

A. Section 23 02 00 - Basic Material and Methods.

B. Section 23 05 29 – Hangers and Support for Piping and Equipment HVAC.

C. Section 23 05 93 - Testing, Adjusting and Balancing.

D. Section 23 07 13 - Duct Insulation.

E. Section 23 33 00 - Ductwork Accessories.

F. Section 23 37 13 - Air Distribution Devices.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firms regularly engaged in manufacture of metal ductwork products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer’s Qualifications: Firms with least 3 years of successful installation experience on projects with metal ductwork systems similar to that required for project.

C. Codes and Standards:

1. SMACNA Standards: Comply with latest SMACNA’s “HVAC Duct Construction Standards, Metal and Flexible” for fabrication and installation of metal ductwork.
2. ASHRAE90.1 Standards: Comply with ASHRAE Handbook, Equipment Volume, Chapter 1 “Duct Construction”, for fabrication and installation of metal ductwork.
3. NFPA Compliance: Comply with NFPA 90A “Standard for the Installation of Air Conditioning and Ventilating Systems”, NFPA 90B “Standard for the Installation of Warm Air Heating and Air Conditioning Systems”, and NFPA 96 Standard.

4. IECC 2015: Comply with 2015 International Energy Conservation Code.

1.4 GENERAL DESCRIPTION

A. Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section.

1.5 SUBMITTALS

A. Submit shop drawings, duct fabrication standards and product data under provisions of Division One.

B. Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work.

C. The contract documents are schematic in nature and are to be used only for design intent. The contractor shall prepare sheet metal shop drawings, fully detailed and drawn to scale, indicating all structural conditions, all plumbing pipe and light fixture coordination, and all offsets and transitions as required to permit the duct to fit in the space allocated and built. All duct revisions required as a result of the contractor not preparing fully detailed shop drawings will be performed at no additional cost.

1.6 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain indicated clear size inside lining. Where offsets or transitions are required, the duct shall be the equivalent size based on constant friction rate.

B. Low Pressure: Low pressure ductwork shall be rated for an operating pressure of 2”. Low pressure ductwork shall be defined as all return, exhaust, and outside air ducts, all supply ductwork associated with constant volume air handling units with a scheduled external static pressure of less than 2”, and all supply ductwork downstream of terminal units in variable volume systems.

C. Medium Pressure: Medium pressure ductwork shall be rated for an operating pressure of 4”. Medium pressure ductwork shall be defined as all supply ductwork extending from variable volume air handling units to terminal units in variable volume systems with air handling units having a scheduled external static pressure of less than 4”. The supply ductwork of constant volume air handling units having a scheduled external static pressure greater than 2” and less than 4” shall be rated for medium pressure.

D. High Pressure: High pressure ductwork shall be rated for an operating pressure of 6”, or the scheduled external pressure of the equipment it is connected to, whichever is greater. The supply ductwork of air handling units having a scheduled external static pressure greater than 4” shall be high pressure.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protection: Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings, use sheet metal end caps on any lined duct exposed to the weather.

B. Storage: Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS

A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

B. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A653.

C. Stainless Steel Sheet: Where indicated, provide stainless steel complying with ASTM A480; Type 316; with No. 4 finish where exposed to view in occupied spaces, No. 1 finish elsewhere. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

D. Aluminum Sheet: Where indicated, provide aluminum sheet complying with ASTM B 209, Alloy 3003, Temper H14.

2.2 MISCELLANEOUS DUCTWORK MATERIALS

A. General: Non-combustible and conforming to UL 181, Class 1 air duct materials.

B. Flexible Ducts: Flexmaster U.S.A., Inc. Type 5M, Thermaflex MKE, ATCO #036 or approved equal, corrosive resistant galvanized steel formed and mechanically locked to inner fabric with minimum 1-1/2” thick, R-6. Flexible duct shall be rated up to at least 10 in.w.g. positive pressure and shall have reinforced metalized outer jacket comply with UL 181, Class 1 air duct.

C. Sealants: Hard-Cast “iron grip” or approved equal, non-hardening, water resistant, fire resistive and shall not be a solvent curing product. Sealants shall be compatible with mating materials, liquid used alone or with tape or heavy mastic.

D. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

1. For exposed stainless steel ductwork, provide matching stainless steel support materials.
2. For aluminum ductwork, provide aluminum support materials.

2.3 LOW PRESSURE DUCTWORK

A. Fabricate and support in accordance with latest SMACNA Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by approved shop drawings. Obtain engineer’s approval prior to using round duct in lieu of rectangular duct.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide airfoil-turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

E. Use crimp joints with bead for joining round duct sizes 6 inch smaller with crimp in direction of airflow.

F. Use double nuts and lock washers on threaded rod supports.

2.4 MEDIUM AND HIGH PRESSURE DUCTS

A. Fabricate and support in accordance with SMACNA Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible and where rectangular elbows are used, provide airfoil-turning vanes. Where acoustical lining is required, provide turning vanes of perforated metal with glass fiber insulation. Weld in place.

C. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.

D. Fabricate continuously welded medium and high pressure round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.5 CASINGS

A. Fabricate casings in accordance with SMACNA Duct Construction Standards and SMACNA High Pressure Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gauge galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce doorframes with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 6 X 6 inch size.

D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gauge back facing and 22 gauge perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb./cubic foot minimum glass fiber media, on inverted channels of 16 gauge.

2.6 KITCHEN HOOD EXHAUST DUCTWORK

A. Fabricate in accordance with SMACNA Duct Construction Standards, and NFPA 96.

B. Construct of 16 gauge carbon steel or 18 gauge stainless steel, using continuous external welded joints.

C. Slope all duct toward the kitchen hood or a grease reservoir so that grease cannot collect in any portion of duct per mechanical code.

2.7 DISHWASHER/SHOWER/LOCKER ROOM EXHAUST DUCTWORK

A. All ductwork shall be stainless steel, one gauge heavier than that required for galvanized steel duct.

B. Slope all duct to drain out grilles or provide drain line to floor drain.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Obtain manufacturer's inspection and acceptance of fabrication and installation of ductwork at beginning of installation.

B. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. Connect terminal units to medium or high pressure ducts with four feet maximum length of flexible duct. Do not use flexible duct to change direction.

E. Connect diffusers or troffer boots to low pressure ducts with 6 feet maximum, 4 feet minimum, length of flexible duct. Hold in place with strap or clamp.

F. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

G. The interior surface of all ductwork shall be smooth. No sheet metal parts, tabs, angles, or anything else may project into the ducts for any reason, except as specified to be so. All seams and joints shall be external.

H. All ductwork located exposed on roof shall be "crowned" to prevent water from ponding. Ref: Insulation for additional requirements.

I. Where ducts pass through floors, provide structural angles for duct support. Where ducts pass through walls in exposed areas, install suitable sheet metal escutcheons as closers.

J. All angles shall be carried around all four sides of the duct or group of ducts. Angles shall overlap corners and be welded or riveted.

K. All ductwork shall be fabricated in a manner to prevent the seams or joints being cut for the installation of grilles, registers, or ceiling outlets.

L. All duct hangers shall be attached to building structure. Cutting slots in roof or floor decking for hanger straps to be cast in concrete is not acceptable.

3.2 INSTALLATION OF FLEXIBLE DUCTS

A. Maximum Length: For any duct run using flexible ductwork, do not exceed 6'-0" extended length.

B. Installation: Install in accordance with Section III of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".

3.3 REQUIREMENTS FOR UNIT CASINGS

A. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

3.4 REQUIREMENTS FOR KITCHEN HOOD EXHAUST DUCT

A. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout.

B. Provide access openings in each change in direction, located on sides of duct 1½" minimum from bottom, and fitted with grease-tight covers of same material as duct

C. Use stainless steel for ductwork exposed to view.

3.5 DUCTWORK APPLICATION SCHEDULE

AIR SYSTEM	MATERIAL
Low Pressure Supply	Galvanized Steel, Aluminum
Medium and High Pressure Supply	Galvanized Steel
Return and Relief	Galvanized Steel, Aluminum
General Exhaust	Galvanized Steel, Aluminum
Kitchen Hood Exhaust	Carbon Steel, Stainless Steel
Dishwasher/Shower/Locker Room Dryer Vent/Paint Hood Exhaust	Stainless Steel
Combustion Air	Galvanized Steel

3.6 DUCTWORK HANGERS AND SUPPORTS

A. All ductwork shall be properly suspended or supported from the building structure. Hangers shall be galvanized steel straps or hot-dipped galvanized rod with threads pointed after installation. Strap hanger shall be attached to the bottom of the ductwork, provide a minimum of two screws one at the bottom and one in the side of each strap on metal ductwork. The spacing, size and installation of hangers shall be in accordance with the recommendations of the latest SMACNA edition.

B. All duct risers shall be supported by angles or channels secured to the sides of the ducts at each floor with sheet metal screws or rivets. The floor supports may also be secured

to ducts by rods, angles or flat bar to the duct joint or reinforcing. Structural steel supports for duct risers shall be provided under this Division.

3.7 AIR DUCT LEAKAGE: (From SMACNA Duct Standards Latest Edition) Test all ductwork (designed to handle over 1000 CFM) as follows:

A. Test apparatus

The test apparatus shall consist of:

1. A source of high pressure air--a portable rotary blower or a tank type vacuum cleaner.
2. A flow measuring device consisting of straightening vanes and an orifice plate mounted in a straight tube with properly located pressure taps. Each orifice assembly shall be accurately calibrated with its own calibration curve. Pressure and flow readings shall be taken with U-tube manometers.

B. Test Procedures

1. Test for audible leaks as follows:
2. Close off and seal all openings in the duct section to be tested. Connect the test apparatus to the duct by means of a section of flexible duct.
   a. Start the blower with its control damper closed.
   b. Gradually open the inlet damper until the duct pressure reaches 1.5 times the standard designed duct operating pressure.
   c. Survey all joint for audible leaks. Mark each leak and repair after shutting down blower. Do not apply a retest until sealants have set.
3. After all audible leaks have been sealed, the remaining leakage should be measured with the orifice section of the test apparatus as follows:
   a. Start blower and open damper until pressure in duct reaches 50% in excess of designed duct operating pressure.
   b. Read the pressure differential across the orifice on manometer No. 2. If there is no leakage, the pressure differential will be zero.
   c. Total allowable leakage shall not exceed one (1) percent of the total system design air flow rate. When partial sections of the duct system are tested, the summation of the leakage for all sections shall not exceed the total allowable leakage.
   d. Even though a system may pass the measured leakage test, a concentration of leakage at one point may result in a noisy leak which, must be corrected.
4. Testing Report
   a. Contractor shall provide a testing report for each air system to the engineer. The report shall indicate the completion of testing and compliance with testing specification.
   b. All duct testing reports shall be included in the final close out documents.

3.8 DUCT SYSTEM PROTECTION

A. Provide temporary closures at the ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation; provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

B. Provide temporary construction filters on air handling equipment and/or return air ductwork during construction to protect ductwork and equipment from dust.

C. Any ductwork stored on site with observable dirt or debris inside shall be cleaned by a third party.

D. If the air handling system has been operated without temporary construction filters or if the integrity of the temporary closures has been compromised, the contractor shall have the duct system cleaned per the following section.

3.9 DUCT SYSTEM CLEANING

A. For renovation projects and HVAC retrofit applications wherein existing duct systems are scheduled to be re-used, or where required by the Duct System Protection section above, the contractor shall have the existing duct systems cleaned in accordance with the current published standards of ASHRAE and NADCA and as indicated below.

B. Duct system cleaning method used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment is assured.

C. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.

D. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.

E. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.

F. Duct cleaning method used shall not damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

G. Replace the fiberglass material if there is any evidence of damage, deterioration, delamination, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating.

H. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

I. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.

J. Cleaning Report: Contractor shall provide a report to the Owner indicating the completion of duct cleaning per specification and areas of the duct system found to be damaged and/or in need of repair.

3.10 DUCT JOINTS AND SEAMS

A. All ductwork shall be constructed to Seal Class A, as referenced in SMACNA Standards.

B. All non-welded joints and seams shall be sealed. This includes but is not limited to:

1. Transverse joints.
2. Longitudinal seams.
3. Duct wall penetrations.
4. Spin-ins, taps, and other branch connections.
5. Access doors, access panels, and duct connections to equipment.

C. Openings for rotating shafts shall be sealed with bushings.

END OF SECTION

SECTION 23 33 00

DUCTWORK ACCESSORIES

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Volume control dampers.

B. Shutoff Dampers.

C. Round Duct Taps.

D. Conical Duct Taps.

E. Fire dampers.

F. Combination fire and smoke dampers.

G. Back draft dampers.

H. Air turning devices.

I. Flexible duct connections.

J. Duct access doors.

K. Duct test holes.

1.2 RELATED WORK

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

B. Section 23 31 13 - Metal Ductwork.

1.3 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B. SMACNA - Low Pressure Duct Construction Standards.

C. UL 33 - Heat Responsive Links for Fire-Protection Service.

D. UL 555 - Fire Dampers and Ceiling Dampers.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division One.

B. Provide shop drawings for shop fabricated assemblies indicated, including volume control dampers duct access doors duct test holes. Provide product data for hardware used.

C. Submit manufacturer's installation instructions under provisions of Division 1, for fire dampers and combination fire and smoke dampers.

PART 2 - PRODUCTS

2.1 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.

C. Fabricate splitter dampers of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/2 inch diameter rod in self aligning, universal joint, action flanged bushing, with set screw.

D. Fabricate single blade dampers for duct sizes to 9-1/2 x 24 inch.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch.

1. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
2. On outside air, return air, and all other dampers required to be low leakage type, provide galvanized blades and frames, seven inches wide maximum, with replaceable vinyl, EPDM, silicone rubber seals on blade edges and stainless steel side seals. Provide blades in a double sheet corrugated type construction for extra strength. Provide hat channel shape frames for strength and blade linkage enclosure to keep linkage out of the air stream. Construction leakage not to exceed 1/2%, based on 2,000 fpm and 4 inch static pressure.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.2 SHUTOFF DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Provide Class I multi-blade damper of parallel blade pattern for all ductwork systems which penetrate the building thermal envelope.

1. Damper shall be constructed of one-piece 16 ga. roll-formed galvanized steel hat-shaped channel frame. Blades shall be 14 ga. roll-formed galvanized steel, airfoil type. Blade edge seals shall be neoprene gaskets mechanically locked to blade edge. Bearings shall be 304 stainless steel, oil-impregnated and self-lubricating sleeve type, turning in extruded holes in damper frame.

C. Shutoff dampers shall have an air leakage rate not greater than 4 cfm/ft^2 of damper surface area at 1.0 in.w.g. and shall be labeled by an approved agency when tested in accordance with AMCA 500D for such purpose.

2.3 ROUND DUCT TAPS

A. Taps to trunk duct for round flexible duct shall be spin-in fitting with locking quadrant butterfly damper, model no. FLD-B03 by Flexmaster or approved equal.

2.4 CONICAL DUCT TAPS

A. Taps to trunk duct for primary air inlet to all VAV terminal units shall be conical fitting, model no. CB by Flexmaster or approved equal.

2.5 ACCEPTABLE MANUFACTURERS - FIRE DAMPERS AND COMBINATION FIRE AND SMOKE DAMPERS

A. Greenheck.

B. Louvers and Dampers Inc.

C. Ruskin.

D. Nailor Industries.

E. Pottorff

2.6 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Provide curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream.

C. Fabricate multiple blade fire dampers per U.L. with 16 gauge minimum galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

D. Fusible links, UL 33, shall separate at 160 degrees F. Provide adjustable link straps for combination fire/balancing dampers.

2.7 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Provide factory sleeve for each damper. Install damper operator on exterior of sleeve and link to damper operating shaft.

C. Fabricate with multiple blades with 16 gauge galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

2. Operators shall be spring return electric type suitable to operate on 120 V AC, 60 cycle.
3. Operators shall be UL listed and labeled.

2.8 SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Motorized Smoke Dampers: multi-blade type, normally open with power on, close automatically when power is interrupted, UL-listed and labeled damper and damper operator.

2.9 ACCEPTABLE MANUFACTURERS – BACKDRAFT DAMPERS

A. Greenheck

B. American Warming and Vent.

C. Louvers and Dampers Inc.

D. Ruskin.

E. Pottorff

F. Substitutions: Under provisions of Division One.

2.10 BACKDRAFT DAMPERS

A. Gravity back draft dampers, size 18 x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.

B. Fabricate multi-blade, parallel action gravity balanced back draft dampers of 16 gauge galvanized steel, or extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

C. Gravity backdraft dampers shall have an air leakage not greater than 20 cfm/ft^2 where not less than 24 inches in either dimension and 40 cfm/ft^2 where less than 24 inches in either dimension. The rate of air leakage shall be determined at 1.0 in.w.g. when tested in accordance with AMCA 500D for such purpose.

2.11 ACCEPTABLE MANUFACTURERS – AIR TURNING DEVICES

A. Young Regulator.

B. Titus.

C. Tuttle and Bailey.

D. Substitutions: Under provisions of Division One.

2.12 AIR TURNING DEVICES

A. On duct sizes less than 12 x 12, multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with worm drive mechanism with 18 inch long removable key operator.

2.13 ACCEPTABLE MANUFACTURERS – FLEXIBLE DUCT CONNECTIONS

A. Metaledge.

B. Ventglass.

C. Substitutions: Under provisions of Division One.

2.14 FLEXIBLE DUCT CONNECTIONS TO AIR MOVING EQUIPMENT

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz per sq yd, approximately 6 inches wide, crimped into metal edging strip.

2.15 ACCEPTABLE MANUFACTURERS – DUCT ACCESS DOORS

A. Greenheck.

B. American Warming and Vent.

C. Ruskin.

D. Titus.

E. Substitutions: Under provisions of Division One.

2.16 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.

B. Review locations prior to fabrication.

C. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover. Insulation shall be replaceable without field cutting or patching.

D. Access doors smaller than 12 inches square may be secured with sash locks.

E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

F. Access doors with sheet metal screw fasteners are not acceptable.

2.17 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Balancing Dampers

1. Provide at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts and as required for air balancing. Use splitter dampers only where indicated.
2. All regulators mounted on externally insulated ductwork shall have 16 gauge elevated platforms at least 1/8 inch higher than the thickness of the insulation. Damper shaft shall have Ventlock No. 607 bearing mounted on ductwork within elevated platform. If duct is inaccessible the operating handle shall be extended and the regulator installed on the face of the wall or ceiling. Where regulators are exposed in finished parts of the building, they shall be flush type, Ventlock No. 666. All regulators shall be manufactured by Ventlock, or approved equal.
3. All dampers in lined ductwork shall have bushing to prevent damper damage to liner.

C. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

D. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.

E. Provide gravity backdraft dampers or motorized shutoff dampers in accessible location nearest to exterior wall/roof penetrations and where indicated for all outdoor air intake and exhaust systems to automatically shut when the associated systems or spaces served are not in use.

F. Provide flexible duct connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Provide at least one inch slack at all flexible duct connections.

G. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

H. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION

SECTION 23 34 00

HVAC FANS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. Section 23 02 00 - Basic Materials and Methods is included as a part of this Section as though written in full in this document.

1.2 WORK INCLUDED

A. Centrifugal roof ventilators.

B. Ceiling and inline ventilators.

C. Roof supply fans.

1.3 RELATED SECTIONS

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment

C. Section 23 09 63 – Energy Management and Control System

D. Section 23 05 93 – Testing, Adjusting and Balancing

1.4 QUALITY ASSURANCE

A. UL Compliance: Fans shall be designed, manufactured, and tested in accordance with UL 705 "Power Ventilators."

B. UL Compliance: Fans and components shall be UL listed and labeled.

C. Nationally Recognized Testing Laboratory Compliance (NRTL): Fans and components shall be NRTL listed and labeled. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.

D. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

E. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

F. Sound Power Level Ratings: Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating." Fans shall be licensed to bear the AMCA Certified Sound Ratings Seal.

G. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE Standard 51 - Laboratory Methods of Testing Fans for Rating.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:

B. Product data for selected models, including specialties, accessories, and the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound power ratings.
3. Motor ratings and electrical characteristics plus motor and fan accessories.
4. Materials, gages and finishes, include color charts.
5. Dampers, including housings, linkages, and operators.
6. Full color paint samples.

C. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

D. Coordination drawings, in accordance with Division 23, Section "Basic Materials and Methods", for roof penetration requirements and for reflected ceiling plans drawn accurately to scale and coordinating penetrations and units mounted above ceiling. Show the following:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension members.
3. Method of attaching hangers to building structure.
4. Size and location of initial access modules for acoustical tile.
5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

F. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer installed wiring and field installed wiring.

G. Product certificates, signed by manufacturer, certifying that their products comply with specified requirements.

H. Maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 23, Section "Basic Materials and Methods".

1.6 DELIVERY, STORAGE, AND HANDLING

A. Fans shall be stored and handled in accordance with the unit manufacturer’s instructions.

B. Lift and support units with the manufacturer's designated lifting or supporting points.

C. Disassemble and reassemble units as required for movement into the final location following manufacturer's written instructions.

D. Deliver fan units as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.8 OPERATIONS PERSONNEL TRAINING

A. Provide a training session for the owner's operations personnel. Training session shall be performed by a qualified person who is knowledgeable in the subject system/equipment. Submit a training agenda two (2) weeks prior to the proposed training session for review and approval. Training session shall include at the minimum:

1. Purpose of equipment.
2. Principle of how the equipment works.
3. Important parts and assemblies.
4. How the equipment achieves its purpose and necessary operating conditions.
5. Most likely failure modes, causes and corrections.
6. On site demonstration.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. PennBarry

B. Loren Cook Company

C. Greenheck Fan Corporation

D. ACME

E. Twin City Fan and Blower

2.2 GENERAL DESCRIPTION

A. Provide fans that are factory fabricated and assembled, factory tested, and factory finished with indicated capacities and characteristics.

B. Fans and Shafts shall be statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.

C. Provide factory baked-enamel finish coat after assembly. Color for roof mounted fans shall be chosen by Architect during the submittal process.

2.3 CENTRIFUGAL ROOF VENTILATORS

A. Fan shall be a spun aluminum, centrifugal, roof mounted, direct driven or belt driven as indicated.

B. Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure.

D. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. A discharge baffle conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections.

E. The motor, bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate and shall be shipped in transit tested packaging.

F. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA standard 204-96, balance quality and vibration levels for fans.

G. Motor shall be heavy duty type with permanently lubricated sealed ball bearings.

H. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty re-greaseable ball type in a cast iron housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

I. Accessories: The following accessories are required.

1. Disconnect Switch: Non-fusible type, with thermal overload protection, mounted inside fan housing, factory-wired through an internal aluminum conduit.
2. Bird Screens: Removable ½ inch mesh, 16 gauge, aluminum or brass wire.
3. Dampers: Gravity backdraft damper or motorized shutoff damper mounted in accessible location. Refer to 23 33 00 – Ductwork Accessories.
4. Roof Curbs: Prefabricated, 12 inch high, heavy-gauge, galvanized steel; mitered and welded corners; 2 inch thick, rigid, fiberglass insulation adhered to inside walls; built-in cant and mounting flange for flat roof decks; and 2 inch wood nailer. Size as required to suit roof opening and fan base. Roof curb shall match roof slope so that the curb is level.

2.4 CEILING AND INLINE VENTILATORS

A. Ceiling and inline ventilators shall be direct drive or belt drive as indicated, centrifugal blower type. Fan wheel shall be constructed of galvanized steel and shall be dynamically balanced. The housing shall be constructed of minimum 20 gauge corrosion resistant galvanized steel and acoustically insulated for quiet operation. Blower and motor assembly shall be easily removable from the housing without disturbing the ductwork. The motor shall be permanently lubricated with built-in thermal overload protection and shall be factory tested prior to shipment. The ceiling ventilators shall be furnished standard with a powder-painted white steel grille.

B. Ventilators shall be certified and licensed to bear the AMCA Seal for Air and Sound Performance. Ventilator performance shall be based on tests and procedures performed in accordance with AMCA publication 211 and comply with the requirements of the AMCA Certified Ratings Program. Fan sound power level ratings shall be based on tests and procedures performed in accordance with AMCA publication 311 and comply with the requirements of the AMCA Certified Ratings Program. Ventilators shall be UL listed and CSA certified.

C. Accessories: The following accessories are required.

1. Dampers:
   a. Aluminum backdraft damper.
   b. Motor-operated volume control damper.
   c. U.L. listed ceiling radiation damper for ceiling fans comply with NFPA Standard 90A rated for 3 hours.
2. Disconnect Switch: Nonfusible type with thermal overload protection.
3. Speed Controls: Fan mounted, solid state speed controller.

2.5 ROOF SUPPLY FANS

A. Roof-mounted, filtered air supply units are of the belt-driven, double width, double inlet (DWDI), forward curved centrifugal blower type. The unit's blower assembly shall be mounted on vibration isolators. Motor drives shall be machine cast iron and variable pitch and shall be factory set to the specified RPM. Belts shall be non-static and oil resistant. Both motor and blower bearings shall be permanently lubricated with sealed ball bearings. The blower housing shall be fabricated of heavy gauge painted steel.

B. Fan shall be listed by Underwriters Laboratories (UL 705) and shall bear the AMCA certified rating seal for sound and air performance.

C. Units housing shall be minimum 18 gauge extruded aluminum with a removable aluminum cover. The insulated cover shall be held in place with bolts for easy access to fan components.

D. Filters shall be permanent, one inch, washable, aluminum type and shall be easily removed for cleaning. Units carry the AMCA Certified Ratings Seal for air performance with filters in place.

E. Accessories: The following items are required.

1. Disconnect Switch: Non-fusible type, with thermal overload protection mounted inside fan housing, factory-wired through an internal aluminum conduit.
2. Bird Screens: Removable ½ inch mesh, 16 gauge, aluminum or brass wire.
3. Dampers: Gravity backdraft damper or motorized shutoff damper mounted in accessible location. Refer to 23 33 00 – Ductwork Accessories.
4. Roof Curb: Prefabricated, 12 inch high, heavy gauge, galvanized steel; mitered and welded corners; 2 inch thick, rigid, fiberglass insulation adhered to inside walls; built-in cant and mounting flange for flat roof decks; and 2 inch wood nailer. Size as required to suit roof opening and fan base.

PART 3 – EXECUTION

3.1 Install in accordance with manufacturer's instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturer's requirements.

END OF SECTION

SECTION 23 37 13

AIR DISTRIBUTION DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Ceiling air diffusers.

B. Wall registers and grilles.

C. Louvers.

D. Other air devices indicated on drawings and schedules.

1.2 RELATED SECTIONS

A. Section 08 91 00 – Louvers

B. Section 23 02 00 – Basic Materials and Methods

C. Section 23 05 93 – Testing, Adjusting and Balancing

D. Section 23 07 13 – Duct Insulation

E. Section 23 31 13 – Metal Ductwork

F. Section 23 33 00 – Ductwork Accessories

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air distribution devices of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. AHRI Compliance: Test and rate air distribution devices in accordance with AHRI 880 - Performance Rating of Air Terminals.
2. ASHRAE Compliance: Test and rate air distribution devices in accordance with ASHRAE 70 - Method of Testing the Performance of Air Outlets and Air Inlets.
3. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
4. AMCA 540 – Test Methods for Louvers Impacted by Wind Borne Debris with Enhanced Protection Approval.
5. AMCA 550 – Test Method for High Velocity Wind Driven Rain Resistant Louvers.
6. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
7. NFPA Compliance: Install air distribution devices in accordance with NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
8. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
9. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
10. IBC – International Building Code.
11. IMC – International Mechanical Code.

12. UMC – Uniform Mechanical Code.

1.4 DEFINITIONS

A. Hurricane-prone regions:
   1. The U.S. Atlantic Ocean and Gulf of Mexico coasts where the ultimate design wind speed for Risk Category II Buildings is greater than 115 mph;
   2. Hawaii, Puerto Rico, Guam, Virgin Islands and American Samoa.

B. Wind-borne debris region: Areas within hurricane-prone regions located:
   1. Within 1 mile of the coastal mean high water line where the ultimate design wind speed is 130 mph or greater; or
   2. In areas where the ultimate design wind speed is 140 mph or greater. For Risk Category II buildings and structures and Risk Category III building and structures, except health care facilities, the wind-borne debris region shall be based on Figure 1609.3(1). For Risk Category IV buildings and structures and Risk Category III health care facilities, the wind-borne debris region shall be based on Figure 1609.3(2).

C. Ultimate design wind speed – The ultimate design wind speed for the determination of the wind loads shall be determined by Figures 1609.3(1), 1609.3(2) and 1609.3(3) of International Building Code.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for the following:
   1. Air Distribution Devices
      a. Schedule of air distribution devices indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
      b. Data sheet for each type of air distribution devices, and accessory furnished; indicating construction, finish, and mounting details.
      c. Performance data for each type of air distribution devices furnished, including aspiration ability, temperature and velocity traverses; throw and drop; and noise criteria ratings. Indicate selections on data.
   2. Louvers
      a. Manufacturer's product data including performance data.
      b. Preparation instructions and recommendations.
      c. Storage and handling requirements and recommendations.
      d. Installation methods.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air distribution device and louver, indicating materials, construction, dimensions, accessories, and installation details.

C. Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver air distribution devices wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.

B. Store air distribution devices and louvers in original cartons and protect from weather and construction work traffic in accordance with manufacturer's instructions. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 WARRANTY

A. Warrant the installation of the work specified herein for one year against becoming unserviceable or causing an objectionable appearance resulting from defective or nonconforming workmanship.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - AIR DEVICES

A. Titus Company

B. Metalaire Industries, Inc.

C. Nailor Industries

D. Krueger

E. Price

2.2 AIR DEVICES

A. Unless otherwise indicated, provide manufacturer's standard air devices when shown of size, shape, capacity, type and accessories indicated on drawings and schedules, constructed of materials and components as indicated and as required for complete installation and proper air distribution.

B. Provide air devices that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.

C. Unless noted otherwise on drawings, the finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H. The paint must pass a 100-hour ASTM D117 Corrosive Environments Salt Spray Test without creepage, blistering, or deterioration of film. The paint must pass a 250-hour ASTM-870 Water Immersion Test. The paint must also pass the ASTM D-2794 Reverse Impact Cracking Test with a 50 inch-pound force applied.

D. Provide air device with border styles that are compatible with adjacent ceiling or wall system, and that are specially manufactured to fit into the wall construction or ceiling module with accurate fit and adequate support. Refer to architectural construction drawings and specifications for types of wall construction and ceiling systems.

E. Provide integral volume damper with roll formed steel blades where indicated on drawings or schedules. Dampers shall be opposed blade design with a screwdriver slot or a concealed lever operator for adjustment through the face of the air device.

F. Air devices designated for fire rated systems shall be pre-assembled with UL classified radiation damper and thermal blanket. Fire rated air devices shall be shipped completely assembled, one assembly per carton; each assembly shall be enclosed in plastic shrink wrap with installation instructions.

2.3 ACCEPTABLE MANUFACTURERS - LOUVERS

A. Ruskin Manufacturing Company

B. Greenheck Company

C. Louvers and Dampers, Inc.

D. Pottorff

E. Arrow

2.4 LOUVERS

A. Louvers not located in hurricane-prone regions or wind-borne debris regions shall meet the requirements of AMCA 500-L for Laboratory Methods of Testing Louvers for Rating and be drainable stationary type louvers.

B. Louvers located in hurricane-prone regions shall meet the requirements of AMCA 550 for High Velocity Wind Driven Rain without the use of a control damper.

C. Louvers located in wind-borne debris regions within 30 feet of grade shall meet the requirements of AMCA 540 for Large Missile Impact.

D. Provide louvers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

E. Provide louvers that have minimum free area and maximum pressure drop as indicated on drawings.

F. Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to architectural construction drawings and specifications for types of substrate.

G. Coordinate with Architect for finish and color.

H. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.

PART 3 – EXECUTION

3.1 All interior surfaces of all air devices shall be painted flat black.

3.2 See floor plans for type, neck size and CFM of air for all air distribution devices.

3.3 Install all air distribution devices as detailed on plans and in accordance with manufacturer's recommendations.

3.4 The backside of all supply air devices shall be insulated with taped and sealed 1½ inch thick external duct wrap. Refer to 23 07 13 - Duct Insulation.

3.5 Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.

3.6 If opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.7 Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.

3.8 Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.

3.9 Touch-up, repair or replace any damaged products prior to substantial completion.

END OF SECTION

SECTION 23 41 00

AIR FILTERS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 23 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

PART 2 - PRODUCTS

2.1 FILTERS

A. Air filters shall be medium efficiency ASHRAE pleated panels consisting of synthetic media, welded wire media support grid, and beverage board enclosing frame, AAF PREpleat M11-HC, 2-inch thick or approved equal.

B. APPROVED MANUFACTURERS: The following manufacturers are approved subject to specification compliance.
1. American Air Filter.
2. Camfil.
3. Airguard Industries, Inc.
4. Cambridge.
5. Filtration Group

2.2 LOW VELOCITY FILTER SECTION

A. Filters shall be of the throwaway cartridge type in 2-inch frames. When installing multiple filters into slide-in frames tape adjacent filters together with duct tape to prevent bypassing of air around the filter. Media shall be rated at 500 feet per minute.

B. Filtering media shall be formed of non-woven reinforced synthetic type filtering media bonded to 96% open area media support grid folded into a non-creased radial pleat design. The filter pack shall be bonded to the enclosing frame to prevent air bypass. Minimum Efficiency Reporting Value of MERV 11 when evaluated under the guidelines of ASHRAE Standard 52.2-2017. Initial resistance shall not exceed 0.30 inches water gauge at 500 FPM face velocity.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install differential pressure switch to activate "Filter Dirty" light when pressure difference across filters reaches 0.5 inches w.g. (adjustable). Locate "filter dirty" lights in mechanical rooms with identifying label.

B. Refer to Section 23 02 00 for additional filter information.

END OF SECTION

SECTION 23 51 26

FLUE PIPE SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 23 02 00, are included as a part of this Section as though written in full in this document.

1.2 SCOPE

Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

PART 2 - PRODUCTS

2.1 FLUE VENTS:

A. Required for boilers:

B. Pipe: Double pipe galvanized steel with air space between inner and outer pipes. Extend into cap.

C. Caps: Galvanized steel, Brieidert (or similar Acme or Triangle) Type L on stack extension above a roof jack which shall be a minimum of two feet high. Bottom plate of cap shall be higher than any parapet or wall within 20', and in no case less than two feet above the roof. Cap shall be 2" larger diameter than outer pipe of flue.

D. Clearances: Maintain adequate clearance from combustible materials to prevent fire hazard. Provide thimble for pipe passing through combustible materials. Provide fiberglass insulation between outer pipe and roof jack to prevent heating roofing materials.

E. Sleeves: Provide airtight sleeves around all vents passing through ceiling cavity of plenum spaces, to prevent flue gases escaping into cavity space.

PART 3 - EXECUTION

3.1 All equipment shall be installed in accordance with the manufacturers recommendations and printed installation instructions.

3.2 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturers requirements.

END OF SECTION

SECTION 23 74 16

ROOFTOP HEATING AND COOLING UNITS (ELECTRIC COOLING - GAS HEATING)

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. Section 23 02 00 – Basic Materials and Methods is included as a part of this Section as though written in full in this document.

1.2 SCOPE

Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for Owner's use.

1.3 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 23 09 63 – Energy Management and Control System

1.4 RELATED SECTIONS

A. Section 23 02 00 – Basic Materials and Methods

B. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

C. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment

D. Section 23 05 93 – Testing, Adjusting, and Balancing

E. Section 23 09 63 – Energy Management and Control System

F. Section 23 33 00 - Ductwork Accessories

G. Section 23 41 00 – Air Filters

1.5 QUALITY ASSURANCE

A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.

B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. AHRI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard.

D. ANSI/ASHRAE/IES 90 A - Energy Conservation in New Building Design Standard provides performance requirements to improve the utilization of energy in new buildings.

E. AHRI 410 - Forced Circulation Air-Cooling and Air- Heating Coils Standard for establishing requirements for testing, rating and certification of ratings.

F. ANSI/UL 465 - Central Cooling Air Conditioners Standard for safety requirements.

G. AMCA 300 - Reverberant room method for sound testing of fans.

H. ANS S1.32 - Precision methods for the determination of sound power levels of discrete frequency and narrow band noise sources in reverberation rooms.

1.6 SUBMITTALS

A. Submit Shop drawings and product data under provisions of Division One.

B. Shop drawings shall indicate components, dimensions, weights, required service clearances, and location and sizes of field connections. Indicate equipment, piping and connections and valves required for complete system.

C. Product data shall include rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

D. Provide fan curves with specified operating point clearly identified.

E. Submit manufacturer's installation instructions.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit operation data.

B. Include start-up instructions, maintenance data, controls, and accessories. Include trouble-shooting guide.

C. Submit maintenance data.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site. Comply with manufacturer's installation instructions for rigging, unloading and transporting units.

B. Accept products on site and inspect for damage.

C. Protect units from physical damage. Factory shipping covers and skids shall be kept in place until installation. Store in a clean dry place and protect from weather and construction traffic.

1.9 WARRANTY

A. Provide a full parts and labor warranty for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide five-year warranty for compressors materials and labor.

1.10 OPERATIONS PERSONNEL TRAINING

A. Provide a training session for the owner’s operations personnel. Training session shall be performed by a qualified person who is knowledgeable in the subject system/equipment.

Submit a training agenda two (2) weeks prior to the proposed training session for review and approval. Training session shall include at the minimum:

1. Purpose of equipment.
2. Principle of how the equipment works.
3. Important parts and assemblies.
4. How the equipment achieves its purpose and necessary operating conditions.
5. Most likely failure modes, causes and corrections.
6. On site demonstration.

PART 2 – PRODUCTS

2.1 PRODUCTS

A. Rooftop unit shall be packaged and include electric cooling and gas-fired heat, with capacity and modulating cooling and heating as shown on the drawings.

B. Unit shall be factory-charged and tested, shall be UL-labeled and ARI-certified by Standard 210 and 270, and shall be AGA-certified.

C. Unit casing shall be heavy-gauge galvanized steel or heavy-gauge aluminum with protective coat of baked enamel. Weatherproof access panels shall be provided for access to all parts requiring service.

D. Compressor(s) shall be hermetic scroll type and shall be resiliently mounted to avoid vibration and noise. Compressor shall be provided with anti-slugging protection, crankcase heater, and time delay on recycling of the compressor. Two internal compressor motor thermal cutouts and a hot gas cutout shall protect the compressor in addition to high-pressure and low-pressure safeties. Standard controls shall permit operation down to 35 deg. F (2 deg. C), and compressor shall be locked out below this temperature.

E. Condenser fan(s) shall be direct-driven and shall be designed for operation exposed to the weather.

F. Condenser coils shall have a sub-cooling section.

G. Refrigerant circuit shall include filter dryer, moisture indicator, sight glass, and gauge ports.

H. Filter rack shall be provided for filters 2 in. thick and shall filter both outdoor air and return air. See Section 23 41 00 for type of filters, and the number of filter changes to be furnished with the equipment.

I. Evaporator fan shall be quiet-type centrifugal blower, directly connected to an adjustable-speed motor or belt driven with an adjustable-pitch pulley on the motor.

J. Heat exchanger shall be aluminized steel, designed for long life and quiet operation. Burner shall provide dependable and quiet ignition in the stages as called for.

K. Gas burner controls shall provide automatic safety pilot, dual automatic gas valves, manual gas cock, and pressure regulator. Ignition shall be electric for the intermittent pilot with 100% shutoff when the unit is off.

L. Induced draft blower shall provide pre-purge and shall be provided with a proving switch to prevent burner operation if venter is not in operation.

M. Provide fan switch and limit control to delay the fan until heat is available and to continue fan operation until heat is dispersed. Limit switch shall shut the burner down in case of failure of operating controls.

2.2 ACCESSORY EQUIPMENT

A. Unit shall be provided with hot gas reheat option for dehumidification. Hot gas reheat coil shall be located on the leaving air side of the evaporator coil and fully piped and circuited at the factory.

B. Condenser coil hail guards shall be provided.

C. A prefabricated heavy gauge galvanized steel, mounting curb shall be provided for field assembly on the roof decking prior to unit shipment. The roof curb shall be a full perimeter type with complete perimeter support of the air handling section and condensing section. The curb shall be a minimum of 14" high and include a nominal 2" x 4" wood nailing strip. Gasket shall be provided for field mounting between the unit base and roof curb.

D. Provide economizer dampers and controls to provide "free cooling" from 0 to 100% outdoor air (OA) when the outside air humidity and temperature are acceptable. Provide OA, return air, and relief air dampers in a factory-provided enclosure. All air shall be filtered and bird screen shall be installed. Dampers shall have an air leakage rate not greater than 4 cfm/ft2 of damper surface area at 1.0 in.w.g. and shall be labeled by an approved agency when tested in accordance with AMCA 500D for such purpose.

E. A solid-state enthalpy changeover control shall determine the capability of the outside air to provide free cooling. The control package shall include a differential enthalpy sensor in the return air duct to compare the enthalpy of the outside air and return air and use the air with the lowest enthalpy for free cooling or assisting the mechanical cooling. The cooling control sequence is as follows:

1. The changeover control determines if the outdoor air is suitable for free cooling.
2. The space thermostat determines if cooling is needed in the building. If so,
3. The actuator modulates the outdoor air and return air dampers to maintain the desired mixed air temperature.
4. The second cooling stage of the space thermostat energizes the compressor to assist the economizer if required.
5. If the outdoor air is not suitable for free cooling, the outdoor air damper remains in the minimum ventilation position and the compressor is energized when space cooling is required.

F. Provide a warm-up thermostat to prevent the OA dampers from opening if the return air temperature is below the set point (65 deg. F) (18 deg. C).

G. Provide necessary controls for operation of the compressor below the normal temperature of the compressor cutout. Operation shall be permitted down to temperature specified on Drawings.

H. Provide factory-trained service person to check out the system, calibrate the controls, and see that the RTU is operating properly. The service person making the settings shall make a written report to the Engineer and the Owner with all set points listed for future reference.

I. Rooftop units mounted on slabs or other fixed locations shall be provided with adapters

for end discharge and return to the unit.

J. Provide programmable combination thermostat/humidistat and other controls required to produce the control functions called for.

K. Manufacturer shall provide BACnet interface card for communication with EMCS.

2.3 ACCEPTABLE MANUFACTURERS

A. Roof top unit shall be the make and model number shown on the schedule on the Drawings, or acceptable equivalents by Carrier, Lennox, Trane, York, Aaon or Daikin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the curb as required by the job conditions and as recommended by the manufacturer, and install proper flashing and counterflashing. See details on the Drawings.

B. Set the unit in place, taking care to protect the adjacent roofing, and connect the supply and return ductwork.

C. Make electrical and gas line connections, taking care that these do not block access to any part of the equipment requiring service.

D. Have the factory service person check out the unit and make a written report. Place the unit in service.

E. Connect full size condensate drain pipe to roof top unit and extend to nearest drain. Pipe shall be schedule 40 galvanized with malleable iron screwed fittings.

3.2 BALANCING AND TEST

A. Operate the roof top unit and check for proper supply air quantity, noise, and proper operation.

B. Report the airflow, static pressure, voltage and current draw of each item, refrigerant pressure readings, etc., as required by Section 23 05 93 – Testing, Adjusting, and Balancing. This system is not complete until these readings have been made, submitted to the engineer, and accepted.

END OF SECTION

SECTION 26 02 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all Work herein.

B. The Contract Drawings indicate the extent and general arrangement of the systems. If any departure from the Contract Drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore, shall be submitted to the Architect for approval as soon as practicable. No such departures shall be made without the prior written approval of the Architect.

1.02 SCOPE OF WORK

A. The Work included under this Contract consists of the furnishing and installation of all equipment and material necessary and required to form the complete and functioning systems in all of its various phases, all as shown on the accompanying Drawings and/or described in these Specifications. The contractor shall review all pertinent drawings, including those of other contracts prior to commencement of Work.

B. This Division requires the furnishing and installing of all items Specified herein, indicated on the Drawings or reasonably inferred as necessary for safe and proper operation; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to, materials, labor, supervision, transportation, storage, equipment, utilities, all required permits, licenses and inspections. All work performed under this Section shall be in accordance with the Project Manual, Drawings and Specifications and is subject to the terms and conditions of the Contract.

C. The approximate locations of Electrical items are indicated on the Drawings. These Drawings are not intended to give complete and accurate details in regard to location of outlets, apparatus, etc. Exact locations are to be determined by actual measurements at the building, and will in all cases be subject to the Review of the Owner or Engineer, who reserves the right to make any reasonable changes in the locations indicated without additional cost to the Owner.

D. Items specifically mentioned in the Specifications but not shown on the Drawings and/or items shown on Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

E. All discrepancies within the Contract Documents, or discrepancies between the Contract Documents and actual job-site conditions shall be reported to the Owner or Engineer so that they will be resolved prior to the bidding, where this cannot be done at least 7 working days prior to bid; the greater or more costly of the discrepancy shall be bid. All labor and materials required to perform the work described shall be included as part of this Contract.

F. It is the intention of this Section of the Specifications to outline minimum requirements to furnish the Owner with a turn-key and fully operating system in cooperation with other trades.

G. It is the intent of the above "Scope" to give the Contractor a general outline of the extent of the Work involved; however, it is not intended to include each and every item required for the Work. Anything omitted from the "Scope" but shown on the Drawings, or specified later, or necessary for a complete and functioning heating, ventilating and air conditioning system shall be considered a part of the overall "Scope".

H. The Contractor shall rough-in fixtures and equipment furnished by others from rough-in and placement drawings furnished by others. The Contractor shall make final connection to fixtures and equipment furnished by others.

I. Contractor shall participate in the commissioning process; including but not limited to meeting attendance, completion of checklists and participation in functional testing.

1.03 RELATED SECTIONS

A. General Conditions

B. Supplementary Conditions

C. Division One

1.04 COOPERATION WITH TRADES:

A. Cooperation with trades of adjacent, related, or affected materials or operations shall be considered a part of this work in order to affect timely and accurate placing of work and bring together in proper and correct sequence, the work of such trades.

1.05 REFERENCES

A. National Electrical Code (NEC)

B. American Society for Testing and Materials (ASTM)

C. Underwriter's Laboratories, Inc. (UL)

D. Insulated Cable Engineer's Association (ICEA).

E. National Electrical Manufacturer's Association (NEMA).

F. Institute of Electrical and Electronic's Engineers (IEEE).

G. American National Standards Institute (ANSI).

H. National Fire Protection Association (NFPA).

I. International Energy Conservation Code (IECC).

1.06 COMPLETE FUNCTIONING OF WORK:

A. All work fairly implied as essential to the complete functioning of the electrical systems shown on the Drawings and Specifications shall be completed as part of the work of this Division unless specifically stated otherwise. It is the intention of the Drawings and

Specifications to establish the types of the systems, but not set forth each item essential to the functioning of the system. In case of doubt as to the work intended, or in the event of amplification or clarification thereof, the Contractor shall call upon the Architect for supplementary instructions, Drawings, etc.

B. Contractor shall review all pertinent Drawings and adjust his work to all conditions shown there on. Discrepancies between Plans, Specifications, and actual field conditions shall be brought to the prompt attention of the Architect.

1. Approximate location of transformers, feeders, branch circuits, outlets, lighting and power panels, outlets for special systems, etc., are indicated on the Drawings. However, the Drawings, do not give complete and accurate detailed locations of such outlets, conduit runs, etc., and exact locations must be determined by actual field measurement. Such locations will, at all times, be subject to the approval of the Architect.
2. Communicate with the Architect and secure his approval of any outlet (lighting fixture, receptacle, switch, etc.) location about which there may be the least question. Outlets obviously placed in a location not suitable to the finished room or without specific approval, shall be removed and relocated when so directed by the Architect. Location of lighting fixtures shall be coordinated with reflected ceiling plans.

C. Additional coordination with mechanical contractor may be required to allow adequate clearances of mechanical equipment, fixtures and associated appurtenances. Contractor to notify Architect and Engineer of unresolved clearances, conflicts or equipment locations.

1.07 SCHEMATIC NATURE OF CONTRACT DOCUMENTS

A. The contract documents are schematic in nature in that they are only to establish scope and a minimum level of quality. They are not to be used as actual working construction drawings. The actual working construction drawings shall be the approved shop drawings.

1.08 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:

1. A specialist in this field and have the personnel, experience, training, and skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their Owners satisfactorily for not less than 3 years.
3. Perform work by persons qualified to produce workmanship of specified quality. Persons performing electrical work shall be required to be licensed. Onsite supervision, journeyman shall have minimum of journeyman license. Helpers, apprentices shall have minimum of apprentice license.

1.09 DATE OF FINAL ACCEPTANCE

A. The date of final acceptance shall be the date of owner occupancy, or the date all punch list items have been completed or final payment has been received. Refer to Division One for additional requirements.

B. The date of final acceptance shall be documented in writing and signed by the architect, owner and contractor.

1.10 DEFINITIONS AND SYMBOLS

A. General Explanation: A substantial amount of construction and Specification language constitutes definitions for terms found in other Contract Documents, including Drawings which must be recognized as diagrammatic and schematic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article, unless defined otherwise in Division 1.

B. Definitions and explanations of this Section are not necessarily either complete or exclusive but are general for work to the extent not stated more explicitly in another provision of the Contract Documents.

C. Indicated: The term "Indicated" is a cross-reference to details, notes or schedules on the Drawings, to other paragraphs or schedules in the Specifications and to similar means of recording requirements in Contract Documents. Where such terms as "Shown", "Noted", "Scheduled", "Specified" and "Detailed" are used in lieu of "Indicated", it is for the purpose of helping the reader locate cross-reference material, and no limitation of location is intended except as specifically shown.

D. Directed: Where not otherwise explained, terms such as "Directed", "Requested", "Accepted", and "Permitted" mean by the Architect or Engineer. However, no such implied meaning will be interpreted to extend the Architect's or Engineer's responsibility into the Contractor's area of construction supervision.

E. Reviewed: Where used in conjunction with the Engineer's response to submittals, requests for information, applications, inquiries, reports and claims by the Contractor the meaning of the term "Reviewed" will be held to limitations of Architect's and Engineer's responsibilities and duties as specified in the General and Supplemental Conditions. In no case will "Reviewed" by Engineer be interpreted as a release of the Contractor from responsibility to fulfill the terms and requirements of the Contract Documents.

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

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

H. Provide: Except as otherwise defined in greater detail, the term "Provide" is used to mean "Furnish and Install", complete and ready for intended use, as applicable in each instance.

I. Installer: Entity (person or firm) engaged by the Contractor or its subcontractor or Sub-contractor for performance of a particular unit of work at the project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protection, cleaning and similar operations, as applicable in each instance. It is a general requirement that such entities (Installers) be expert in the operations they are engaged to perform.

J. Imperative Language: Used generally in Specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe

responsibilities that must be fulfilled indirectly by the Contractor, or when so noted by other identified installers or entities.

K. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended as minimum quality level or quantity of work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable tolerance limits. In complying with requirements, indicated or scheduled numeric values are either minimums or maximums as noted or as appropriate for the context of the requirements. Refer instances of uncertainty to Owner or Engineer via a request for information (RFI) for decision before proceeding.

L. Abbreviations and Symbols: The language of Specifications and other Contract Documents including Drawings is of an abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self explanatory nature have been included in text of Specifications and Drawings. Specific abbreviations and symbols have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of Specification requirements with notations on Drawings and in Schedules. These are frequently defined in Section at first instance of use or on a Legend and Symbol Drawing. Trade and industry association names and titles of generally recognized industry standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of Contract Documents so indicate. Except as otherwise indicated, graphic symbols and abbreviations used on Drawings and in Specifications are those recognized in construction industry for indicated purposes. Where not otherwise noted symbols and abbreviations are defined by 1993 ASHRAE Fundamentals Handbook, chapter 34 "Abbreviations and Symbols", ASME and ASPE published standards.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Deliver products to the project at such time as the project is ready to receive the equipment, pipe or duct properly protected from incidental damage and weather damage.

C. Damaged equipment shall be promptly removed from the site and new, undamaged equipment shall be installed in its place promptly with no additional charge to the Owner.

1.12 SUBMITTALS

A. Coordinate with Division 01 for submittal timetable requirements, unless noted otherwise within thirty (30) days after the Contract is awarded. The Contractor shall submit an electronic copy of a complete set of shop drawings and complete data covering each item of equipment or material. The submittal of each item requiring a submittal must be received by the Architect or Engineer within the above thirty day period. The Architect or Engineer shall not be responsible for any delays or costs incurred due to excessive shop drawing review time for submittals received after the thirty (30) day time limit. The Architect and Engineer will retain a copy of all shop drawings for their files. All literature pertaining to items subject to Shop Drawing submittal shall be submitted at one time. Submittals shall be placed in one electronic file in PDF 8.0 format and bookmarked for individual specification sections. Individual electronic files of submittals for individual specifications shall not be permitted. Each submittal shall include the following items:

1. A cover sheet with the names and addresses of the Project, Architect, MEP Engineer, General Contractor and the Subcontractor making the submittal. The cover sheet shall also contain the section number covering the item or items submitted and the item nomenclature or description.
2. An index page with a listing of all data included in the Submittal.
3. A list of variations page with a listing all variations, including unfurnished or additional required accessories, items or other features, between the submitted equipment and the specified equipment. If there are no variations, then this page shall state "NO VARIATIONS". Where variations affect the work of other Contractors, then the Contractor shall certify on this page that these variations have been fully coordinated with the affected Contractors and that all expenses associated with the variations will be paid by the submitting Contractor. This page will be signed by the submitting Contractor.
4. Equipment information including manufacturer's name and designation, size, performance and capacity data as applicable. All applicable Listings, Labels, Approvals and Standards shall be clearly indicated.
5. Dimensional data and scaled drawings as applicable to show that the submitted equipment will fit the space available with all required Code and maintenance clearances clearly indicated and labeled at a minimum scale of 1/4" = 1'-0", as required to demonstrate that the alternate or substituted product will fit in the space available.
6. Identification of each item of material or equipment matching that indicated on the Drawings.
7. Sufficient pictorial, descriptive and diagrammatic data on each item to show its conformance with the Drawings and Specifications. Any options or special requirements or accessories shall be so indicated. All applicable information shall be clearly indicated with arrows or another approved method.
8. Additional information as required in other Sections of this Division.
9. Certification by the General Contractor and Subcontractor that the material submitted is in accordance with the Drawings and Specifications, signed and dated in long hand. Submittals that do not comply with the above requirements shall be returned to the Contractor and shall be marked "**REVISE AND RESUBMIT**".

B. Refer to Division 1 for additional information on shop drawings and submittals.

C. Equipment and materials submittals and shop drawings will be reviewed for compliance with design concept only. It will be assumed that the submitting Contractor has verified that all items submitted can be installed in the space allotted. Review of shop drawings and submittals shall not be considered as a verification or guarantee of measurements or building conditions.

D. Where shop drawings and submittals are marked "**REVIEWED**", the review of the submittal does not indicate that submittals have been checked in detail nor does it in any way relieve the Contractor from his responsibility to furnish material and perform work as required by the Contract Documents.

E. Shop drawings shall be reviewed and returned to the Contractor with one of the following categories indicated:

1. **REVIEWED:** Contractor need take no further submittal action, shall include this submittal in the O&M manual and may order the equipment submitted on.
2. **REVIEWED AS NOTED:** Contractor shall submit a letter verifying that required exceptions to the submittal have been received and complied with including additional accessories or coordination action as noted, and shall include this submittal and compliance letter in the O&M manual. The contractor may order

the equipment submitted on at the time of the returned submittal providing the Contractor complies with the exceptions noted.

3. **NOT APPROVED:** Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is not approved, the Contractor will automatically be required to furnish the product, material or method named in the Specifications and/or drawings. Contractor shall not order equipment that is not approved. Repetitive requests for substitutions will not be considered.
4. **REVISE AND RESUBMIT:** Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is marked revise and resubmit, the Contractor will automatically be required to furnish the product, material or method named in the Specifications and/or provide as noted on previous shop drawings. Contractor shall not order equipment marked revise and resubmit. Repetitive requests for substitutions will not be considered.
5. **CONTRACTOR'S CERTIFICATION REQUIRED:** Contractor shall resubmit submittal on material, equipment or method of installation. The Contractor's stamp is required stating the submittal meets all conditions of the contract documents. The stamp shall be signed by the General Contractor. The submittal will not be reviewed if the stamp is not placed and signed on all shop drawings.
6. **MANUFACTURER NOT AS SPECIFIED:** Contractor shall resubmit new submittal on material, equipment or method of installation when the alternate or substitute is marked manufacturer not as specified, the Contractor will automatically be required to furnish the product, material or method named in the specifications. Contractor shall not order equipment where submittal is marked manufacturer not as specified. Repetitive requests for substitutions will not be considered.

F. Materials and equipment which are purchased or installed without shop drawing review shall be at the risk of the Contractor and the cost for removal and replacement of such materials and equipment and related work which is judged unsatisfactory by the Owner or Engineer for any reason shall be at the expense of the Contractor. The responsible Contractor shall remove the material and equipment noted above and replace with specified equipment or material at his own expense when directed in writing by the Architect or Engineer.

G. Shop Drawing Submittals shall be complete and checked prior to submission to the Engineer for review.

H. Furnish detailed shop drawings, descriptive literature, table of contents listing all items being submitted at the beginning of each submittal package, physical data and a specification critique for each section indicating "compliance" and/or "variations" for the following items:

Distribution Panelboards
Panelboards
Wiring Gutters
Heavy Duty Disconnect Switches
Lighting Fixtures
Lighting Contactors
Time Clocks
Lighting Control System
Photocells
Wiring Devices and Plates
Conduit and Fittings
Wire

Switchboards
Harmonic Mitigating & Dry Type Transformers
Intercom/Clock/PA Systems (See Div. 27)
Fire Alarm System (See Div. 28)
Surge Protection Device (SPD)

I. Refer to each specification section for additional requirements.

1.13 OPERATION AND MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 and in addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

1.14 COORDINATION DRAWINGS

A. Prepare coordination drawings to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of pipe, duct, equipment, and other materials. Include the following:
   a. Wall and type locations.
   b. Clearances for installing and maintaining insulation.
   c. Locations of light fixtures and sprinkler heads.
   d. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
   e. Equipment connections and support details.
   f. Exterior wall and foundation penetrations.
   g. Routing of storm and sanitary sewer piping.
   h. Fire-rated wall and floor penetrations.
   i. Sizes and location of required concrete pads and bases.
   j. Valve stem movement.
   k. Structural floor, wall and roof opening sizes and details.
2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

4. Prepare reflected ceiling plans to coordinate and integrate installations, air distribution devices, light fixtures, communication systems components, and other ceiling-mounted items.

B. This Contractor shall be responsible for coordination of all items that will affect the installation of the work of this Division. This coordination shall include, but not be limited to: voltage, ampacity, capacity, electrical and piping connections, space requirements, sequence of construction, building requirements and special conditions.

C. By submitting shop drawings on the project, this Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified and intended, in full coordination with all other Contractors and Subcontractors.

1.15 RECORD DRAWINGS

A. Maintain a continuous record during the course of construction of all changes and deviations in the work from the contract drawings. Upon completion of the work, purchase a set of "Auto Positive Tracings" on vellum and make corrections as required to reflect the electrical systems as installed. Location and size of all conduit shall be accurately shown to dimension. Submit three prints of the tracings for approval. Make corrections to tracings as directed and deliver "Auto Positive Tracings" to the Architect. Record drawings shall be furnished in addition to shop drawings. Symbols on the Record drawings shall correspond to the identification symbols on the contract drawings and equipment identification plates and tags.

B. The Contractor shall maintain a set of clearly marked black line record "AS-BUILT" prints on the job site on which he shall mark all work details, alterations to meet site conditions and changes made by "Change Order" notices. These shall be kept available for inspection by the Owner, Architect or Engineer at all times.

C. Refer to Division 1 for additional requirements concerning record drawings. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil. Delivery of as-built prints and reproducibles is a condition of final acceptance.

D. The record prints shall be updated on a daily basis and shall indicate accurate dimensions for all buried or concealed work, precise locations of all concealed pipe or duct, locations of all concealed valves, controls and devices and any deviations from the work shown on the Construction Documents which are required for coordination. All dimensions shall include at least two dimensions to permanent structure points.

E. Submit three prints of the tracings for approval. Make corrections to tracings as directed and delivered "Auto Positive Tracings" to the architect. "As-Built" drawings shall be furnished in addition to shop drawings.

F. When the option described above is not exercised then upon completion of the work, the Contractor shall transfer all marks to a clear, concise, set of reproducible, record "AS-BUILT" drawings and shall submit the reproducible drawings with corrections made by a competent draftsman and three (3) sets of black line prints to the Architect or Engineer for review prior to scheduling the final inspection at the completion of the work. The reproducible record "AS-BUILT" drawings shall have the Engineers Name and Seal removed or blanked out and shall be clearly marked and signed on each sheet as follows:

CERTIFIED RECORD DRAWINGS

DATE:

(NAME OF GENERAL CONTRACTOR)

BY:_____
(SIGNATURE)

(NAME OF SUBCONTRACTOR)

BY:_____
(SIGNATURE)

1.16 CERTIFICATIONS AND TEST REPORTS

A. Submit a detailed schedule for completion and testing of each system indicating scheduled dates for completion of system installation and outlining tests to be performed and schedule date for each test. This detailed completion and test schedule shall be submittal at least 90 days before the projected Project completion date.

B. Test result reporting forms shall be submitted for review no later than the date of the detailed schedule submitted.

C. Submit 4 copies of all certifications and test reports to the Architect or Engineer for review adequately in advance of completion of the Work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

D. Certifications and test reports to be submitted shall include, but not be limited to those items outlined in Section of Division 26.

1.17 MAINTENANCE MANUALS

A. Coordinate with Division 1 for maintenance manual requirements, unless noted otherwise bind together in “D ring type” binders by National model no. 79-883 or equal, binders shall be large enough to allow ¼” of spare capacity. Three (3) sets of all approved shop drawing submittals, fabrication drawings, bulletins, maintenance instructions, operating instructions and parts exploded views and lists for each and every piece of equipment furnished under this Specification. All sections shall be typed and indexed into sections and labeled for easy reference and shall utilize the individual specification section numbers shown in the Electrical Specifications as an organization guideline. Bulletins containing information about equipment that is not installed on the project shall be properly marked up or stripped and reassembled. All pertinent information required by the Owner for proper operation and maintenance of equipment supplied by Division 26 shall be clearly and legibly set forth in memoranda that shall, likewise, be bound with bulletins.

B. Prepare maintenance manuals in accordance with Special Project Conditions, in addition to the requirements specified in Division 26, include the following information for equipment items:

1. Identifying names, name tags designations and locations for all equipment.
2. Fault Current calculations and Coordination Study.
3. Reviewed shop drawing submittals with exceptions noted compliance letter.
4. Fabrication drawings.

5. Equipment and device bulletins and data sheets clearly highlighted to show equipment installed on the project and including performance curves and data as applicable, i.e., description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and model numbers of replacement parts.
6. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
7. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions, servicing instructions and lubrication charts and schedules.
8. Equipment name plate data.
9. Wiring diagrams.
10. Exploded parts views and parts lists for all equipment and devices.
11. Color coding charts for all painted equipment and conduit.
12. Location and listing of all spare parts and special keys and tools furnished to the Owner.
13. Furnish recommended lubrication schedule for all required lubrication points with listing of type and approximate amount of lubricant required.

C. Refer to Division 1 for additional information on Operating and Maintenance Manuals.

D. Operating and Maintenance Manuals shall be turned over to the Owner or Engineer a minimum of 14 working days prior to the beginning of the operator training period.

1.18 OPERATOR TRAINING

A. The Contractor shall furnish the services of factory trained specialists to instruct the Owner's operating personnel. The Owner's operator training shall include 12 hours of onsite training in three 4 hour shifts.

B. Before proceeding with the instruction of Owner Personnel, prepare a typed outline in triplicate, listing the subjects that will be covered in this instruction, and submit the outline for review by the Owner. At the conclusion of the instruction period obtain the signature of each person being instructed on each copy of the reviewed outline to signify that he has a proper understanding of the operation and maintenance of the systems and resubmit the signed outlines.

C. Refer to other Division 26 Sections for additional Operator Training requirements.

1.19 SITE VISITATION

A. Visit the site of the proposed construction in order to fully understand the facilities, difficulties and restriction attending the execution of the work.

B. Before submitting a bid, it will be necessary for each Contractor whose work is involved to visit the site and ascertain for himself the conditions to be met therein in installing his work and make due provision for same in his bid. It will be assumed that this Contractor in submitting his bid has visited the premises and that his bid covers all work necessary to properly install the equipment shown. Failure on the part of the Contractor to comply with this requirement shall not be considered justification for the omission or faulty installation of any work covered by these Specifications and Drawings.

C. Understand the existing utilities from which services will be supplied; verify locations of utility services and determine requirements for connections.

D. Determine in advance that equipment and materials proposed for installation fit into the confines indicated.

1.20 WARRANTY

A. The undertaking of the work described in this Division shall be considered equivalent to the issuance, as part of this work, of a specific guarantee extending one year beyond the date of completion of work and acceptance by Owner, against defects in materials and workmanship. Materials, appliances and labor necessary to effect repairs and replacement so as to maintain said work in good functioning order shall be provided as required. Replacements necessitated by normal wear in use or by Owner's abuse are not included under this guarantee.

B. All normal and extended warranties shall include parts, labor, miscellaneous materials, travel time, incidental expenses, freight/shipping, refrigerant, oils, lubricants, belts, filters and any expenses related to service call required to diagnose warranty problems.

1.21 TRANSFER OF ELECTRONIC FILES

A. Project documents are not intended or represented to be suitable for reuse by Architect/Owner or others on extensions of this project or on any other project. Any such reuse or modification without written verification or adaptation by Engineer, as appropriate for the specific purpose intended, will be at Architect/Owner’s risk and without liability or legal exposure to Engineer or its consultants from all claims, damages, losses and expense, including attorney’s fees arising out of or resulting thereof.

B. Because data stored in electric media format can deteriorate or be modified inadvertently, or otherwise without authorization of the data’s creator, the party receiving the electronic files agrees that it will perform acceptance tests or procedures within sixty (60) days of receipt, after which time the receiving party shall be deemed to have accepted the data thus transferred to be acceptable. Any errors detected within the sixty (60) day acceptance period will be corrected by the party delivering the electronic files. Engineer is not responsible for maintaining documents stored in electronic media format after acceptance by the Architect/Owner.

C. When transferring documents in electronic media format, Engineer makes no representations as to the long term compatibility, usability or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by Engineer at the beginning of the Project.

D. Any reuse or modifications will be Contractor’s sole risk and without liability or legal exposure to Architect, Engineer or any consultant.

E. The Texas Board of Architectural Examiners (TBAE) has stated that it is in violation of Texas law for persons other than the Architect of record to revise the Architectural drawings without the Architect’s written consent.

1. It is agreed that “MEP” hard copy or computer-generated documents will not be issued to any other party except directly to the Architect/Owner. The contract documents are contractually copyrighted and cannot be used for any other project or purpose except as specifically indicated in AIA B-141 Standard Form of Agreement Between Architect and Owner.

2. If the client, Architect/Owner, or developer of the project requires electronic media for “record purposes”, then an AutoCAD/Revit documents will be prepared

by the Engineer on electronic media such as removable memory devices, flash drives, or CD's. These documents can also be submitted via file transfer protocols. AutoCAD/Revit files will be submitted with all title block references intact to permit the end user to only view and plot the drawings. Revisions will not be permitted in this configuration.

3. At the Architect/Owner's request, Engineer will assist the contractor in the preparation of the submittals and prepare one copy of AutoCAD/Revit files on electronic media or submit through file transfer protocols. The electronic media will be prepared with all indicia of documents ownership removed. The electronic media will be prepared in a ".rvt" or ".dwg" format to permit the end user to revise the drawings.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. The names and manufacturers and model numbers have been used in the Contract documents to establish types of equipment and standards of quality. Where more than one manufacturer is named for a specific item of equipment, only one of the specified manufacturers will be considered for approval. Where only one manufacturer is mentioned with the phrase "or approved equal", Contractor may submit an alternate manufacturer for consideration, provided the following conditions are met:

1. Submit alternate equipment with complete descriptive data in shop drawing form. Provide sample of equipment upon request for review by Architect. Samples will be returned if requested in writing.
2. Alternate equipment must be equal from the standpoint of materials, construction and performance.
3. Alternate submittal must be presented to the Engineer/Architect ten (10) days prior to bid date for approval.

B. The Architect and Engineer shall be the sole judge of quality and equivalence of equipment, materials and methods.

2.02 All materials and products used on this project shall be listed by Underwriters' Laboratories.

2.03 ACCESS DOORS

A. Wherever access is required in walls or ceilings to concealed junction boxes, pull boxes, equipment, etc., installed under this Division, furnish a hinged access door and frame with flush latch handle to another Division for installation. Doors shall be as follows:

1. Plaster Surfaces: Milcor Style K.
2. Ceramic Tile Surfaces: Milcor Style M.
3. Drywall Surfaces: Milcor Style DW.
4. Install panels only in locations approved by the Architect.

2.04 EQUIPMENT PADS

A. Provide 4-inch high concrete pads for indoor floor mounted equipment. Pads shall conform to the shape of the equipment with a minimum of 6 inches beyond the equipment. Top and sides of pads shall be troweled to a smooth finish, equivalent to the floor. External corners shall be bullnosed to a 3/4-inch radius, unless shown otherwise.

B. Provide 6-inch high concrete pads for all exterior mounted equipment. Pads shall conform to the shape of the equipment with a minimum of 6 inches beyond the

equipment. Provide a 4-foot monolithic extension to the pad in front of the equipment for service when mounted on a non-finished area (i.e. landscape, gravel, clay, etc.). Top and sides of pads shall be troweled to a smooth finish. External corners shall be bullnosed to a 3/4-inch radius, unless shown otherwise

C. Provide a minimum 6-inch high, steel reinforced concrete pad for generators. Pads shall be 6 inches larger than the outside perimeter dimensions. Provide a 4-foot monolithic extension to the pad around the equipment for service when mounted on a non-finished area (i.e. landscape, gravel, clay, etc.). Refer to structural details. Top and sides of pads shall be troweled to a smooth finish. External corners shall be bullnosed to a 3/4-inch radius, unless shown otherwise. The Generator shall be bolted to the pad per the manufacturer's recommendations.

D. Provide steel reinforced concrete pad for utility transformers. Pads shall comply with Utility Company Standards.

2.05 ESCUTCHEONS

A. Provide heavy chrome or nickel plated plates, of approved pattern, on conduit passing through walls, floors and ceilings in finished areas. Where conduit passes through a sleeve, no point of the conduit shall touch the building construction. Caulk around such conduit with sufficient layers of two hour rated firesafing by Thermafiber 4.0 P.C.F. density, U.S.G. fire test 4/11/78 and seal off openings between conduit and sleeves with non-hardening mastic prior to application of escutcheon plate. Escutcheons shall be Gravler Sure-Lock, or approved equal.

2.07 SPACE LIMITATIONS

A. Equipment shall be chosen which shall properly fit into the physical space provided and shown on the drawings, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearances in accordance with Code requirements. Physical dimensions and arrangement of equipment shall be subject to the approval of the Architect.

2.08 PAINTING

A. All factory assembled equipment for electrical work, except light fixtures, that normally is delivered with a factory applied finish shall be delivered with a hard surface factory applied finish such as baked-on machinery enamel which will not require additional field painting. The finish shall consist of not less than 2 coats of medium gray color paint USA No. 61 Munsell Notation 8-3G, 6. 10/0.54 enamel. This Contractor shall protect this finish from damage due to construction operations until acceptance of the building. He shall be responsible for satisfactorily restoring any such finishes or replacing equipment that becomes stained or damaged.

2.09 ELECTRICAL SYSTEM IDENTIFICATION

A. Conduit Systems: Provide adequate marking of major conduit which is exposed or concealed in accessible spaces to distinguish each run as either a power or signal/communication conduit. Except as otherwise indicated, use orange banding with black lettering. Provide self-adhesive or snap-on type plastic markers. Indicate voltage for that raceway. Locate markers at ends of conduit runs, on pull boxes, on junction boxes, near switches and other control devices, near items of equipment served by the conductors, at points where conduit passes through walls or floors, or enters non-accessible construction and at spacings of not more than 50 feet along each run of conduit. Switch-leg conduit and short branches for power connections do not have to be marked, except where conduit is larger than ¾ inch. Branch circuit conduits, junction boxes and pull boxes shall be marked with a permanent marker indicating panel name

and branch circuit numbers.

B. Underground Cable Identification: Bury a continuous, preprinted, bright colored plastic ribbon cable marker with each underground cable (or group of cables), regardless of whether conductors are in conduit, duct bank, or direct buried. Locate each directly over cables, 6 to 8 inches below finished grade.

C. Identification of Equipment:

1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Care shall be taken not to obliterate this nameplate in any way.
2. Provide an additional laminated plastic engraved identifying nameplate for each major piece of equipment. Nameplates shall be Black backplate with white letters and numbers for Normal equipment; Red backplates with white letters and numbers for Optional Emergency Equipment; and Yellow backplate with white letters and numbers for Life Safety Equipment. All labels shall be secured by stainless steel screws to each automatic transfer switch, switchboard, distribution panel, motor control center, panelboards, and safety disconnect switches. ~~Emergency backed panelboards shall have white on red background nameplates~~.
   a. Identifying nameplates shall have ¼ inch high engraved letters and shall contain the following information:
      1) Name
      2) Voltage
      3) Phase
      4) "3" or "4" wire, and
      5) Where it is fed from.
   b. An example of a panelboard nameplate is:
      Center: **Panel – 1HB**
      Center: **480/277 volt, 3 phase, 4 wire**
      Center: **Fed from DP2**
   c. An example of an automatic transfer switch nameplate is:
      Center: **ATS #2**
      Center: **480/277 volt, 3 phase, 4 wire, 4 pole**
      Center: **Fed from MSB and DPE**
   d. An example of an equipment disconnect switch nameplate is:
      Center: **AHU-1**
      Center: **480V, 3Ph**
      Center: **DP2-2,4,6**
   e. Transformer Nameplates shall be securely attached with rivets.
      Center: **T-CLA**
      Center: **480/208Y120V**
      Center: **Fed from HA-13,15,17**
3. Each feeder device in a switchboard, distribution panel, and motor control center device shall have a nameplate showing the load served in ½ inch high engraved letters.
4. Laminated plastic engraved identifying nameplate shall be secured by screws to each individual motor starter, enclosed circuit breaker, wireway, and terminal cabinet.
   a. Identifying nameplates shall have ¼ inch high engraved letters and shall indicate the equipment served.
   b. An example if an enclosed circuit breaker:
      Center: **Panel KH MCB**
5. Each wiring device in non-dwelling units shall be identified with the branch circuit

(LA-2) using black on clear self-adhesive tape for normal loads and red on white tape for emergency loads. Affix labels to the front of the coverplate.

6. Cardholders and directory cards shall be furnished for circuit identification in panelboards. Cardholder shall be located on inside of panel door and shall be in a welded metal frame with clear plastic front. Circuit lists shall be typewritten. Circuit descriptions shall include location and name of each item of equipment served. Spares and spaces shall be written in erasable pencil for future use. Circuit directory shall show the room served by each circuit. The final graphs/signage room numbers shall be used. Do not use Architectural numbering on plans.
7. Prohibited Markings: Markings which are intended to identify the manufacturer, vendor, or other source from which the material has been obtained are prohibited for installation within public, tenant, or common areas within the project. Also, prohibited are materials or devices which bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters' Laboratories, Inc.), and approval labels are exceptions to this requirement.
8. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of electrical facilities. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with recognized industry standards for color and design.
9. Operational Tags: Where needed for proper and adequate information on operation and maintenance of electrical system, provide tags of plasticized card stock, either preprinted or hand printed. Tags shall convey the message, example: "DO NOT OPEN THIS SWITCH WHEN BURNER IS OPERATING."

PART 3 - EXECUTION

3.01 EXCAVATING AND BACKFILLING

A. Trenching and backfilling and other earthwork operations required to install the facilities specified herein shall conform to the applicable requirements of Division 2 (95% of maximum standard density). Where trenching or excavation is required in improved areas, the backfill shall be compacted to a condition equal to that of adjacent undisturbed earth and the surface of the area restored to the condition existing prior to trenching or excavating operations. Provide a minimum of 3" of sand underneath all conduits. The plans indicate information pertaining to surface and sub-surface obstructions; however, this information is not guaranteed. Should obstructions be encountered whether or not shown, the Contractor shall alter routing of new work, reroute existing lines, remove obstructions where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of new work and leave existing surfaces and structures in a satisfactory and serviceable condition. **All work shall comply with OSHA Standards.**

3.02 WORKMANSHIP AND CONCEALMENT

A. The work of this Section shall be performed by workman skilled in their trade. Installation shall be consistent in completeness whether concealed or exposed. Each item of electrical work shall be concealed in walls, chases, under floors and above ceilings except:

1. Where shown to be exposed.
2. Where exposure is necessary to the proper function.

3.03 SLEEVES, CUTTING AND PATCHING

A. This section shall be responsible for placing sleeves for all conduit passing through walls,

partitions, sound walls, beams, floors, roof, etc. Sleeves through below-grade walls shall use water-tight fitting manufactured by O-Z/Gedney.

B. All cutting and patching will be done under another Division, but this Section will be responsible for timely performance of this work and layout of holes and setting sleeves.

C. All un-used sleeves shall be sealed with 2 hour UL approved fire sealant manufactured by “3M” or approved equal.

D. Refer to 26 05 33 for additional requirements.

3.04 ELECTRICAL GEAR

A. Install all electrical equipment in accordance with the National Electrical Code and as shown on the drawings.

B. Lighting contactors, time clocks, disconnect switches, etc. mounted in mechanical/electrical rooms shall be mounted at a working height not requiring a ladder, when wall space is available. Installation of these devices at greater elevations shall be approved by the Engineer. Contractor shall provide a coordination sketch of each mechanical/electrical room noting locations and mounting heights of all electrical devices (note bottom and top elevations) shown to be installed. Sketches shall be provided to the Engineer for review and the general contractor for coordination with other trades working in these rooms.

C. Fire retardant back boards secured to drywall studs may be used for contactors, time clocks, fire alarm equipment, security equipment, and disconnect switches 60 amp or smaller. All other wall mounted devices shall be mounted to unistrut. Unistrut shall be securely mounted to the floor and structural ceiling. Toggle bolts or anchor bolts attached to drywall is not acceptable.

3.06 CLEANING

A. Clean lighting fixtures and equipment.

B. Touch-up and refinish scratches and marred surfaces on panels, switches, starters, and transformers.

3.07 CORROSIVE AREAS

A. In areas of a corrosive nature, which include but are not limited to the following: pool equipment rooms, cooling towers and areas subject to salt air, etc., provide NEMA 4 X stainless steel or fiberglass reinforced enclosures for contactors, panelboards, controllers, starters, disconnects and materials used as supporting means (i.e. plastibond unistrut, pipe, fittings). The use of spray on coating may be acceptable in some applications.

3.08 TESTS AND INSPECTIONS

A. Tests and inspection requirements shall be coordinated with Division I.

B. Date for final acceptance test shall be sufficiently in advance of completion date of contract to permit alterations or adjustments necessary to achieve proper functioning of equipment prior to contract completion date.

C. Conduct re-tests as directed by Architect on portions of work or equipment altered or

adjusted as determined to be necessary by final acceptance test. No resultant delay or consumption of time as a result of such necessary re-test beyond contract completion date shall relieve Contractor of his responsibility under contract.

D. Put circuits and equipment into service under normal conditions, collectively and separately, as may be required to determine satisfactory operation. Demonstrate equipment to operate in accordance with requirements of these specifications. Perform tests in the presence of Architect. Furnish instruments and personnel required for tests.

E. Final Inspection:

1. At the time designated by the Architect, the entire system shall be inspected by the Architect and Engineer. The contractor or his representative shall be present at this inspection.
2. Panelboards, switches, fixtures, etc., shall be cleaned and in operating condition.
3. Certificates and documents required hereinbefore shall be in order and presented to the Architect prior to inspection.
4. Panel covers, junction box covers, etc., shall be removed for visual inspection of the wire, bus bars, etc.
5. After the inspection, any items which are noted as needing to be changed or corrected in order to comply with these specifications and the drawings shall be accomplished without delay.

F. The contractor shall provide a thermographic test using an independent testing laboratory using an infrared scanning device. This test shall include but not limited to all switchboards, distribution panelboards, panelboards, automatic transfer switches and other electrical distribution devices. This test shall be conducted to locate high temperature levels. This test shall be conducted between 3 to 8 months after occupancy, but not beyond the one year warranty period. Submit test to the architect and engineer using test reporting forms. All unacceptable conditions shall be corrected prior to the end of the warranty period.

END OF SECTION

SECTION 26 03 00

DEMOLITION WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The drawings do not show all demolition work required. The contractor shall make himself familiar with the required scope of work to accomplish the work required by these documents. All demolition work implied or required shall be included in the scope of this contract.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 DEMOLITION WORK

A. The contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing such loss or damage. The contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all electrical services for the new and existing facilities. The contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

B. The contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

C. Where existing construction is removed to provide working and extension access to existing utilities, contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

D. Where partitions, walls, floors, or ceilings of existing construction are being removed, all contractors shall remove and reinstall in locations approved by the Architect all devices required for the operation of the various systems installed in the existing construction.

E. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The contractor shall allow the Owner 2 weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

F. The contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The contractor may, at his discretion and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

G. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

H. When items scheduled for relocation are found to be in damaged condition before work has been started on dismantling, the contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the contractor's responsibility and shall be repaired or replaced by the contractor as approved by the Owner, at no additional cost to the Owner.

I. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

J. During the construction and remodeling, portions of the project shall remain in service. Construction equipment, materials, tools, extension cords, etc., shall be arranged so as to present minimum hazard or interruption to the occupants of the building.

K. Certain work during the demolition phase of construction may require overtime or nighttime shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner's Representative at least 72 hours in advance.

L. Make every effort to minimize damage to the existing building and the Owner's property. Repair, patch, or replace as required any damage which might occur as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during construction. Cooperate with the Owner and other trades in scheduling and performance of the work.

M. Include in the contract price all rerouting of existing conduits, wiring, outlet boxes, fixtures, etc., and the reconnecting of existing fixtures as necessitated by field conditions to allow the installation of the new systems. Furnish all temporary conduit, wiring, boxes, etc., as required to maintain lighting and power service for the existing areas with a minimum of interruption. Remove wire and conduit back to nearest accessible active junction box and extend to existing homeruns as required.

N. All existing lighting fixtures, switches, outlets, speakers, materials, equipment and appurtenances not included in the remodel or alteration areas are to remain in place and shall remain in service.

O. Electrical equipment, outlets, speakers, circuits to mechanical and building systems equipment, etc., which are to remain, but which are served by conduit and/or circuiting that is disturbed by the remodeling work, shall be reconnected in such as manner as to leave it in proper operating condition.

P. Existing branch circuit wiring which is to be removed, shall be pulled from the raceways and the empty conduit shall be removed to a point of permanent concealment.

Q. Existing lighting fixtures shown to be removed and indicated to be reused, shall be cleaned, repaired, relamped and provided with such new accessories as may be needed for the proper installation in their new locations.

R. New circuiting indicated to be connected to existing panels shall be connected to "spares" and/or "released" breakers as applicable, or new breakers provided where space is available. Contractor shall verify the existing panel load and feeder capacity prior to adding any additional loads.

S. Within the remodeled or alteration areas where existing ceilings are being removed and new ceiling are installed, all existing lighting fixtures, other ceiling mounted devices and their appurtenances shall be removed and reinstalled into the new ceiling, unless otherwise shown or specified.

T. Within the remodeled or alteration areas where existing walls are being removed, all existing lighting fixtures, switches, receptacles, other materials and equipment and their appurtenances shall be removed, where required by the remodel work either shown or specified.

U. Within the remodeled or alteration areas, any existing conduit or boxes found without proper support shall be secured to structure. All abandoned conduit and low voltage wiring systems shall be removed from the ceiling or wall spaces in its entirety.

V. Refer to Architectural "Demolition" and "Alteration" plans for actual location of walls, ceilings, etc. being removed and/or remodeled.

END OF SECTION

SECTION 26 03 13

ELECTRICAL DEMOLITION FOR REMODELING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

B. The contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing such loss or damage. The contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all electrical services for the new and existing facilities. The contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

C. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The contractor shall allow the Owner 2 weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

D. The contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

E. Prior to dismantling of existing signal systems that extend beyond the area for the Scope of Work for this project, test systems (i.e. Fire Alarm, Intercom, Clock, Sound Reinforcement, Television, CCTV, Security, etc.) to confirm all are in proper functioning order. Document any non-functioning devices or circuits and provide a written log. Any non-functioning equipment or device not in proper operating condition at the completion of the work shall be repaired at no cost to the Owner.

1.02 RELATED SECTIONS

A. Section 01120 – Alteration Project Procedures.

B. Section 02072 – Minor Demolition for Remodeling.

C. Div. 27 - Communications

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

B. Include in the contract price all rerouting of existing conduits, wiring, outlet boxes, fixtures, etc., and the reconnecting of existing fixtures as necessitated by field conditions to allow the installation of the new systems. Furnish all temporary conduit, wiring, boxes, etc., as required to maintain lighting and power service for the existing areas with a minimum of interruption. Remove wire and conduit back to nearest accessible active junction box and extend to existing homeruns as required.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Public Address System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the Owner and at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Section 01120, Section 02072, and this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned

outlets, which are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

L. Where existing construction is removed to provide working and extension access to existing utilities, contractor shall remove doors, piping, conduit, outlet boxes, wiring, lighting fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

M. Where partitions, walls, floors, or ceilings of existing construction are being removed, all contractors shall remove and reinstall in locations approved by the Architect all devices required for the operation of the various systems installed in the existing construction.

N. During the construction and remodeling, portions of the project shall remain in service. Construction equipment, materials, tools, extension cords, etc., shall be arranged so as to present minimum hazard or interruption to the occupants of the building.

O. Certain work during the demolition phase of construction may require overtime or nighttime shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner's Representative at least 72 hours in advance.

P. All existing lighting fixtures, switches, outlets, speakers, materials, equipment and appurtenances not included in the remodel or alteration areas are to remain in place and shall remain in service.

Q. Electrical equipment, outlets, speakers, circuits to mechanical and building systems equipment, etc., which are to remain but which are served by conduit and/or circuiting that is disturbed by the remodeling work, shall be reconnected in such as manner as to leave it in proper operating condition.

R. Existing branch circuit wiring which is to be removed, shall be pulled from the raceways and the empty conduit shall be removed to a point of permanent concealment.

S. Within the remodeled or alteration areas where existing walls are being removed, all existing lighting fixtures, switches, receptacles, other materials and equipment and their appurtenances shall be removed, where required by the remodel work either shown or specified.

T. New circuiting indicated to be connected to existing panels shall be connected to "spares" and/or "released" breakers as applicable, or new breakers provided where space is available. Contractor shall verify the existing panel load and feeder capacity

prior to adding any additional loads.

U. In all the remodeled areas where existing ceilings are being removed and reinstalled, all existing lighting fixtures, other ceiling mounted devices (i.e. smoked detectors, speakers, etc.) and their appurtenances shall be removed and reinstalled, unless otherwise shown or specified. This also applies to new ceiling installations.

V. Existing lighting fixtures shown to be removed and indicated to be reused, shall be cleaned, repaired, and provided with new accessories as required for the proper operation in their new locations. Provide new lamps and ballast as required.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3.05 INSTALLATION

A. Install relocated materials and equipment under the provisions of Section 01120.

3.06 REMOVAL OF MATERIALS

A. The contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The contractor may, at his discretion and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The contractor shall clean, repair, and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation are found to be in damaged condition before work has been started on dismantling, the contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the contractor's responsibility and shall be repaired or replaced by the contractor as approved by the Owner, at no additional cost to the Owner.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be

interrupted without prior specific approval of the Owner as hereinbefore specified.

E. Within the remodeled or alteration areas, any existing conduit or boxes found without proper support shall be secured to structure. All abandoned conduit and low voltage wiring systems shall be removed from the ceiling or wall spaces in its entirety.

END OF SECTION

SECTION 26 05 19

WIRE, CABLE AND RELATED MATERIALS

PART 1 - GENERAL

1.01 SCOPE

A. Provide 600 volt building wire, cable and connectors and 300 volt wire, cable and connectors.

B. WORK INCLUDED: Include the following Work in addition to items normally part of this Section.

1. Wiring for lighting and power.
2. Automatic Control Wiring.
3. Connection of equipment shown.

C. WORK SPECIFIED ELSEWHERE:

1. Heating, ventilating, and air conditioning equipment.
2. Structured cabling system.
3. Coaxial cables
4. **Fire Alarm System.**
5. **Voice Communications and Sound System**

1.02 STANDARDS

A. UL83

B. ASTM B-3

C. All wire cable and connectors shall be UL approved.

1.03 ACCEPTABLE MANUFACTURERS

A. 600 VOLT WIRE AND CABLE

1. Southwire
2. Encore
3. Cerro
4. General Cable

B. 300 VOLT WIRE AND CABLE

1. Westpenn
2. Beldon
3. Alpha
4. Southwire
5. General Cable

C. FLEXIBLE CABLE SYSTEMS

1. AFC Modular Cable Systems

D. CONNECTORS

1. Ilsco
2. Cooper
3. AMP - TYCO
4. Burndy
5. Ideal
6. 3M
7. NSI Industries
8. O.Z. Gedney
9. Thomas & Betts
10. Buchanan

1.04 SUBMITTALS

A. Shop drawings shall include, but not limited to:

1. Cutsheets of wire, cable and connectors to indicate the performance, fabrication procedures, product variations, and accessories.

1.05 REQUIREMENTS OF REGULATORY AGENCIES WORK IN ACCORDANCE WITH:

A. National Electrical Code.

B. Local, municipal, or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.01 WIRING

A. All wire shall be new and continuous without weld, splice, or joints throughout its length. It must be uniform in cross-section, free from flaws, scales and other imperfections.

B. WIRE MATERIAL: Conductors shall be soft drawn, annealed copper. Aluminum wiring is not acceptable unless otherwise noted on drawings.

C. TYPES:

1. Provide type **XHHW** insulation for all buried feeders and service entrance conductors.
2. Provide type “THHN/THWN-2” insulation for all branch circuits and above grade feeders.
3. All wire No. 8 and larger shall be stranded. All wire No. 10 and smaller shall be stranded or solid.
4. Provide type "XHHW" or other 90 degrees insulation wiring for branch circuit wiring installed through continuous rows of fixture bodies.
5. All 300-volt cable including but not limited to telephone, fire alarm, data, CATV and security shall be UL listed for use in return air plenums.

D. CONDUCTOR SIZES

1. Feeder conductors shall be sized for a maximum of 2% drop in rated voltage at scheduled load.
2. Branch circuit conductors shall be sized for a maximum 3% drop in the rated voltage to the longest outlet on the circuit.

3. Minimum wire shall be No. 12, unless otherwise shown on Drawings or required by Code.

E. COLOR CODING: No. 6 or larger conductors shall use tape for color coding. No. 8 and smaller wire shall be color coded in accordance with the governing authority requirements or as follows:

120/208 VOLT	277/480 VOLT	120/240 VOLT
Neutral: White	Neutral: Gray	Neutral: White
Phase A: Black	Phase A: Purple	Phase A: Black
Phase B: Red	Phase B: Brown	Phase B: Orange
Phase C: Blue	Phase C: Yellow	Phase C: Blue
Ground: Green	Ground: Green	Ground: Green

2.02 GROUNDING

Permanently connect all conduit work, motors, starters, and other electrical equipment to grounding system in accordance with the National Electrical Code.

2.03 METAL CLAD CABLE - TYPE MC

Only acceptable for lighting fixture whips in accordance with 26 51 00.13. Also acceptable for running through furniture and millwork

2.04 ARMORED CABLE - TYPE AC

Not allowed.

PART 3 - EXECUTION

3.01 WIRE

A. Do not pull wire into conduit until Work of an injurious nature is completed. Where two or more circuits run to a single outlet box, each circuit shall be properly tagged. Wyreze or approved equal may be used as a lubricant where necessary.

B. Splices shall be fully made up in outlet boxes with compression crimp-on type splice connectors.

C. Joints and splices will not be permitted in service entrance or in feeders. Joints in branch circuits will be permitted where branch circuits divide, and then shall consist of one through-circuit to which the branch shall be spliced. Joints shall not be left for the fixture hanger to make. Connect joints and splices with Buchanan Series "2000" solderless connectors complete with insulating caps or properly sized twist on wire nuts. “**Wago” push-in connectors are not acceptable.**

D. All stranded conductors shall be furnished with lugs or connectors.

E. Connectors furnished with circuit breakers or switches shall be suitable for copper wire termination.

F. “Sta-Cons” shall be used to terminate stranded conductors on all switches and receptacles.

G. **Metal Clad Cable - Type MC**

1. Only acceptable for lighting fixture whips in accordance with 26 51 00.13. Also acceptable for running through furniture and millwork.

H. All stranded #10 and small conductors shall be terminated with an approved solderless terminal if the device or light fixture does not have provisions for clamp type securing of the conductor.

I. The jacket for all travelers used on 3-way and 4-way switches shall be pink.

J. Route conductors for 480Y277V systems in a separate raceway. Do not combine with 208Y120V or 120/240V systems.

K. Emergency circuits shall not be routed with normal conductors.

3.02 BALANCING SYSTEM

The load on each distribution and lighting panel shall be balanced to within 10% by proper arrangement of branch circuits on the different phase legs. Provide written documentation showing results. Submit with O & M manuals.

3.03 LOW VOLTAGE WIRING

A. Low voltage wiring shall be plenum rated. All wiring in mechanical rooms, electrical rooms, drywall ceiling, inaccessible areas, underground, plaster ceiling, inside concealed walls areas exposed to occupant view, and other areas subject to physical damage shall be run in conduit.

B. Low voltage wiring shall be routed in separate raceways from power wiring systems.

C. Sleeves shall be placed in the forms of concrete, masonry and fire rated walls, floor slabs and beams, for the passage of wiring. Sleeves should be set in place a sufficient time ahead of the concrete work so as not to delay the work. Sleeves shall be rigid galvanized steel.

D. Provide Caddy J-hooks supported independently from other system to support cable at 4-foot on center or closer if required by manufacture.

E. Provide a junction box to make up all joints and splices.

3.04 CABLE SUPPORTS

A. Provide cable supports in all vertical raceways in accordance with Article 300.19 of the NEC.

3.05 DEFECTS

A. Defects shall include, but are not to limited to, the following:

1. Tripping circuit breakers under normal operation.
2. Improperly connected equipment.
3. Damaged, torn, or skinned insulation.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

1.02 SCOPE

A. WORK COMBINED WITH OTHER SECTIONS: Combine the work specified herein with the following Sections to form a single responsibility for the Work:

1. Electrical.
2. Basic materials and methods.

B. Provide electrical service, equipment and wiring device grounding as shown, scheduled and as specified.

C. The types of grounding include, but not limited to, the grounding bonding of all equipment devices, building steel piping, and as required by the National Electrical Code, Local Inspection Department and Power Company.

1.03 STANDARDS

A. NATIONAL ELECTRICAL CODE (NFPA-70)

B. Local municipal and State codes that have jurisdiction.

C. NECA

1.04 ACCEPTABLE MANUFACTURES

A. Provide grounding products manufactured by Copperweld and Cadweld.

B. Burndy

1.05 SUBMITTALS

A. Shop drawings shall include, but not limited to the following:

1. Cut sheets of ground rods, clamps and connectors.
2. Grounding system diagram.

PART 2 - PRODUCTS

2.01 GENERAL: Provide all materials required to construct a complete grounded electrical system.

A. GROUND RODS: Ground rods shall be 3/4" inch diameter by 10 feet long construction with copper jacket and a steel core.

B. CLAMPS: Ground clamps shall be copper except for steel or iron pipes in which the clamps shall be galvanized iron.

C. CONDUCTORS: Conductors shall be connected by means of an approved pressure connector or clamp.

D. EQUIPMENT GROUND BUS: Provide minimum 2" x 12" x ¼" copper ground bus bar, secured to wall in main electrical rooms and wherever noted at 12" AFF. Insulate from wall with stand-off bushings. Refer to Detail on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. GENERAL: Existing service grounding system shall remain. Provide additional grounding as shown and specified to maintain a properly grounded system.

B. BUILDING STEEL AND PIPING SYSTEM: Install a bonding jumper between building steel and metallic piping systems to bond them to the electrical grounding system.

C. NEUTRAL: The neutral shall be grounded only at the service entrance and other separately derived systems. The neutral shall be kept separate from the grounding system and shall not be used as a ground.

D. GROUNDING SEPARATELY DERIVED ALTERNATING CURRENT SYSTEM

1. TRANSFORMERS: The center point (neutral) of each wye connected transformer shall be bonded to the case and the grounding electrode conductor shall be connected to the grounded conductor and building steel.

E. GROUNDING CONDUCTOR: A grounding conductor and metallic conduit system shall bond all equipment served by the electrical system. Provide a flexible bonding jumper for isolated metallic piping and ductwork and around expansion fittings and joints.

F. CONDUIT GROUNDING BUSHING: Conduit terminating in equipment that has a ground bus such as switchboards, panelboards, etc., shall have grounding bushings installed. Ground each conduit 1-1/4", or larger by means of a grounding bushing and to the ground bus in the equipment.

G. MOTORS: The frame of all motors shall be grounded.

H. SPECIAL GROUNDING: Provide a minimum #6 AWG copper grounding conductor for each telephone board, television system, etc. unless otherwise noted. Terminate the grounding conductor on ground bus and to the building electrical grounding system. Refer to 800.100(D) and 820.100(D) of the NEC.

I. REMOTE PANELBOARDS: Provide a grounding electrode conductor to all remote panels as required by the NEC and shown on drawings.

J. LIGHTING FIXTURES: Flexible fixture whips containing a green grounding conductor shall be used to connect lighting fixtures. Flexible fixture whips shall not exceed ten feet. MC cable whips shall not exceed 6 feet.

K. RECEPTACLES: All receptacles shall be grounded using the branch circuit grounding conductor. Receptacles shall use an approved grounding yoke.

3.02 TESTING: Perform a ground resistance test using a biddle analog or digital portable earth/ground resistance tester. The system resistance shall not exceed 5 OHMS. Provide

additional electrodes as required. Refer to 250.53(A) of the NEC. Test shall not be conducted following wet weather. Provide personal instruments to conduct these tests and submit certified test for review. Test shall be verified by Engineer.

END OF SECTION

SECTION 26 05 33

RACEWAYS

PART 1 - GENERAL

1.01 SCOPE

A. Provide electrical raceways and fittings as shown, scheduled and specified.

B. The types of raceways and fittings required are as follows:

1. Rigid Metal Conduit (RMC)
2. Electrical metallic tubing (EMT)
3. Rigid Polyvinyl Chloride Conduit (PVC) (Sch. 40 or 80)
4. Flexible Metal Conduit (FMC)

1.02 STANDARDS

A. ANSI, C80.1 & C80.3

B. NEMA FB-1

C. NEMA TC3

D. UL, 6, 797 & 1242

1.03 ACCEPTABLE MANUFACTURERS

A. Raceways

1. Allied
2. Republic
3. Prime Conduit (Carlon)
4. Wheatland Tube
5. Cantex
6. Western Tube
7. Robroy Industries
8. OCAL

B. Fittings

1. Appleton
2. Crouse Hinds
3. Steel City
4. O.Z. Gedney
5. Carlon
6. Raco, Inc.
7. Bridgeport

C. Boxes

1. RACO
2. Thomas and Betts
3. Steel City
4. Eaton

5. Crouse-Hinds
6. Appleton

D. Surface Raceways

1. Hubbell
2. Wiremold
3. Panduit

1.04 SUBMITTALS

A. Shop drawing shall include but not be limited to:

1. Cutsheets for raceways and fitting, solvents, primers, etc.

1.05 REQUIREMENTS OF REGULATORY AGENCIES WORK IN ACCORDANCE WITH:

A. National Electrical Code.

B. Local, municipal, or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.01 CONDUIT AND FITTINGS: **(*Note to Specifier: Delete items not used.)***

a. Rigid Metal Conduit.

(1) Hot-dip galvanized rigid steel conduit, galvanized after fabrication. All threads shall be galvanized after cutting. A uniform zinc coating shall be applied to the inner and outer walls.

(2) Fittings shall be threaded, malleable iron, either cadmium plated or hot-dip galvanized.

b. Electrical Metallic Tubing (EMT).

(1) EMT shall be made of hot-dip galvanized strip steel. The interior shall be coated with a corrosion-resistant lubricant for ease of wire pulling.

c. Rigid Nonmetallic Conduit.

(1) Conduit shall be schedule 40 or 80 polyvinyl chloride (PVC) or fiberglass, UV stabilized, rated for 90°C conductors.

(2) Fittings shall be solvent weld socket type.

d. Flexible Metal Conduit

(1) Spirally wound continuously interlocked zinc coated strip steel.

(2) Fittings shall be one screw for smaller than 1-1/2-inch, two screw for 1-1/2-inch and larger, double clamp steel or malleable iron, either cadmium plated or hot-dip galvanized.

2.02 PULL BOXES

A. Interior pull boxes shall be constructed of sheet metal. Covers shall be secured with screws and hinges where required.

B. Exterior in-ground pull boxes shall be concrete or polymer as manufactured by Brooks, Dalworth, Hubbell Quazite, or approved equivalent. Covers shall include identification of systems contained. Provide H20 wheel loading where in traffic bearing areas.

2.03 WIREWAYS

A. Wireways shall be made of not less than 16-gauge sheet steel for 4 inch and 6 inch square sizes and 14 gauge steel for 8 inch and 12 inch square sizes. Couplings end plates, and knockouts shall be furnished as required. Each section of wireways shall be rigidly supported.

B. The finish shall be ANSI-49 gray epoxy paint applied by a cathodic electrode position paint process over a corrosion resistant phosphate preparation for NEMA 1 wireways. Provide galvanized steel for NEMA 3R wireways. NEMA 3R wireways and auxiliary gutters are for horizontal mounting only.

2.04 FITTINGS

A. Couplings for rigid steel or intermediate conduit shall be hot dipped galvanized steel. Set screw type is not acceptable.

B. Steel or malleable iron fittings shall be used on all other raceway types except for PVC. Die-cast fittings are not allowed.

C. **EMT systems shall utilize steel insulated throat, set screw connectors and steel set screw couplings in all indoor conditioned spaces. EMT system shall utilize steel insulated throat, threadless, watertight compression type connectors and steel threadless watertight compression type coupling in all non-conditioned spaces.**

D. Provide nylon bushing on end of all low voltage cabling system conduits (sleeves, rough-ins, etc.).

PART 3 - EXECUTION

3.01 PROVIDE CONDUIT AS FOLLOWS:

A. GENERAL

The Drawings are diagrammatic, and are intended to show the general location of outlets, devices, fixtures, and arrangement and control of circuits. The Contractor shall determine exact locations by actual measurement of the building or by reference to the Architectural Drawings.

B. Except as noted or otherwise specified, all wiring shall be installed in galvanized rigid steel or electrical metallic tubing (EMT) of the proper size to contain the number of conductors required in accordance with the latest edition of the N.E.C. Where conduit sizes are shown on the drawings, these shall take precedence. **Contractor shall epoxy coat galvanized rigid steel conduit for use in natatoriums.**

C. EMT in sizes up to 4 inches when concealed or not exposed to damage and located indoors only. (EMT is not acceptable in wet and damp location.)

D. **R**igid galvanized steel shall be used for all penetrations of slab on grade.

E. Rigid galvanized steel where embedded in concrete or masonry construction, mechanical yard or in exterior/interior applications where subject to damage.

F. Schedule 40 and 80 PVC may be utilized underground or below slab where shown on the construction documents. Conduit shall not be routed in slab unless specifically noted on the plans.

G. MINIMUM SIZE: 3/4 inch.

H. Fixture whips: Refer to 26 51 00 for additional information.

I. Flexible metal shall be used for connecting rotating equipment installed in conditioned dry locations spaces, unless noted otherwise, herein.

J. LFMC shall be used for connecting rotating or vibrating equipment installed in non-conditioned spaces or damp and wet locations, and outside.

N. Of such size, and so installed that conductors may be drawn in without injury or excessive strain.

O. Where entering panels, pull boxes, junction boxes, or outlet boxes, shall be secured in place with lock nuts inside and outside, and insulated bushings inside.

P. Have Red seal type VCC or approved equal cable supports in risers, as required by N.E.C.

Q. Have ends reamed after cutting and application of die.

R. Keep conduit corked and dry during construction, and swab out before conductors are pulled.

S. Have bends and offsets made with approved tools. Bends or offsets in which the pipe is crushed or deformed shall not be installed.

T. Where not embedded in concrete or masonry, be firmly secured by approved clamps, half-straps or hangers.

U. Have O.Z. Gedney or approved equal expansion fittings where crossing building expansion joints.

V. Except in the mechanical equipment rooms, run conduit concealed, and by the shortest practicable route between outlets. Install risers, drops, and offsets necessary to avoid conflict with ductwork, piping, structural members, and similar items.

W. Install exposed conduit in mechanical rooms, and elsewhere as indicated, parallel to horizontal and vertical lines of walls, ceilings, and floors.

X. Lighting fixtures in finished areas having suspended acoustical ceilings shall be connected to outlet boxes of lighting grid by flexible metal conduit; length not to exceed eight feet (six feet if using 3/8” manufactured fixture “whips”).

Y. Outlet boxes in partitions shall never be set back to back. They shall be offset to prevent undue noise transmission from room to room.

Z. Concealed conduit shall run in as direct manner as possible using long bends. Exposed conduit shall be run parallel with or at right angles to the lines of the building; and all bends shall be made with standard conduit elbows or conduit benders. Not more than equivalent of four quarter bends shall be used in any run between terminals and cabinet, of between outlet or junction boxes. Approved condulets shall be used in lieu of conduit elbows where ease of installation and appearance warrants their use and approved by the engineer. Conduit joints shall be made with approved couplings and unions.

AA. Conduits shall be continuous from outlet to outlet and from outlets to cabinets, junction or pull boxes and shall be electrically continuous throughout. Terminals of all conduits shall be provided with double lock nuts and bushing or terminated on conduit hubs. Use of running threads is prohibited.

BB. Each entire conduit system shall be installed complete before any conductors are drawn in. Every run of conduit shall be finished before covering up to guard against obstructions and omissions.

CC. Sleeves shall be placed in the forms of concrete, masonry and fire rated walls, floor slabs and beams, for the passage of conduits. Sleeves should be set in place a sufficient time ahead of the concrete work so as not to delay the work. Sleeves shall be rigid galvanized steel and set to extend 4” above slab.

DD. All pipe penetrations through walls and concrete floors shall be fire rated by applying USG Thermafiber in the space between the concrete and the pipe. The fire rating shall be additionally sealed by using 3M brand model CP 25 or 303 fire barrier caulk and putty. All fire rating material shall be installed in accordance with manufacturer's printed instructions.

EE. All conduit shall be cleaned and swabbed to remove all foreign matter and moisture prior to pulling wire and cable. All boxes in which conduits terminate shall be cleaned of all concrete mortar and other foreign matter.

FF. Provide #30 nylon pulling line in all conduits in which permanent wiring is not installed.

GG. All conduit shall be securely fastened and supported using hot galvanized malleable iron one-hole pipe straps, clamps, hanger or other means approved by the engineer. Supports shall be as required by NEC. Tie wire shall not be used as support or securing means. Support conduit independently of ceiling hanger wire. Use all thread rods to support outlet boxes, junction boxes and conduit.

HH. When PVC conduit is routed underground, all stub-up's and 90° elbows shall be galvanized steel. Use rigid galvanized steel when penetrating concrete on grade. Wrap in plastic tape for entire length of pipe in contact with earth and concrete, to 6” above slab.

II. Branch circuits run underground shall be run in Schedule 40 or 80 PVC conduit. Install ground wire in accordance with NEC table 250.122.

JJ. Flexible and liquid-tight flexible steel conduit shall be used for final connections to utilization equipment. Liquid-tight flexible steel conduit shall be used for all exterior locations and all interior locations subject to moisture, vibrations, rotating equipment and dry-type transformers. Refer to Section 26 02 00 for additional information concerning

flexible steel conduit.

KK. Route all conduit above ground/slab unless otherwise noted on the construction documents.

LL. Contact the Architect and Engineer for an installation review before covering any below grade or above grade conduit.

MM. All new outlets shall be flush mounted. In remodeled areas where wall construction prohibits flush mounting, provide wiremold 2400 series, unless noted otherwise. Verify exact location and routing with architect before installation.

NN. Contractor shall not penetrate water proof barriers without using proper fitting to maintain barriers. This shall include exterior walls and slabs. Coordinate with Architect for proper methods.

3.02 CONDUIT CORROSION PROTECTION

A. Branch circuit conduits installed in concrete slabs on fill or grade shall be positioned in a manner to ensure complete concrete cover. In no case shall such conduits be exposed below or above the slab surfaces, or penetrate the waterproof membrane.

B. At locations where metallic conduits pass through slabs on grade or transitions below grade, PVC coated rigid galvanized conduit shall be used. **Contactor shall use 3M corrosive protective tape on rigid galvanized conduit.**

C. Conduit installed in the air gap between the water resistant barrier and finish brick shall not exceed 2ft in length.

3.03 EXPANSION FITTINGS

A. Install approved expansion fitting in all conduit runs in excess of 150 feet or when crossing building expansion joints.

B. Make provision for expansion and shifting of metal or PVC conduits where risers occur from underground.

3.04 OUTLET AND JUNCTION BOXES

A. Provide an approved galvanized outlet box with adequate volume for number of conductors installed.

B. Provide standard galvanized switch boxes of the required number of gangs. Switch boxes where conduit is exposed shall be handy boxes or approved equal.

C. Outlet boxes for receptacles shall be similar to Universal 52151 with suitable raised cover. Receptacle boxes where conduit is exposed shall be handy boxes or approved equal.

D. Weatherproof boxes shall be FS or FD. Provide these boxes in all non-conditioned areas, exterior areas and natatoriums.

E. Outdoor boxes shall be NEMA 3R, with conduit connections made by Myers Hubs.

F. See notes and details on Drawings for special box requirements.

G. Provide junction boxes required to facilitate installation of the various conduit systems. Provide support boxes required for risers, each complete with approved cable supports as described elsewhere in this Division.

H. Outlet boxes for drywall shall be standard galvanized 4" square boxes with the appropriate device cover. Secure all outlet boxes with a backing brace connected to two adjacent studs. Mounting brackets with a single ear to rest against the backing sheetrock are not acceptable.

I. Provide floor outlet fittings for voice/data requirements to match fittings for duplex floor receptacles.

J. Provide 3-1/2” deep gangable masonry boxes in all masonry wall (CMU). Steel City GW-135-G or approved equal.

K. Provide shallow 4”x4” boxes in all demountable partitions.

L. Metallic boxes located in fire rated walls or partitions shall be separated by a minimum horizontal distance of 24 in. This minimum separation distance between metallic boxes may be reduced when “ Wall Opening Protective Materials” (CLIV) are installed according to the requirements of their Classification. Metallic boxes shall not be installed on opposite side of walls or partitions of staggered stud construction unless “Wall Opening Protective Materials” are installed with the metallic boxes in accordance with Classification requirements for the protective materials.

M. Junction, pull boxes, condulets, gutters, disconnects, contactors, etc., above 2-foot x 2-foot grid ceilings shall be mounted within 18-inches of ceiling grid. Above 2-foot x 4 – foot grid ceiling they shall be mounted within 30-inches of ceiling grid. All junction box, pull box, gutter openings shall be side or bottom accessible.

3.05 THRU-WALL SEALS

A. Provide O.Z. Gedney “Thru-wall” seals for all conduits passing through concrete structure below grade, above grade, and floor penetrations below grade. These prevent moisture from entering the building.

B. Straight sleeves are not acceptable.

3.06 PULL BOXES

A. Interior pull boxes shall be provided for conduit systems as required and shall be constructed of galvanized steel of not less than gauge and size specified by National Electrical Code. Size pull boxes per NEC 314.28, minimum.

B. Where two or more feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation.

C. Exterior in-ground pull boxes shall have open bottoms with sand and rock beds below box for drainage of water. Provide closed bottom boxes where specified. Closed bottom boxes shall be provided with sumps for portable pump to allow for extracting water. Refer to details on the drawings.

D. Pull boxes mounted in pole bases shall be coordinated with the pour of the pole base and shall be flush with finished footing.

3.07 WIREWAYS

A. Wireways shall be installed as indicated or required and locations shall be coordinated with architect.

B. Wiring in wireways shall be neatly bundled, tied and suitably tagged.

END OF SECTION

SECTION 26 22 13

LOW VOLTAGE DISTRIBUTIONS TRANSFORMERS

PART 1 - GENERAL

1.01 SCOPE

A. Provide 480 volt primary step down transformers as shown, scheduled and as specified.

B. Provide control power transformers as required for proper operation of starters, contactors, etc.

C. The type of transformers required are energy efficient dry-type general purpose transformers.

1.02 STANDARDS

A. Products shall be designed, manufactured, tested and installed in compliance with applicable ANSI/IEE and NEMA standards.

B. All low voltage transformers shall be UL listed and labeled.

C. All low voltage transformers 15 kVA and larger shall meet or exceed U.S. DOE efficiency requirements, 10 CFR Part 431 (2016) – Energy Efficiency Program for Certain Commercial and Industrial Equipment, Subpart K – Distribution Transformers; regardless of the date of manufacture.

D. All low voltage transformers 15 kVA and larger shall be tested for efficiency in accordance with U.S. DOE test methods, 10 CFR Part 429 (2016) – Certification, Compliance, and Enforcement for Consumer Products and Commercial and Industrial Equipment; regardless of the date of manufacture.

1.03 ACCEPTABLE MANUFACTURERS

A. Provide one of the following manufacturers for general purpose use:
   1. General Electric Company
   2. Square D Company
   3. Power Quality International
   4. Powersmith’s
   5. Eaton

1.04 SUBMITTALS

A. Shop drawings shall include, but not be limited to:
   1. Cutsheets of transformers with sound and load ratings, dimensions, weights, impedance rating, insulation type, temperature rise and tap configurations.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. National Electrical Code.

B. Local, municipal, and/or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.01 GENERAL PURPOSE

A. Provide dry type, two-winding transformers with primary and secondary voltages and KVA ratings as shown on plans. Transformers shall operate at 60 hertz. All transformers shall be manufacture with standard materials and components.

2.02 MATERIALS AND COMPONENTS FOR GENERAL PURPOSE TRANSFORMERS

A. All cores shall be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be clamped together with structural steel angles. The completed core and coil shall be isolated from the base by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. The vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating system requiring the complete removal of all fastening devices will not be accepted. Windings shall be copper. Foil windings are not acceptable.

B. The transformer core shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with NEMA, IEEE and ANSI standards.

C. Transformer coils shall be of continuous-wound type construction and shall be impregnated with non-hygroscopic, thermo-setting varnish.

D. Transformers shall be enclosed in drip-proof, metallic enclosures designed to provide for air cooling and prevent accidental contact with live conductors. Wiring compartment shall be located below the core and coil and cooled by air circulation or insulated from the core and coil by means of a suitable thermal insulation barrier. Provide 6” from live parts to transformer case. Transformers exposed to weather or installed in a sprinkled area shall have rain shields on all openings. Entire transformer enclosure shall be cleaned, phosphatized, primed and painted with a gray, baked enamel.

E. Transformers shall operate at 100% nameplate KVA rating continuously while in a 40 degree C ambient without exceeding the rated average winding temperature rise of the ANSI insulation system as described below.

Temperature rating shall be as follows:

RATING	PHASE – INSULATION - TEMP. RISE
0.025 through 3 KVA	Single - Type B - 80º C
5 through 25 KVA	Single - Type F - 115º C
3 through 15 KVA	Three - Type F - 115º C
37½ KVA and larger	Single - Type H - 150º C
30 KVA and larger	Three - Type H - 150º C

F. Transformers shall have minimum full load rated taps in the primary windings as follows:

3 through 25 KVA 2 - 5% FCBN

15 through 300 KVA	6 - 2-½% TAPS, 2 above and 4 below nominal

G. Maximum sound ratings shall be as follows:

KVA	db
0 to 9	40
10 to 50	45
51 to 150	50
151 to 300	55
301 to 500	60

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install transformer in accordance with manufacturer's written instructions, and recognized industry practices.

B. Housekeeping Pad: Provide a nominal 3-½" high, 2500 PSI (28 Day) concrete reinforced pad with number 6 welded wire mesh. The pad shall conform to the shape of the transformer and extend at least 3 inches beyond the length and width of the transformer. All corners of the pad shall be rounded.

C. Mounting: Install floor mounted transformers on properly sized rubber-in-shear vibration isolators. Trapeze mounted transformers shall use rubber-in-shear hangers. Wall mounted transformers shall not be mounted directly to the wall without vibration isolation.

D. Connection: Route conductors in a minimum of 2 feet of flexible steel conduit to transformer enclosure. Provide grounding conductor sized per NEC, connected to the building grounding electrode system. The grounding electrode conductor (GEC) shall be connected directly to the XO terminals. Provide multiple barrel lugs for grounding connections. Do not use single lugs for this type of application.

E. Transformer enclosures shall be inspected for damage at time of delivery to the job site. Damaged transformer enclosures shall not be accepted at time of delivery and shall be replaced with un-damaged transformers. Transformer enclosures shall not be used for storage of other equipment or as a surface for standing or stepping. Transformers that have been damaged during construction shall be replaced prior to final acceptance.

F. **Provide nameplate (bakelite). Nameplate shall be riveted to the equipment surface. Using screws is strictly prohibited. Refer to specification section 26 02 00 – 2.8 (C.2) for additional information.**

3.02 TESTING

A. Insulation, Tests: Prior to energization, check transformers windings for continuity and test the insulation resistance. Tests shall be made using a Biddle Megger or equivalent test instrument, per manufacturers' recommendations. Provide written documentation of testing. Submit with O & M manuals.

B. Tap Setting: Measure current and voltage under load conditions to provide correct tap settings.

C. Infrared Scanning: After Substantial Completion by not more than 2 months after Final Acceptance, perform an infrared scan of each transformer. Remove fronts if not equipped with viewing ports to make joints and connections accessible to a portable scanner

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SCOPE

A. Provide panelboards as shown, scheduled and as specified herein.

B. The types of panelboards include:

1. Panelboards.
2. Power distribution panelboards.

1.02 STANDARDS

A. Products shall be designed, manufactured, tested and installed in compliance with applicable standards.

B. Products shall conform to all applicable UL standards and shall be UL-labeled.

1.03 ACCEPTABLE MANUFACTURERS

A. Provide one of the following manufacturers:

1. General Electric Company/ABB
2. Square D Company
3. Siemens
4. Eaton

1.04 SUBMITTALS

A. Shop drawings shall include, but not be limited to:

1. Cutsheets of all enclosures, circuit breakers, fusible switches, bussing, rating, schedules and all accessories clearly labeled.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. WORK IN ACCORDANCE WITH:

1. National Electrical Code.
2. Local, municipal, or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. General

Provide power distribution and panelboards as indicated in the panelboard schedule and as shown on the plans. Power distribution panelboards shall be equipped with fusible switches or circuit breakers as shown on the schedule. Panelboards shall be equipped with thermal-magnetic, molded case circuit breakers of frame and trip ratings as shown on

the schedule.

B. Busing Assembly and Temperature Rise

Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50ºC. rise above 40ºC ambient. Heat rise test shall be conducted in accordance with Underwriters Laboratories Standard UL 67. The use of conductor dimensions will not be accepted in lieu of actual heat tests. All current carrying parts of the bus shall be tin or silver-plated copper.

1. Bus structure shall be isolated. Bus bar connections to the branch circuit breakers shall be distributed phase or phase sequence type and shall accept bolt-on circuit breakers for all panelboards.

2. The lugs for terminating conductors shall be rated at 75° C on all panel boards and circuit breakers.

Provide an extruded bare copper ground bus. Provide an isolated ground copper bus in each panel serving isolated ground circuits. Provide a full-size copper neutral bus in each panelboard enclosure. Provide a double size neutral buss when served by a harmonic mitigating transformer.

C. Distribution Panelboards

Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Large, permanent, individual circuit numbers shall be affixed to each breaker in a uniform position. Tripped indication shall be clearly shown by the breaker handle taking a position between “ON” and “OFF”. Provisions for additional breakers shall be such that no additional connectors will be required to add breakers. Circuit breakers shall be of the frame size, trip setting and interrupting capacity as indicated on the drawings. Circuit breakers shall be rated 65,000 AIC unless otherwise noted on plans.

1. Provide arc energy reduction switch for each breaker rated 1200 amps or larger to comply with 240.87 of the NEC. Switch shall be equipped with a pad lockable cover with a blue LED pilot light that illuminates when system is activated. Locate switch and cover recessed mounted adjacent to the breaker it serves or remote as indicated on the plans. Provide label and all required hardware. Remote switch(es) shall be flush mounted in wall near entry to the room or where indicated.

2. Fusible Switches

All fusible switches shall be quick-make, quick-break with visible blades and dual horsepower ratings. Switch handles shall physically indicate “ON” and “OFF” positions. Switches shall be lockable only in the “OFF” position and accept three industrial type heavy duty padlocks. Switch covers and handles shall be interlocked to prevent opening in the “ON” position. A means shall be provided to permit authorized personnel to release the interlock for inspection purposes. Switches shall include positive pressure rejection type fuse clips for use with UL Class R fuses and be UL labeled for 200,000 AIC.

D. 480/277 Volt Panelboards

Main breakers shall be vertically mounted. Horizontally mounted main breakers are not

acceptable.

Circuit breakers shall be bolt-on thermal-magnetic, molded case circuit breakers. Breakers shall be 1, 2 or 3-pole with an integral crossbar to assure simultaneous opening of all poles in multiple circuit breakers. Breaker shall have an over-center, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have “ON”, “OFF” and “TRIPPED” positions. Circuit breakers shall be UL listed in accordance with UL Standard 489 and shall be rated 277 Volt ac (single pole, 15-30 amperes) or 480Y/277 volts ac (2 and 3 pole) with continuous current ratings as noted on the plan. Interrupting ratings shall be a minimum of 18,000 rms symmetrical amperes at 277 volts ac (single pole) or 480Y/277 volts ac (2 and 3 pole). Single pole, 15 and 20 ampere circuit breakers intended to switch fluorescent lighting loads on a regular basis shall carry the SWD marking. Circuit breakers shall be rated 18,000 AIC unless otherwise noted on plans.

E. 240 Volt Panelboards

Main breakers shall be vertically mounted. Horizontally mounted main breakers are not acceptable.

Circuit breakers shall be bolt-on thermal-magnetic, molded case circuit breakers. Breakers shall be 1, 2, or 3 pole with an integral crossbar to assure simultaneous opening of all poles in multiple circuit breakers. Breakers shall have an overcenter, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have "ON", "OFF" and "TRIPPED" positions.

Circuit breakers shall be UL listed in accordance with UL standard 489 and shall be rated 240 volts ac maximum with continuous current rating as noted on the plans.

Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip settings of the breaker to prevent repeated arcing short resulting from frayed appliance cords. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" at 120V ac and carry the SWD marking.

UL Class A 5mA ground fault circuit protection shall be provided on all receptacle circuits serving wet areas and on all 120V ac branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional circuit breaker.

UL Class B 30mA ground fault circuit protection (GFEP) shall be provided on all equipment circuits requiring ground fault protection. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring.

Provide Shunt Trip Breakers including control power for circuits under cooking hoods and other equipment having this requirement.

Provide Breaker with Switched Neutral circuits with common trip for gasoline pumps and other equipment having this requirement.

Circuit breakers shall be rated 22,000 AIC unless otherwise noted on plans.

Provide double sized neutral bus with panels served from a non-linear transformer or when indicated on drawings. This shall be a UL approved assembly.

F. Cabinets and Fronts

The panelboard bus assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust resistant steel. **Provide stainless steel front cover for all panels located in all Pool Equipment rooms, Food Labs, Snack Bars, Culinary Arts, Kitchens and Life Skills rooms. All NEMA-1 panels shall have hinged front covers. The front cover shall have a door with hinges, latch and a lock. The piano hinged, door-in-door front covers shall allow full access to the circuit breaker gutter area without having to remove the entire front cover.** All panelboard lock shall be keyed alike. Circuit breaker and fusible distribution panels shall have four-piece trims. A welded circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Provide NEMA 1 enclosure where installed indoors unless otherwise noted. Provide NEMA 3R enclosure where installed outside or in a sprinkled area.

G. Safety Barrier

The distribution panelboard interior assembly shall be dead front with panelboard cover removed. Main lugs or main breakers shall have barriers on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall have barriers.

H. Integrated Equipment Short Circuit Rating

Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the integrated equipment rating shown on the panelboard schedule or on the plans. This rating shall be established by testing with the over-current devices mounted in the panelboard. The short circuit tests on the over-current devices and on the panelboard structure shall be made simultaneously by connecting the fault to each over-current device with the panelboard connected to its rated voltage source. Method of testing shall be per Underwriters Laboratories Standard UL 67. The source shall be capable of supplying the specified panelboard short circuit current or greater. Testing of panelboard over-current devices for short circuit rating only while individually mounted is not acceptable. Also, testing of the bus structure alone is not acceptable. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install panelboards, including electrical connections, in accordance with manufacturers written instructions, NEC and recognized industry practices.

B. Housekeeping Pads: Mount floor mounted panelboards on 4-inch high concrete housekeeping pads.

C. Fuses: Install fuses of the rating and class as shown in each fusible distribution panel scheduled on drawings.

D. Conduits: Stub up three one-inch conduits to an accessible location above the ceiling for each recessed panelboard.

E. Infrared Scanning: After Substantial Completion by not more than 2 months after Final Acceptance, perform an infrared scan of each switchboard. Remove fronts if not equipped with viewing ports to make joints and connections accessible to a portable scanner. Submit a copy the owner and engineer for review. If O&M manuals are submitted prior to performance of infrared scan, contractor shall submit a signed letter to verify the scan has been arranged. Letter shall indicate the scan provider and the date It will be performed.

3.02 IDENTIFICATION

A. Nameplate: Each panelboard shall have an engraved bakelite nameplate. Nameplates shall be white with black letters and show panel designation. Nameplates shall be attached with stainless steel screws. Refer to Section 26 02 00, paragraph 2.08(C).

B. Directory Card: Cardholders and directory cards shall be furnished for circuit identification in panelboards. Cardholder shall be located on inside of panel door and shall be in a metal frame with clear plastic front. Circuit lists shall be typewritten. Circuit descriptions shall include location and name of each item of equipment served. Spares and spaces shall be written in erasable pencil for future use. Circuit directory shall show the room served by each circuit. The final graphs/signage room numbers shall be used. Do not use Architectural numbering on plans.

C. Replacement Components: Nameplate shall identify replacement components.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 – GENERAL

1.1 SCOPE

A. Provide wiring devices as shown; scheduled, required and as specified.

B. The types of wiring devices required include:

1. Receptacles
2. Switches
3. Coverplates

1.2 STANDARDS

A. NEMAWD-1

B. NEMA WD-6

C. UL

D. Federal Spec WC-596-F and WS-896

1.3 ACCEPTABLE MANUFACTURERS

A. Hubbell

B. Leviton

C. Pass & Seymour (P&S)

1.4 SUBMITTALS

A. Shop drawings shall include but not be limited to:

1. Cut sheets of all devices indicating NEMA configuration, rating, materials, color, and all accessories.
2. Cut sheets of all coverplates indicating materials, color and any engraving specified on drawing or in the specifications.

1.5 REQUIREMENTS OF REGULATORY AGENCIES WORK IN ACCORDANCE WITH:

A. National Electric Code.

B. Local, municipal, or state codes that have jurisdiction.

PART 2 – PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. GENERAL
1. Provide factory assemble wiring devices with the rating type and color as required and specified for the service indicated.

2. Provide matching one-piece multiple gang plates where switches are ganged.
3. Provide wall plates for each receptacle furnished.
4. Architect reserves the right to select wiring device styles and colors to match wall finish.
5. Wall plates shall be of same manufacturer as devices.

2.2 SWITCHES

A. Provide specification grade Ivory toggle switches where indicated on the Drawings.

B. Wall switches shall be 20 Amp, 120-277 volt and shall be Hubbell, Leviton or P&S as follows:
1. SINGLE POLE SWITCHES: Leviton 1221-2, Hubbell HBL1221, P&S PS20AC1
2. DOUBLE POLE SWITCHES: Leviton 1222-2, Hubbell HBL1222, P&S PS20AC2
3. THREE WAY SWITCHES: Leviton 1223-2, Hubbell HBL1223, P&S PS20AC3
4. FOUR WAY SWITCHES: Leviton 1224-2, Hubbell HBL1224, P&S PS20AC4
5. MOMENTARY CONTACT SWITCHES: Leviton 1257, Hubbell HBL1557, P&S 1251
6. THREE POSITION, TWO CIRCUIT MAINTAINED CONTACT SWITCHES: Leviton 1285, Hubbell HBL 1385, P&S 1225
7. KEY TYPE LOCKABLE BARREL KEY OR CORBIN STYLE: Leviton 1221-2KL with 2KL key or P&S PS20AC1-KL with 4609 key for each switch, Hubbell #HBL 1221-RKL.

C. 120/277V Line Voltage Dimmers: Provide Lutron DIVA or Maestro series or as shown on drawings. Wall box dimmers shall be sized to handle the load. Where fluorescent or LED dimming ballasts/drivers are to be used, coordinate wall box dimmer with ballast/driver manufacturer.

D. Light Handle Switches: Provide Leviton 1221-7LX, Hubbell HBL1221-lLx, P&S PS20AC1-ISL 20A, 120-277V, Industrial Grade lighted handles (lighted when off; or appropriate lighted when “on” toggle, where indicated) to switch loads where noted on the drawings. Use Leviton 1221-7PX, Hubbell HBL1221-PLx, P&S PS20AC1-CPLx for lighted when on.

2.3 RECEPTACLES

A. Provide specification grade Ivory receptacles where indicated on the drawings. Coordinate exact location with architect.

B. Receptacles shall be Hubbell, Leviton or Pass & Seymour as follows:

1. Duplex 20A-125V-self grounding:with Brass mounting yoke (NEMA configuration 5-20R): Hubbell HBL5352, Leviton 5362, P&S 5362A
2. Simplex 20A-125V-Self Grounding with Brass mounting yoke (NEMA configuration 5-20R): Hubbell HBL5361, Leviton 5361, P&S 5361 with Brass mounting yoke
3. Isolated ground duplex, 20A-125V: (Orange, NEMA configuration 5-20R) Hubbell IG5352, Leviton 5362IG , P&S IG5362
4. Clock hanger receptacle 15A-125V: (Brown with stainless steel plate with hanger, NEMA configuration 5-15R). Leviton 5361-CH, Hubbell 5235, P&S S3733-SS
5. Ground fault circuit interrupter (GFCI) receptacle 20A-125V; (NEMA Configuration 5-20R, shall incorporate self-test, auto monitoring technology and features which will lock-out or render the device incapable of being reset if ground fault protection is compromised, with "Feed through" connectors capable

of protecting connected downstream receptacles on a single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, Hubbell GFRST20, Leviton GFNT2, or P & S 2097
Install Hubbell GFTRST20, Leviton GFTR2 or P&S 2097TR Tamper Resistant type for locations requiring Tamper Resistant installations
Install Hubbell GFTWRST20, Leviton GFWR2 or P&S 2097TRWR Weather Resistant type for installations in damp or wet locations.

6. Tamper resistant receptacles 20A-125V (NEMA configuration 5-20R): Hubbell HBL8300SGA, Leviton 8300-SG, P&S TR63-H.
7. Surge Protection Duplex Receptacles 20A-125V, (NEMA 5-20R) Hospital grade to include **LED** light and audible alarm: Hubbell HBL8362SA, Leviton 8380, P&S 8300BLSP
8. Equipment receptacles shall be coordinated with owner/manufacturer requirements and the correct and appropriate receptacle and coverplate shall be installed.
9. USB charger and duplex receptacle 20A-125V (Fed Spec Grade) with two USB Type 2.0 Ports 5.0Amp, 5V DC tamper resistant: Hubbell USB8300-X (Hospital Grade), P&S TR20HUSBAC-X.

2.4 PLATES

A. Furnish and install plates on all outlet boxes. Oversize (Jumbo) plates are not acceptable.

B. Plates shall be 302/304 smooth stainless steel.

C. Provide Hubbell WP Series, Bell, Carlon or Leviton NEMA 3R weatherproof coverplates on all exterior wiring devices. Enclosure shall be suitable for wet locations when in use.

D. Plates shall be Hubbell SS Series, Leviton, Pass & Seymour 302/304 smooth stainless steel on all receptacles 30 amps and larger.

E. Stainless steel device plates shall be provided at locations with tile or stone walls.

PART 3 – EXECUTION

3.1 WIRING DEVICE MOUNTING HEIGHTS

A. Unless noted to the contrary on plans, or directed otherwise during the progress of the Work, wiring devices shall be set as follows:

1. Switches 42" above finished floor.
2. Wall mounted receptacles shall be installed vertically at 15 inches to the bottom outlet above finished floor unless otherwise noted or as required by local codes.
3. Wall telephone outlets shall be mounted 15 inches to the bottom above finished floor unless otherwise noted. Mount even with wall mounted receptacles.
4. At locations above counters, set devices at 6 inches above to the centerline counter tops, verify exact mounting height with the architect.

3.2 INSTALLATION (Refer to 26 05 33 for outlet box specifications).

A. Wall switches shall be set in a suitable steel box and shall be installed on the strike side of the door as finally hung, whether so indicated on the Drawings or not.

B. Receptacles shall be installed in a suitable steel box.

C. The Architect reserves the right to relocate wiring device up to a distance of 5 feet from the location shown, before rough-in, without additional cost.

D. Provide multi-gang device covers at locations where devices gang together.

E. Device locations are indicated schematically on the drawings along with the type and mounting height. Final locations and mounting heights shall be coordinated with the Architect on the jobsite, and with shop drawings of equipment; including equipment to be furnished and installed by the Owner. Devices installed in walls covered with vinyl, fabric wallpaper or other special finishes shall be coordinated and verified with the Architect on the job-site.

F. Stranded wire termination to switches, receptacles, devices and miscellaneous control devices shall be with an approved solderless terminal if clamp type securing is not possible (i.e. Sta-Con crimp on fork tongue connectors; Burndy Type TP-F).

G. Tamper-resistant type receptacles shall be installed for all 15A and 20A, 125V and 250V non-locking receptacles in all Dwelling Units, Guest rooms and guest suites of hotels and motels, Child Care Facilities, Pre-K and Elementary Education Facilities, and as specified in NEC 406.12.

H. All single-phase receptacles rated 150 volts to ground, or less, 50 amperes or less and three-phase receptacles rated 150 volts to ground or less, 100A or less, in Food Service areas, Bathrooms, Rooftops, Outdoors, Indoor Wet Locations, Locker Rooms, or Crawl Spaces shall be GFCI, in accordance with NEC 210.8(B).

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.01 SCOPE

A. Provide fuses as shown and scheduled and indicate by this specification section and other specifications sections.

B. The type of fuses include:

1. 600 volt current limiting.
2. 250 volt current limiting.

1.02 STANDARDS

A. ANSI

B. UL

1.03 ACCEPTABLE MANUFACTURERS

Provide fuses manufactured by Bussmann manufacturing.

1.04 SUBMITTALS

A. Shop drawings shall include, but not be limited to:

1. Cutsheets of all fuses showing ratings and fuse curves.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. WORK IN ACCORDANCE WITH:

1. National Electrical Code.
2. Local, municipal, or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.01 CURRENT - LIMITING FUSES

A. General: Provide 200,000 amp interrupting capacity current limiting fuses of the ampacity and voltage indicated and scheduled.

B. Mains, Feeders and Branch Circuits

1. Circuits 601 to 6000 ampere shall be protected by current limiting BUSSMANN HI-CAP Time Delay Fuses KRP-C. Fuses shall employ "O" ring as positive seals between the end bells and the glass melamine fuse barrel. The terminals shall be peened. Fuses shall be time-delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .1 seconds or less and be listed by Underwriters' Laboratories Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class L.

2. Circuits 0 to 600 ampere shall be protected by current limiting BUSSMANN LOW-PEAK Dual Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All dual-element fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284 degree Fahrenheit melting point alloy and shall be independent of the short-circuited clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and listed by Underwriters' Laboratories Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class RK1.

3. Motor Circuits - All individual motor circuits rated 600 amperes or less shall be protected by BUSSMANN FUSETRON Dual Element Fuses FRN-RK (250 volts) or FRS-RK (600 volts). The fuses for 1.15 service factor motors shall be installed in ratings approximately 125% of motor full current except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuse should be 150% to 200% of the motor full load current. Larger H.P. Motor shall be protected by BUSSMANN Type KRP-C HI-CAP Time-Delay Fuses of the rating shown on the drawings. 1.0 service factor motors shall be protected by BUSSMANN FUSETRON Dual-Element Fuses FRN-RK (250 volts) or FRS-RK (600 volts) installed in ratings approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK5

4. Circuit breaker panels shall be protected by BUSSMANN LOW-PEAK Dual-Element LPN-RK (250 volts) or LPS-RK (600 volts) as shown on the drawings. The fuses shall be UL Class RK1.

2.02 SPARES

Upon completion of the building the contractor shall provide the owner with spare fuses as shown below.

A. 10% (minimum of 3) of each type and rating of installed fuses shall be supplied as spares.

B. BUSSMANN spare fuse cabinets - Catalog No. SFC - shall be provided to store the above spares.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Fuses: Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment from the manufacturer to the job-site or from installation. All fuses shall be furnished and installed by the electrical contractor. All fuses shall be of the same manufacturer.

B. All fuses shall be installed in fuse holders.

END OF SECTION

SECTION 26 28 16

SAFETY AND DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 SCOPE

A. Provide safety and disconnect switches as shown, scheduled and as specified herein.
B. Refer to Section 26 29 01 for motor rated toggle type starter/disconnect switches.

1.02 STANDARDS

A. Products shall be designed, manufactured, tested and installed in compliance with applicable standards.

1. NEMA KS1 - Enclosed switches
2. Federal specification W-S-865C-Heavy duty switches

B. Products shall conform all applicable UL standards, including UL98 (standard for safety, enclosed and dead front switches) and shall be UL-labeled.

1.03 ACCEPTABLE MANUFACTURERS

A. Provide one of the following manufacturers:

1. General Electric Company
2. Square D Company
3. Siemens
4. Eaton

1.04 SUBMITTALS

A. Shop drawings shall include, but not be limited to:

1. Cutsheets of switches with ratings, physical dimensions and all accessories clearly labeled.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. WORK IN ACCORDANCE WITH:

1. National Electrical Code.
2. Local, municipal, or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.01 GENERAL

A. Furnish and install heavy duty type safety switches with the number of switched poles as indicated on the plans and specifications. All safety switches shall be NEMA Heavy Duty Type HD, and Underwriters Laboratories listed.

2.02 MATERIALS AND COMPONENTS

A. Switch Interior

All switches shall have switch blades that are fully visible in the "OFF" position when the door is open. Switches shall have removable arc suppressor where necessary, to permit easy access to line side lugs. Lugs shall be front removable and UL listed for 60ºC and 75ºC copper or aluminum cables. All switches blades and contacts shall be plated copper. Adjust fuse block to accept Class J fuses, as required.

B. Switch Mechanism

Switches shall have a quick-make and quick-break operating handle and mechanism, which shall be an integral part of the box, not the cover. Padlocking provisions shall be provided for locking in the "OFF" position with at least three padlocks. Switches shall have a dual cover interlock to prevent unauthorized opening of the switch door when the handle is in the "ON" position, and to prevent closing of the switch mechanism with the door open. A means shall be provided to permit authorized personnel to release the interlock for inspection purposes. Handle position shall indicate if switch is "ON" or "OFF".

C. Neutral

Provide a solid neutral with the safety switch where a neutral is present in the circuit.

D. Ratings

Switches shall be horsepower rated for ac and/or dc as indicated by the plans. The fused switches shall have Class R rejection fuse clips or adjusted for Class J fuses. UL listed short circuit ratings of the switches, when equipped with Class R fuses, shall be 200,000 symmetrical amperes.

E. Enclosures

1. Indoor switches shall be furnished in NEMA 1 enclosures.
2. Outdoor switches, switches located in wet areas or sprinkled areas shall be furnished in NEMA 3R enclosures.
3. Switches installed in wet areas such as cooling tower areas shall be NEMA 4X stainless steel or fiberglass reinforced polyester.
4. Switches installed in kitchens shall be stainless steel.
5. Switches installed in areas of a corrosive nature and subjected to salt air shall be NEMA 4X stainless steel or fiberglass reinforced polyester.

F. Electrical Interlock Contacts

Provide electrical interlock contacts on all disconnect switches serving motors in which remote VFDs are serving the motor. Provide conductors from contacts to the safe circuit inside the VFD. De-energizing the disconnect switch shall signal VFD to stop.

G. Service Entrance

Switch shall be suitable for use as service entrance equipment when installed in accordance with the National Electrical Code.

H. Grounding

Provide a grounding bar with each safety switch.

PART 3 - EXECUTION

3.01 GENERAL

A. Install safety and disconnect switches, including electrical connections, and fuses in accordance with manufacturer's written instructions, NEC and recognized industry practices.

B. Location: Install switches within sight of controllers.

C. Hubs: Provide bolt-on hubs for rainproof or wet area applications.

D. Infrared Scanning: After Substantial Completion by not more than 2 months after Final Acceptance, perform an infrared scan of each switchboard. Remove fronts if not equipped with viewing ports to make joints and connections accessible to a portable scanner.

3.02 IDENTIFICATION

A. Nameplate: Each disconnect switch shall have an engraved bakelite nameplate. Nameplates shall be white with black letters and show equipment served. Nameplates shall be attached with stainless steel screws.

END OF SECTION

SECTION 26 29 13

MOTOR STARTERS

PART 1 - GENERAL

1.01 SCOPE

A. Provide motor starters or controllers as shown, scheduled and as specified herein.

B. The types of motor starters include:
1. Individual motor starters.
2. Combination motor starters.
3. Manual motor starters.

C. All motor starters for equipment furnished under Division 23 shall be installed under Division 26 requirements unless noted otherwise on the plans.

1.02 STANDARDS

A. Products shall be designed, manufactured, tested and installed in compliance with applicable standards.

B. Products shall conform to all applicable UL standards and shall be UL-labeled.

1.03 ACCEPTABLE MANUFACTURERS

A. Provide one of the following manufacturers:
1. General Electric Company
2. Square D Company
3. Siemens
4. Eaton

1.04 SUBMITTALS

A. Shop drawings shall include, but not be limited to:

1. Cutsheets of all enclosures, circuit breakers, fusible and non-fusible switches, overloads, ratings, schedules and all accessories clearly labeled.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. WORK IN ACCORDANCE WITH:

1. National Electrical Code.
2. Local, municipal, or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.01 MOTOR STARTERS

A. GENERAL: Motor starters shall be Square D Company Class 8536 across-the-line magnetic type, full-voltage, non-reversing (FVNR) starter. Provide FVNR speed, single winding starter where indicated. **Provide FVNR two speed, single winding or two speed, two winding starters where indicated. Provide Square D Class 8736 "FVR" with selector switch for motors being served by a variable speed drive.** All starters

shall be constructed and tested in accordance with the latest NEMA standards, sizes and horsepower. IEC sizes are not acceptable. Starters shall be mounted in a general purpose, dead front, painted steel enclosure and surface-mounted. Provide size and number of poles as shown and required by equipment served.

B. CONTACTS: Magnetic starters contacts shall be double break solid silver alloy.

All contacts shall be replaceable without removing power wiring or removing starter from panel. The starter shall have straight-through wiring.

C. OPERATING COILS: Operating coils shall be 120 volts and shall be of molded construction. When the coil fails, the starter shall open and shall not lock in the closed position.

D. OVERLOAD RELAYS: Provide manual reset, trip-free Class 20 overload relays in each phase conductor in of all starters. Overload relays shall be melting alloy type with visual trip indication. All 3 phase and single phase starters shall have one overload relay in each ungrounded conductor. Relay shall not be field adjustable from manual to automatic reset.

E. PILOT LIGHTS: Provide a red “on” running pilot light and green “off” pilot light for all motor starters. Provide fast and slow pilot lights for two speed starters. Pilot lights shall be mounted in the starter enclosure cover and shall be “L.E.D.”. Pilot lights shall be operated from an interlock on the motor starter and shall not be wired across the operating coil.

F. CONTROLS: Provide starters with HAND-OFF-AUTOMATIC switches. Coordinate additional motor starter controls with the requirements of Division 23. Motor starter controls shall be mounted in the starter enclosure cover.

G. CONTROL POWER TRANSFORMER: Provide a single-phase 480 Volt (or 208V, where required) control power transformer with each starter for 120 Volt control power. Connect the primary side to the line side of the motor starter. The primary side shall be protected by a fuse for each conductor. The secondary side shall have one leg fused and one leg grounded. Arrange transformer terminals so that wiring to terminals will not be located above the transformer.

H. AUXILIARY CONTACTS: Each starter shall have one normally open and one normally closed convertible auxiliary contact in addition to the number of contacts required for the "holding interlock", remote monitoring, and control wiring. In addition, it shall be possible to field-install three more additional auxiliary contacts without removing existing wiring or removing the starter from its enclosure.

I. UNIT WIRING: Unit shall be completely pre-wired to terminals to eliminate any interior field wiring except for line and load power wiring and HVAC control wiring.

J. ENCLOSURES: All motor starter enclosures shall be NEMA 1, general purpose enclosures or NEMA-3R if mounted outside. Provide NEMA 4X stainless steel mounted next to cooling towers.

K. Power Monitor: Provide a Square "D" RM3TAR114TS7 or approved equal phase failure and under-voltage relay, base and wiring required for starters serving motors 5 horse power and larger. Set the under-voltage setting according to minimum voltage required for the motor to operate within its range.

2.02 COMBINATION MOTOR STARTERS

A. GENERAL: Combination motor starters shall consist of a magnetic starter and a fusible or non-fusible disconnect switch in a dead front, painted steel NEMA 1 enclosure unless otherwise noted and shall be surface-mounted. Size and number of poles shall as shown and required by equipment served. Combination motor starters shall be as specified for motor starters in Paragraph 2.01, except as modified herein.

B. DISCONNECT SWITCH: Disconnect switches shall be as specified in Section 26 28 16.

2.03 MANUAL MOTOR STARTERS

A. GENERAL: Manual starters shall consist of a manually operated toggle switch equipped with melting alloy type thermal overload relay. Thermal unit shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed. Contacts shall be double break, silver alloy, visible from both sides of starter. Manual starters shall be Square D class 2510 or 2512 or approved equal. Provide the size and number of poles shall be as shown and required by equipment served. Furnish red pilot light as indicated.

B. ENCLOSURES: All manual motor starter enclosures shall be NEMA 1, general purpose enclosures, or NEMA-3R if mounted exposed to high moisture conditions. Provide NEMA-4X when mounted next to cooling tower.

PART 3 - EXECUTION

3.01 INSTALLATION OF MOTORS

A. GENERAL: Mount electric motors which are not factory installed.

B. MOTOR CONNECTIONS: Provide electrical and grounding connections to motors as indicated. Connections as follows:

1. Not less than 18-inch length of flexible liquid-tite conduit, extending from motor connection box to motor branch circuit conduit on outdoor and wet locations. Provide flexible steel conduit for inside dry locations.
2. Install connections mechanically secure, assuring electrical continuity, proper and effective grounding.

3.02 INSTALLATION OF MOTOR STARTERS

A. GENERAL: Install motor starters in accordance with the manufacturer's written instructions, the applicable requirements of the NEC and the NECA's "Standard of Installation", and recognized industry practices to ensure that products serve the intended function.

B. OVERLOADS: Install overload heaters in each motor starter. Heater ratings shall be based on actual motor nameplate full load amps.

C. COORDINATION: Motor starters shall be provided to properly coordinate with motors as furnished by Division 23. Motor starter controls shall be provided to properly coordinate with controls specified in Division 23.

D. SUPPORTS: Motor starter enclosures shall be installed on galvanized unistrut or other supports where mounting on wall and shall not be supported by conduit alone. When

enclosures are unit mounted on equipment served, the switch shall not inhibit the removal of any service panels or interfere with any required access areas. Combination starter disconnects and starters mounted in ceiling plenums shall be installed 18" above ceiling grid or adjacent to equipment where maintenance access is provided.

3.03 TESTING

A. GENERAL: Check motor starters for continuity of circuits, for short circuits and demonstrate that it is functioning properly with HVAC controls.

B. INFRARED SCANNING: After Substantial Completion by not more than 2 months after Final Acceptance, perform an infrared scan of each switchboard. Remove fronts if not equipped with viewing ports to make joints and connections accessible to a portable scanner.

C. MOTOR-STARTER COORDINATION DOCUMENTATIONS: Provide motor-starter coordination documents including, but not limited to, the following information in the operation and maintenance manuals.

1. Motor size in horsepower
2. Motor full load amp
3. Motor efficiency
4. Service factor
5. Size and manufacturer catalog number of starter and thermal overloads.

END OF SECTION

SECTION 26 29 26

MISCELLANEOUS ELECTRICAL CONTROLS AND WIRING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

1.02 SCOPE

A. Provide the various miscellaneous control devices, wiring and additional branch circuits as required, shown and specified.

B. The types of miscellaneous control devices and wiring include but not limited to the following.

1. Contactors
2. Relays
3. Photocells
4. Lighting Controls
5. Time switches
6. Additional control wiring and safety devices as shown and specified.
7. Door bells and/or buzzers.

C. WORK SPECIFIED ELSEWHERE:

1. Various control devices, of an electrical nature, for the safe operation and temperature control of the heating, ventilating, air conditioning and plumbing systems provided under Division 23.
2. All control wiring and conduit shall be furnished under Division 23. All power wiring 120 Volt or larger shall be provided by Division 26.
3. Refer to building controls specification, Division 23 for scope of work required to be performed by Division 26 (electrical contractor).

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. WORK IN ACCORDANCE WITH:

1. National Electrical Code.
2. Local municipal or state codes that have jurisdiction.

1.04 ACCEPTABLE MANUFACTURERS

A. Provide one of the following manufacturers:

1. LIGHTING CONTACTORS AND RELAYS
   a. General Electric
   b. Square D Company
   c. Automatic Switch Company
2. PHOTOCELLS AND TIME SWITCHES
   a. Tork, Inc.
   b. Intermatic time controls
   c. AMF paragon

3. OCCUPANCY SENSORS
- a. Wattstopper
- b. Sensor Switch
- c. Leviton
- d. Lutron
- e. Hubbell
- f. Acuity Brands

1.05 SUBMITTALS

A. Shop drawings shall include, but not be limited to:

1. Cutsheets of all enclosures, contactors, lighting control sensors, rating, schedules and all accessories clearly labeled. Coordinate color finish of wall sensors with Section 26 27 26 - Wiring Devices, and the Architect.
2. Provide Lighting Control Shop Drawings for an installation guide and commissioning of the lighting controls system. Include power packs, sensor control (line voltage and low voltage) diagrams, schedules, and sequence of operation. Ensure compatibility with Lighting products supplied and installed.

PART 2 - PRODUCTS

2.01 MATERIAL

A. GENERAL: This Section shall outline the basic installation of electric devices, conduit, boxes, fittings, and wiring required for complete interconnection of several systems, this may not reflect every required appurtenance. It does not cover integral parts of mechanical equipment.

B. CONTACTORS AND RELAYS: Provide control wiring, contactors, and relays with the ampere-rating and number of poles as shown, specified, and required for a complete and functioning system:

1. Rated at 600 volts, 60 hertz.
2. Continuously rated contacts for all types of ballast and tungsten lighting, resistance and motor loads. Contacts shall be sized as scheduled or noted.
3. Shall have totally enclosed, double-break silver-cadmium-oxide power contacts. Auxiliary arcing contacts are not acceptable. Contact inspection and replacement shall be possible without disturbing line or load wiring.
4. The contactor shall have straight-through wiring with all terminals clearly marked.
5. The contactor shall be approved per UL508 and/or CSA, and be designed in accordance with NEMA ICS2-21 1B.
6. They shall be industrial-duty rated for applications to 600 volts maximum.
7. The contactor shall have provisions for factory or field addition of:
   a. Four (4) N.O. or N.C. auxiliary contacts rated 6 amperes continuous at 600 volts.
   b. Single or double circuit, N.O. or N.C., 30 or 60 ampere 600 volt power-pole adder.
8. The contactor shall have a NEMA type 1 enclosure unless otherwise noted.
9. Control power to the contactor 120V control circuit shall be provided from the nearest panelboard 120V circuit. If the 120V control power circuit is not shown, provide a control power transformer for 120 volt control power and a 120 volt coil when required for control. Provide primary and secondary fuses on the control power transformer.

10. Mechanically Held Lighting Contactors - Coil-clearing contacts shall be supplied so that the contactor coils shall be energized only during the instance of operation. Both latch and unlatch coils shall be encapsulated. All contactors shall be mechanically held unless noted otherwise on the plans.
11. Provide 2-wire or 3-wire control modules as required to operate lighting contactors.
12. Provide hand-off-automatic controls (H-O-A) for each lighting contactor.
13. Provide relays and contactors to shut down air handling units.

C. PHOTOCELLS: Provide a specification grade self-contained, weatherproof, photoelectric control that shall be mounted on an FS type weatherproof junction box. The photocell shall:

1. Switch "ON" at dusk and "OFF" at dawn.
2. Adjustable from 2 to 50 foot candles.
3. Rated at 2000 watts.
4. Use 1" diameter cadmium sulphide cell.
5. Have a 2 minute delay to prevent false switching.

D. TIME SWITCHES: Provide a 7-day**,** 2-channel digital, programmable time clock with astronomic correction and battery back-up feature installed in a NEMA 3R/12 enclosure.

E. Door Bells/buzzers
1. At Kitchen exterior entrance doors
   a. Provide door button and conduit pathway to bell as shown on plan
   b. Provide Edwards 340 series Adaptabel AC Bell
      1. Operable at 120v, 60hz
      2. If step-down xfmr is required, provide 1900 deep rough-in box and install transformer behind bell
      3. Bell height shall be 96” AFF.

F. Control wiring shall be not less than #14 AWG type TW, and shall be color coded and labeled with Brady markers throughout. Bundle multiple conductors with Ty-Raps.

G. OCCUPANCY SENSORS: Occupancy sensors shown on drawings are for reference only. Quantity and location of sensors in each space shall be provided as recommended by manufacturer. Provide all accessories necessary for complete and functioning system including but not limited to: power packs, photocells, override switches. Provide occupancy sensors as follows, or as detailed on the drawings:

1. Ceiling Mounted Occupancy Sensors:
   a. Line Voltage Sensor: Wattstopper #DT-355 dual tech sensor or equal.
   b. Low Voltage Sensor: Wattstopper #DT-300 dual tech sensor or equal with BZ150 Power Pack and LVSW101 Digital Switch.
2. Wall Mounted Occupancy Sensors (large room):
   a. Low Voltage Sensor: Wattstopper #DT-200 dual tech sensor or equal with BZ150 Power Pack and LVSW101 Digital Switch.
3. Wall Mounted Occupancy Sensors (private office): 120/277V
   a. Single Relay: Wattstopper #DSW-301 dual tech wall sensor or equal.
   b. Dual Relay: Wattstopper #DSW-302 dual tech wall sensor or equal.
4. Digital Room Controller (Classroom Room Controller):
   a. Line Voltage: Wattstopper #LMRC-101 or equal.
5. Digital Low Voltage 3-button Switch (Classroom):
   a. Low Voltage: Wattstopper #LMSW-103 or equal.
6. Digital Low Voltage 2-button Switch Dual Tech Occupancy Sensor:

a. Low Voltage: Wattstopper #LMDW-102 or equal.

7. Digital Low Voltage 1-button Dimmer Switch:
   a. Low Voltage: Wattstopper #LMDM-101 or equal.
8. Digital Low Voltage Dimmer/Occupancy Sensor Switch:
   a. Low Voltage: Wattstopper #DW-311 or equal.
9. Digital Network Bridge (System Interface):
   a. Low Voltage: Wattstopper #LMBC-300 or equal.

PART 3 - EXECUTION

3.01 Install miscellaneous electrical controls and wiring to provide a functioning system.

3.02 DIVISION 22, 23, 27, AND 28 MISCELLANEOUS POWER AND CONTROLS

A. Install electrical devices not an integral part of mechanical equipment providing conduit, boxes, fittings, wiring, and other devices.

B. Electrical contractor is responsible for providing all line voltage power to devices indicated by controls contractor that require electrical power to operate. Electrical contractor shall terminate line voltage power to termination points indicated by control contractor. Electrical contractor shall coordinate with controls contractor to determine sizing and quantities of line voltage circuits to adequately power control devices. Electrician is to obtain circuits from nearest low voltage panel using spare circuits provided, if device requires power not already available.

3.03 Install contactor and relays in electrical/mechanical rooms unless otherwise noted.

3.04 Install photocells on the roof unless otherwise directed by the architect. Coordinate any roof penetrations with all other trades and shield from other light sources.

3.05 Provide miscellaneous connections for signs, door operators, window shades, and other furnished equipment as shown on the Drawings.

3.06 Provide Start-Up Services and programming for the Lighting Controls System. Submit documentation that occupancy sensors have been installed per specification and tested to function correctly. Identify any defective devices, replace and retest. Obtain time delay setting from the Owner's representative.

END OF SECTION

SECTION 26 43 13.13

SURGE PROTECTIVE DEVICES – STANDARD INTERRUPTING

PART 1 - GENERAL

1.01 SCOPE

A. Specify the electrical and mechanical requirements for a modular high-energy surge protective device system (SPD). The specified system shall provide effective high energy surge current diversion and be suitable for application in ANSI/IEEE C62.41 Category A, B and C3 environments, as tested by ANSI/IEEE C62.11, C62.45.

B. The system shall be constructed using multiple surge current diversion modules utilizing only metal oxide varistors (MOV) computer matched to +/- 1 volt variance and tested for manufacturer's defects for the surge current path. The modules shall be designed and constructed in a manner that ensures surge current sharing.

1.02 STANDARDS

A. The specified system shall be designed, manufactured, tested and installed in compliance with the following codes and standards:

Canadian Standards Association (CSA)
American National Standards Institute and
Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41, C62.45)
Institute of Electrical and Electronic Engineers 1100 Emerald Book
Federal Information Processing Standards Publication 94 (FIBS PUB 94)
National Electrical Manufacturer Association (NEMA LS-1 1992)
National Fire Protection Association (NFPA 20, 75 and 780)
National Electric Code (NFPA 70)
Underwriters Laboratories (UL 1449, Fourth Edition 2014)
Underwriters Laboratories (UL 1283, Fifth Edition)
International Electrotechnical Commission (IEC 801)
International Standards Organization (ISO) Company certified ISO 9001 for manufacturing, design and service
EMC Directive 89/336/EEC - CE compliant

B. The systems individual units shall be UL Listed and labeled under UL 1449 (Fourth Edition) Standard for Surge Protection Devices Type 1 with a nominal discharge current of 20kA and the surge ratings shall be permanently affixed to the SPD. Each unit shall also be listed and labeled to UL1283 for type 2 locations.

1.03 ACCEPTABLE MANUFACTURERS

A. Southern Tier Technologies
B. ACT Communications

1.04 SUBMITTALS

A. Shop drawings shall include, but not be limited to:

1. Cutsheets of surge protection devices with ratings, physical dimensions and all accessories clearly labeled.
2. Device labels shall be clearly indicated in cutsheets.

3. All standards and listings, as specified in section 1.2A-B, shall be clearly labeled in cutsheets provided.
4. Cutsheets shall clearly outline that design requirements of this specification have been met.
5. Third Party Test Report verifying surge current rating, longevity, testing, and filtering capabilities.

1.05 QUALITY ASSURANCE

A. The manufacturer shall be ISO 9001 certified. The specified system shall be tested at the component and fully assembled level, under surge conditions with AC power applied for a minimum of 1 hour. Testing shall include but not be limited to quality control checks, dielectric voltage withstand test per UL and CSA requirements, UL ground continuity tests and operational and calibration tests.

B. The unit shall be designed and manufactured in the USA by a qualified manufacturer of line conditioning equipment and Active Tracking Filters. The manufacturer shall have been engaged in the design and manufacture of such products for a minimum of 10 years.

PART 2 - PRODUCTS

2.01 ENCLOSURE

A. The specified system shall be provided in a heavy duty NEMA 4/12 or better dust-tight, drip-tight enclosure with no ventilation openings.

2.02 OVERCURRENT PROTECTION (FUSING)

A. All components, including suppression, filtering, and monitoring components, shall be individually fused and rated to allow maximum specified surge current capacity. For every 100 K amps of Surge Current Capacity, 120 amps RMS of internal, integral fusing shall be required.

B. Individual surge components shall be sand packed and fused at a maximum of 7 1/2 amps to prevent violent failure. The fusing shall be UL listed to be capable of interrupting up to 300 kA symmetrical fault current with 600VAC applied. Replaceable fusing is unacceptable. Overcurrent protection that limits specified surge currents is not acceptable.

2.03 DESIGN REQUIREMENTS

A. Protection Modes
The SPD shall provide protection as follows: All modes, L-N or L-L, L-G and N-G (where applicable) Note: L = Line, G = Ground, N = Neutral

B. UL 1449 Ratings
Based on an 80kA per mode (160kA per phase) rating, the maximum UL 1449 listed surge ratings for each and/or all of the specified protection modes shall not exceed the following in any mode of protection:

System voltage	Voltage Protection Rating
120/208 or 120/240 volt	700 volts
208, 240, 277, 230/400, or 277/480 volt	1000 volts

These ratings may vary depending upon the kA rating specified on the drawings.

C. Noise Attenuation
The unit shall be UL 1283 Listed as an electromagnetic interference filter in type 2 locations. The filter shall provide insertion loss with a maximum of 60 dB from 100 KHz to 100 MHz per 50 Ohm Insertion Loss Methodology from MIL 220A. The system shall provide up to 120 dB insertion loss from 100 KHz to 100 MHz when used in a coordinated facility system.

D. Life Cycle Testing
The SPD system shall be duty life cycle tested to survive 6,000/12,000 20kV, 10kA Surges, per IEEE C62.41 Category C3 surge current with less than 5% degradation of clamping voltage.

2.04 CONNECTIONS

A. The terminals shall be provided to accommodate a minimum wire size of #6 AWG.

2.05 ACCESSORIES

A. Unit Status Indicators:
Red and green solid state indicators with printed labels shall be provided on the front cover to redundantly indicate on-line unit status. The absence of the green light and the presence of the red light shall reliably indicate that surge protection is reduced and service is needed to restore full operation.

B. Dry Contacts for remote monitoring:
Electrically isolated Form C dry contacts, one normally open and one normally closed set standard on all units for remote monitoring.

C. Undervoltage detection:
Unit shall be equipped with 70% undervoltage detection capability.

D. Phase Loss Monitoring:
Unit shall be equipped with phase loss monitoring.

E. Power Loss Monitoring:
Unit shall be equipped with power loss monitoring.

2.06 TESTING

A. Component Testing and Monitoring
Unit shall include an on-line circuit which tests and redundantly monitors individual components in all protection modes including neutral to ground (where applicable).

2.07 ENVIRONMENTAL REQUIREMENTS

A. Storage Temperature: -55 to +85 C (-67 to +187 F)

B. Operating Temperature: -40 to +60 C (-40 to 140 F)

C. Relative Humidity: 0% to 95%

D. Audible Noise: less than 45 dBa at 5 feet (1.5 m).

E. Operating Altitude: 0 to 18,000 feet above sea level.

2.08 WARRANTY

A. The manufacturer shall provide a full 5 year parts and a 10 year labor warranty from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL Listing requirements and any applicable national, state or local electrical codes. Direct, factory trained, ISO 9001 certified employees must be available for 48 hour assessment. A 24 hour 800 number must be available to support warranty.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install the parallel SPD with short and straight conductors as practically possible. Locate adjacent to the switchboard or panel it is serving. The contractor shall twist the SPD input conductors together to reduce input conductor inductance. The contractor shall follow the SPD manufacturer's recommended installation practices as found in the installation, operation and maintenance manual and comply with all applicable codes. Note, SPD shall not be installed more than 5 feet from switchboard/panel it is protecting. If device is more than 2 feet away the connection shall be made using a low impedance (HPI) cable.

END OF SECTION

SECTION 26 51 00. 13

LIGHTING FIXTURES- LIGHT EMITTING DIODE (LED)

PART 1 - GENERAL

1.01 SCOPE

A. Furnish and install general and emergency lighting fixtures as noted on the drawings. Fixtures shall be completely wired with lamps installed and shall be in perfect operating condition at the time of substantial completion.

B. The types of lighting fixtures required for this project include:

1. LED

1.02 STANDARDS

A. All fixtures shall conform to all applicable UL standards and shall be UL label including damp and wet location ratings. “ETL listed” is an acceptable listing.

B. NFPA 101

C. ANSI C82.1

D. NEMA-LE

E. IEEE Publication 587 Category “A” (Electronic Ballast)

F. All LED drivers shall be UL recognized Class 2 per UL1310 or non-Class 2 per UL 1012 as applicable.

G. UL 1008

H. All LED drivers shall comply with applicable requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 15, for Non-Consumer Equipment.

I. All LED drivers shall be RoHS compliant.

J. TM-21

K. LM-80

L. LM-79

M. L70

N. DLC

1.03 ACCEPTABLE MANUFACTURERS

A. Provide lighting fixtures produced by manufacturers as shown and scheduled.

1.04 SUBMITTALS

A. Shop drawings shall include a brochure with a separate cut sheet for each fixture type arranged in alphabetical order with fixture and all accessories/options clearly labeled. Provide performance data for each fixture. Provide an independent test lab report for each fixture if requested by the Architect/Engineer.

B. Provide driver and LED module data brochures for each fixture type.

C. Furnish air handling and heat removal data for light fixtures specified with these requirements.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. WORK IN ACCORDANCE WITH:

1. National Electrical Code.
2. Local, municipal, or state codes that have jurisdiction.
3. UL fire resistance directory.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. General:

Provide the size, type and rating of each light fixture shown and scheduled. All light fixtures shall complete with reflectors, lens, trim rings, flanges, LED modules, lamp holders, drivers, fuses, wiring, earthquake clips, etc. to provide a complete functioning light fixture.

B. Lighting Fixture Types:

1. LED Fixtures
   a. Fixtures shall be pre-wired with frame-in kit and integral thermal management system for fixtures. Driver shall be encased in metal-can construction for optimal thermal performance.
   b. Total fixture lumen output is dependent on the chip, thermal management, driver current and optical system. LED fixtures shall be tested as a complete unit or system. Only DOE recognized CALiPER testing laboratory results shall be utilized.
   c. Interior LED fixtures shall have integral common mode and differential mode surge protection of 3kV(1.2/50µs, 2 ohm combination wave).
   d. Exterior LED fixtures shall have integral common mode and differential mode surge protection of 10kV/10kA(1.2/50µs, 2 ohm combination wave).
2. Exit signs
   a. Exit signs shall meet all federal, state and local codes.
   b. Provide fire alarm interface relay when required to flash exit signs.
   c. Provide battery packs for emergency operation when not connected to emergency generator power.

2.02 LED MODULES AND DRIVERS - COORDINATE WITH LIGHT FIXTURE SCHEDULE

A. LED

1. Driver manufacturer shall have a 10-year history producing electronic drivers for the North American market.
2. Driver shall carry a five year limited warranty from date of manufacture against defects in material or workmanship (including replacement) for operation at a maximum case temperature of 80 degrees Celsius.
3. Drivers shall not contain any Polychlorinated Biphenyl (PCB).
4. Provide driver with integral color-coded leads.
5. Driver shall operate from 50/60 Hz input source of 120 Volt through 277 Volt or 347 Volt through 480 Volt with sustained variations of +/- 10% (voltage) with no damage to the driver.
6. Driver output shall be regulated to +/- 5% across published load range. And shall have a power factor greater than .90 for primary application to 50% of full load rating with an input current Total Harmonic Distortion (THD) of less than 20% to 50% of full load rating.
7. Provide drivers with a Class A sound rating.
8. Provide LED drivers for outdoor fixtures with a minimum operating temperature of -40 degrees Celsius (-40 F). Provide LED drivers for indoor fixtures with a minimum operating temperature of -20 degrees Celsius (-2F).
9. Drivers shall tolerate sustained open circuit and short circuit output conditions without fail and auto-resetting without need for external fuses or trip devices.
10. Driver output ripple current shall be less than 15% measured peak-to-average, with ripple frequency being greater than 100Hz.
11. Driver performance requirements shall be met when operated to 50% of full load rating.
12. Driver shall have integral thermal foldback to reduce driver power above rated case temperature to protect the driver if temperatures reach unacceptable levels.
13. Drivers shall comply with NEMA 410 for in-rush current limits.
14. Dimmable drivers shall be controlled by a Class 2 low voltage 0-10VDC controller with dimming range controlled between 1 and 8VDC with source current 150μA.

2.03 LAMPS – COORDINATE WITH LIGHT FIXTURE SCHEDULE

2.04 EMERGENCY LED BATTERY BACKUP

A. Provide Bodine #BSL310M for emergency light fixtures in 9 or 10-foot ceiling.

B. Provide Bodine #BSL20 for emergency LED driver for emergency light fixtures in ceiling heights greater than 12 feet.

C. Provide Bodine #BSL17-C2 for emergency LED driver for LED downlights.

D. Provide unswitched hot leg. Hot leg shall originate from the same branch circuit as required in NEC article 700.12 (F).

PART 3 - EXECUTION

3.01 INSTALLATIONS

A. General

1. Install the type of light fixture where shown and indicated in accordance with

manufacturer's written instructions.

2. Provide earthquake clips on all recessed lay-in light fixtures as required by building code.
3. Adjust all adjustable light fixtures, as directed by the Architect.
4. Provide safety chains and wire guards for light fixtures located in gymnasium, multi-purpose rooms, play areas, etc.

B. Coordination

1. The contractor shall verify the type of fixtures with the ceiling types as indicated on the drawings. Any discrepancies shall immediately be brought to the architect's attention before the contractor places his order and accepts delivery. Fixtures shall fit exact in the type of ceiling scheduled. Provide plaster frames, trim rings and other accessories required for a correct fit.
2. Provide supports attached to structural member to support fixtures when the ceiling system cannot maintain support.
3. Refer to architectural reflected ceiling plan for the exact location of all light fixtures. Notify the architect for any discrepancies or conflicts with structural, architectural, mechanical piping or ductwork before installation.

C. Mounting

1. Provide support channels to support outlet boxes used support surface mounted light fixtures such as exit signs or downlights.
2. Pendant or surface mounted fixture shall be provided with required mounting devices and accessories, including hickeys and stud-extensions, ball-aligners, canopies and stems. Locations of fixtures in mechanical areas shall be coordinated with mechanical contractor. Mounting stems of pendant fixtures shall be of the correct length to uniformly maintain the fixture heights shown on the drawings or established in the field. The allowable variation tolerance in mounting individual fixtures shall not exceed 1/4 inch and shall not vary more than 1/2 inch from the floor mounting height shown on the Drawings. Fixtures hung in continuous runs shall be installed absolutely level and in line with each other. Hanging devices shall comply with Code requirements. Fixtures shall employ single - not twin - stem hangers unless otherwise noted.
3. All structure mounted fixtures (i.e. bracket mounted, pipe mounted and surface mounted) shall be provided with cables of suitable size and weight to support the weight of the fixture. Cables shall be fastened around or fastened to the housing of the fixture. On pendant fixtures, one safety cable of suitable size and weight to support the weight of the fixture assembly shall connect the top of the pendant to the supporting structure by means of welding or bolting, and one safety cable shall connect the housing of the fixture to the bottom of the pendant. Where more than one pendant per fixture occurs, only one pendant must be cabled. Track fixtures for pendant mounted track shall also be supplied with clip-on safety cables of suitable size and weight to support the weight of the fixture.
4. Provide secondary support wires from all four (4) corners of the lay-in fixtures to the structure above. Do not support fixtures from ceiling grid wire supports, piping, conduit, side walls, or mechanical equipment. Ceiling specifications do not supersede this requirement.

D. Electrical Connection

1. All light fixtures shall be connected from a branch circuit junction box using 1/2" flexible metal conduit or MC cable fixture pigtails not exceeding 8'- 0". Provide #12 AWG conductors. All fixtures must be grounded by using a grounding conductor. Fixture to fixture wiring of fixtures installed in an accessible ceiling is

not permitted. Fixture whips shall not lay-on ceiling tile or grid. Provide caddy clips to provide additional support.

E. Fire Rated Ceiling

1. Provide fire rated canopy or enclosure for all fixtures recessed in a fire rated ceiling. The fire rated canopy or enclosure shall be as required by the UL design number listed in the UL fire resistance directory. Refer to architectural drawing for the UL design number. Coordinate with ceiling installer and manufacturer.

F. Air Handling Fixtures

1. Install all air handling light fixtures with return air slot in the open position, if it is to be as an air handling fixture. Coordinate with mechanical contractor.

3.02 FINAL INSPECTION

A. Remove all plastic and protective coating from all fixtures. Fixtures shall be thoroughly cleaned. Replace any damaged fixture or fixture parts including reflectors, louvers, lens and metal parts that show signs of corrosion.

B. Replace all other defective fixtures showing signs of excessive usage.

C. Demonstrate proper operation of all fixtures and controls.

END OF SECTION

SECTION 27 10 00

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

This section identifies the technical design and specification requirements for the structured cabling system for the Crestview Elementary School project at Judson Independent School District (Owner) located in San Antonio, Texas. The structured cabling system as specified is an Industry Standard Category 6/6A Structured Cable System and will support network connectivity for IP systems.

Contractor shall provide all materials, equipment, and labor necessary to provide a complete and functional Industry Standard Category 6/6A cable plant regardless of any materials and/or equipment not listed or described in this specification and/or supplementary drawings.

1.01 RELATED REQUIREMENTS

A. The general provisions of the Contract and the requirements of the following Sections apply to the Work specified in this Section.

B. All Work of this Section shall comply with the requirements of the Conditions of Contract (including, but not limited to, Bidding Requirements, Contract Forms, Conditions of Contract, and Standard Forms), with all Specifications Sections of Division 01 General Requirements, with the Drawings, and with all other relevant and Contractual Documents.

C. Contractor shall participate in a pre-construction meeting with the General Contractor, Architect, Owner, and Consultant prior to the commencement of any work. Coordinate with Division Sections as required.

1.02 CONTRACTOR REQUIREMENTS

A. The Contractor shall be a Certified Installer of the proposed Manufacturer Structured Cabling Solution prior to submitting a proposal for the work.

B. The Contractor shall possess any and all relevant Manufacturer Certifications for the company and all installers prior to submitting a proposal for the work. Contractor shall provide a list of their technical support staff together with their work experience, training history and manufacturer's certifications for the Company and installers.

C. Installers must be certified, trained and experienced on the specific installation, termination, and testing of the systems as specified.

D. The Contractor shall certify and the Manufacturer of the solution shall warrant the solution for a period of no less than twenty (20) years.

E. The Contractor shall be an established business with local support and shall have been in business for a minimum of five (5) years.

F. The Contractor shall have prior experience with projects of a similar size and scope. The Contractor shall provide a minimum of five (5) installed systems comparable to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year. The Contractor shall provide the following information for each reference: Project Name, Project Location, Project Start Date, Project Completion Date, Project Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.

G. Past performance with the Owner is a selection criterion. Experience related to any past or present project with the Owner should be disclosed with bid response.

H. Qualified Contractors should submit proof of all certifications and experience detail with bid response.

1.03 SUBMITTALS

A. To Be Submitted with Proposal

1. Contractor shall submit an itemized listing of all equipment, materials and labor required for the installation of the structured cable system as specified herein. This listing shall be provided in printed form and electronic format (Microsoft Excel) and shall contain: Part Number, Description, Unit of Measure, Unit Cost, Quantity, Labor Cost and Extended Cost to provide a complete and functional cable plant system. Attachment “A” attached to these specifications shall be used for this purpose.

2. Contractor shall submit an estimated drop count for each Equipment Room/Telecommunications Room indicating the quantity of Category 6/6A drops served from each applicable Equipment Room/Telecommunications Room. This listing shall be provided in printed form and electronic format (Microsoft Excel). Attachment “B” attached to these specifications shall be used for this purpose.

B. To Be Submitted Prior to Installation

1. Product data sheets for all proposed system components. Product data sheets shall include: an equipment schedule listing of all system components to be installed in the project and the manufacturer’s product reference and specification literature for all products to the utilized and/or installed in the project. Contractor shall not purchase or install any equipment until product data sheets have been received and approved by the Architect/Engineer.

2. Contractor shall provide to Owner’s representative shop drawings of the proposed layouts of equipment and structured cable system. Shop drawings shall include equipment rack layouts, wall elevations, system schematics, one-line and riser diagrams. Shop drawings shall indicate proposed cable pathways and routing, outlet numbering, and equipment elevations. Detailed shop drawings shall be submitted on 30” X 42” bond paper and be kept current at all times in the event of site inspection. Contractor shall not perform any work until shop drawings have been received and approved by the Architect/Engineer.

3. Contractor shall provide to Owners representative a Cable Record document (spreadsheet) which includes a list of all cables to be installed under this contract. The record shall reflect all cables installed including horizontal, backbone, and specialty. The Cable Record shall include a unique identifier for each cable and be used as a basis to track the details of each installed cable including but not limited to: cable number, origin, destination, type, pass fail information, cable label, and other relevant data as required. These cable records shall at all times match the shop drawings and match the as-built drawings upon final completion.

4. Contractor shall provide and keep current a construction schedule which shall be coordinated with the General Contractor. The schedule shall indicate milestones, tasks, manpower allocation, testing activities, and final completion.

C. To Be Submitted Post Installation

1. Contractor shall prepare, update and make available to the Architect/Engineer three (3) sets of comprehensive drawings accurately depicting the “as-built” condition of the structured cable system as it was installed. As-Built drawings must be provided in original hardcopy format and on a thumb drive in AutoCAD 2018 or higher. The Contractor shall prepare, update, and make available to the Consultant a comprehensive set of "as built" drawings using the original scale, indicating (but not limited to) exact dimensions and locations of all telecommunication rooms, frames, racks, trays, terminal blocks, patch panels, cable runs, cable pathways, workstation locations, and labeling scheme. As-Built drawings shall be turned over to the Consultant at the

time of final systems acceptance of the structured cable system installation. Final payment will not be made until these drawings are received and approved by the Architect/Engineer.

2. Contractor shall provide (3) copies of the final Cable Record reflecting the as-built condition of the cable plant and include all relevant data for each and every cable installed under this contract.

3. The Contractor shall provide three (3) sets of test documentation for the structured cable system to the Architect/Engineer at the time of final systems acceptance. Test results shall be provided in original hardcopy format and on a CD-ROM. Test documentation shall include Power Meter and Light Source Fiber Optic Tests and Category 6/6A test results for each cable drop in accordance with these specifications. Final payment will not be made until these test results are received and approved by the Architect/Engineer. Test documentation shall be bound, sectioned and tabbed in the following order (when applicable):

   a. Inter-Building Outside Fiber Optic Cable

   b. Inter-Building Outside Copper Cable

   c. Intra-Building Fiber Optic Cable

   d. Intra-Building Copper Cable

   e. Horizontal 4-Pair UTP Category 6 Cable

   f. Horizontal 4-Pair UTP Category 6A Cable

4. The Contractor shall furnish the original Certificate of Warranty to the Architect/Engineer at the time of final systems acceptance. Final payment will not be made until this Certificate of Warranty is received and approved by the Architect/Engineer.

5. Contractor shall provide warranty information to include the name, address and phone number contacts for warranty call outs. Final payment will not be made until this warranty information is received and approved by the Architect/Engineer.

PART 2 - PRODUCTS

The following sections specifically list the acceptable equipment types and items for this project. Proposed equivalent items must meet or exceed these specifications and the specifications of the listed item. In the event a specified manufacturer's part number has changed or is no longer valid, Contractor shall substitute the appropriate equivalent manufacturer's part number. Owner or Owner's designate will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to installation. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished. Any Owner-furnished materials or equipment not installed in the project shall be returned to the Owner. Contractor shall store all materials and equipment in accordance with manufacturers' instructions in a weather-tight, secure enclosure. Contractor shall be responsible for safety and security of all Owner-furnished materials until project is complete and accepted by Owner.

2.01 ACCEPTABLE MANUFACTURERS

A. Category 6 / 6A UTP Horizontal Cable

1. 4-Pair UTP –Category 6 (White Sheath)

a. Mohawk 6 LAN – Part No. M58280 (or Hitachi Equivalent)

2. 4-Pair UTP –Category 6A, Wireless Access Points (White Sheath)

a. Mohawk 6 LAN – Part No. M58647 (or Hitachi Equivalent)

B. Category 6/6A Horizontal Cable Termination

1. IDF / MDF Termination

a. Hubbell UDX Super High Density 48-port Blank Patch Panels – Part No. UDX48E1U

b. Hubbell Xcelerator – Category 6 Jack Insert Orange Part No.HXJ6OR

c. Hubbell NextSpeed Ascent – Category 6A Jack Insert Light Almond – (Wireless Access Points) - Part No. HJ6AOW25

2. Telecommunications Outlets Termination

a. Hubbell Xcelerator – Category 6 Jack Insert Orange Part No.HXJ6OR

b. Hubbell NextSpeed Ascent – Category 6A Jack Insert Light Almond (Wireless Access Points) - Part No. HJ6AOW25

C. Telecommunications Faceplates

1. Hubbell IFP – 4-Port Single Gang Flush White Part No. IFP14W

2. Hubbell 630 – Wall Phone Stainless Steel Faceplate Part No. P630SR1GC6

3. Hubbell ISM – 2-Port Surface Mount Box White Part No. ISM2W

4. Hubbell – Blank Insert White Part No. UNDC-WH

D. Pathway Cable Support

1. Main Pathway Cable Support

a. Wire Mesh Basket Cable Tray – 24” PROVIDED by DIVISION 26

2. Secondary Pathway Cable Support

a. Erico – CADDY CAT LINKS J-Hook Series

E. Grounding and Bonding

1. Chatsworth – Grounding Bus Bar, 20” for MDF Part No. 40153-020

2. Chatsworth – Grounding Bus Bar, 10” for IDFs Part No. 13622-010

3. Chatsworth – Cable Runway Ground Strap Kit Part No. 40164-001

4. Chatsworth – One Mounting Hole Ground Terminal Block Part No. 08009-001

5. Chatsworth – Ground Bar for Wall Mount Cabinet Part No. 10610-019

6. Superior Essex – 6AWG Green Insulation Part No. 12-018-04

7. Chatsworth – Vertical Rack Mounted Copper Bus Bar Part No. 40160-072

F. Fire Stop (Intumescent Putty and Pillows)

1. STI Spec Seal as Required

2. 3M Products as Required

PART 3 - EXECUTION

3.01 CODES, STANDARDS AND REGULATIONS

A. Telecommunications Industry Association

1. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, 2009

2. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, 2009

3. ANSI/TIA -568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard, 2009

4. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, 2008

5. ANSI/TIA/EIA–569-B, Commercial Building Standard for Telecommunications Pathways and Spaces, 2005

6. ANSI/TIA–569-B Amendment 1, Commercial Building Standard for Telecommunications Pathways and Spaces, 2009

7. ANSI/TIA-606 -B, Administration Standard for Commercial Telecommunications Infrastructure, 2012

8. ANSI-J-STD-607-B, Commercial Building Grounding and Bonding Requirements for Telecommunications, 2011.

9. ANSI/TIA-758, Customer-Owned Outside Plant Telecommunications Infrastructure Standard, 2004

B. AIA

C. Local

D. NEC

E. ISO

F. FCC

G. UL

H. OSHA

I. NFPA

J. NEMA

K. Plenum Applications - Applicable Flame Test: UL 910 (NFPA 262-1990).

3.02 GENERAL REQUIREMENTS

A. In the installation of this work, the Contractor shall comply in every way with the requirements of local laws, ordinances, and rules, the laws of the State of Texas, the National Board of Fire Underwriters, and the National Electrical Code. If, in the opinion of the Contractor, there is anything in the plans or specifications that will not strictly comply with the above laws, ordinances, and rules, the matter shall be referred to the attention of the Architect/Engineer for a decision before proceeding with that part of the work.

B. In the event of any conflicts between documents referenced herein and the contents of this specification, the Contractor shall notify in writing to the Architect/Engineer of any such occurrences before the purchasing of any equipment, materials and/or installation by the Contractor. The Architect/Engineer will notify the Contractor of any actions required to resolve these conflicts.

C. No change in the plans or in the specifications shall be made without full consent in writing of the Architect/Engineer.

D. The Contractor shall obtain written permission from the Architect/Engineer before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, or partition ceilings.

E. The Contractor shall install the materials in accordance with the manufacturers' guidelines and specifications.

F. The Contractor shall promptly correct all system discrepancies or defects for which the Contractor is responsible.

G. The Contractor shall coordinate all work with the Architect/Engineer prior to purchase of products or installation of structured cable system.

H. The Contractor shall submit product data sheets for all materials to the Architect/Engineer prior to the purchase or installation of structured cable system.

I. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

J. The Contractor shall be certain that all work areas are in compliance with the Occupational Safety and Health Administration (OSHA) regulations.

K. The Contractor shall have written approval from the Architect/Engineer for any additional work outside the Contract Documents prior to beginning such work.

L. The Contractor shall not roll or store cable reels without an appropriate underlay.

M. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.

N. The Contractor shall insure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during placement. Failure to follow the appropriate guidelines may require the contractor to provide additional material and labor necessary to rectify the situation. This shall also apply to any and all damages sustained to the cables by the installation contractor during the implementation.

O. The Contractor shall install all equipment as close to the wiring fields as possible, taking into consideration, testing, administration, maintenance, and future growth.

P. The Contractor shall be responsible for testing all cable prior to the installation of the cable. If the Contractor fails to perform this testing operation, the Contractor shall accept the cable as good and assume all liability for the replacement of the cable should it be found defective at a later date.

Q. The Contractor shall plug ALL penetrations, conduits, sleeves, cable trays, etc., where cabling has been installed through rated walls/floors with an UL listed and approved intumescent re-enterable fire-stop system consisting of a re-enterable putty for sleeves and conduit penetrations and pillow stop systems for cable trays where they pass through rated walls

R. The Contractor shall be responsible for returning any and all penetrations through rated walls or floors made for structured cabling to their pre-penetration rating.

S. The Contractor shall maintain a set of working specifications and drawings on site at all times and shall be responsible for keeping the drawings updated on a minimum of a weekly basis. These working drawings shall be made available for inspection at the request of the Architect/Engineer or the Owner.

T. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment or wiring are required, these units shall be the standard product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.

U. All wiring, equipment and installation materials shall be new and of the highest quality. Cable, equipment and installation materials shall be delivered and stored in a clean, dry space at the Contractors expense. Materials and equipment will be properly packaged in factory-fabricated type containers and protected from the environment, damaging fumes, construction debris, and traffic, etc. until the job is installed or completion of the project.

V. Labels on all wiring, materials, and equipment must show that a nationally recognized testing laboratory lists these. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect/Engineer, which certifies performance characteristics and which meet ANSI/TIA/EIA 568-B.1 standard.

W. All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be allowed unless specifically approved or specified by the Architect/Engineer.

X. All material used in the installation shall be made of corrosion-resistant material, such as plastic, anodized aluminum, or brass and be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals apt to corrode through electrolysis under the environmental operating conditions specified.

Y. All cable installed in a plenum rated environment shall meet or exceed the Underwriters Laboratories (UL) fire rated cable insulation requirements.

Z. Any pulling compound or lubricant used in the installation shall not deteriorate the conductor or the insulation of the cable.

AA. Twenty (20') feet of service loop for inter-building backbone cable shall be coiled, mounted and stored at each cable end above the ladder rack in the MDF/IDF.

BB. Twenty (20') feet of service loop for intra-building backbone cable shall be coiled, mounted and stored at each cable end above the ladder rack in the MDF/IDF.

CC. Ten (10') feet of service loop for horizontal cables shall be coiled, mounted and stored above the ladder rack in each MDF/IDF.

DD. Thirty-six (36") inches of maintenance loop for horizontal distribution cable shall be coiled and stored on the J-hook directly above the workstation outlet.

EE. Thirty-six (36") inches of maintenance loop for horizontal distribution cable shall be coiled and stored in the gang-box or floor-box as applicable at the workstation location.

FF. Indoor fiber shall have a service loop of ten (10') feet of fiber element to be placed in the fiber optic termination or splice cabinet serving as the building fiber optic cross connect. And ten (10') feet of the fiber bundle shall be neatly routed in the enclosure with the end stripped back to allow the installation of the fiber fan out kits.

3.03 Horizontal cable lengths for individual links shall not at any time exceed 90 m (295 ft) from the point of termination at the jack to the point of termination in the patch panel. If building restrictions cause a cable run to exceed 90 m (295 ft), the Contractor shall immediately notify the owner's representative by means of a written notification from the Contractor's project manager. Contractor will stop installation on that run until further directed by the owner's representative. If the Owner approves an installation of over 295 feet, then an Owner approved network extender/repeater must be used at a length of 270 feet. The network extender must be labeled with the drop number and a label of the ceiling grid identifying the device location.

3.04 SYSTEM REQUIREMENTS

A. Horizontal Distribution Cable Plant

a. The Contractor shall furnish and install Category 6/6A UTP cable runs from each MDF and/or IDF to each outlet location respectfully as indicated in the technology drawings. These cable runs will provide data communications at each outlet.

b. Data Termination

1) The Contractor shall terminate all cables at the workstation locations in appropriately sized Contractor furnished and installed faceplates or surface mount boxes with Category 6/6A modular jacks with connector specifications as defined by the ANSI/TIA/EIA 568-A Commercial Building Wiring Standard with the EIA-568B sequence as indicated in the technology drawings. And according to Owner"s Technology Standards. Any unused faceplate position(s) shall have the appropriate number and color of blanks installed. Contractors shall coordinate with the Architect/Engineer and obtain written approval of the color of the faceplates and inserts before ordering and installation of the horizontal cable plant.

2) Contractor shall furnish and install rack-mounted blank patch panels in each MDF/IDF for termination of the station cable. Contractor shall submit scaled drawings and obtain written approval from the Architect/Engineer as to the exact location of the patch panels prior to installation.

a) 48-port rack mounted patch panel(s) in existing MDF as necessary. **Contractor shall coordinate with JISD technology department in regards to rearrangement of IDF cabinet prior to installation.**

B. Patch Cords in MDF/IDF

1. Category 6 **Yellow** Patch Cables – 9-inch and 1-ft Yellow patch cables equal to the total number of Category 6 cables for Camera and Access Control cable installed. Distribution between 9 – inch and 1-ft will depend upon final patching requirements and shall be approved in writing prior to purchase and installation.

2. Category 6 **White** Patch Cables – 9-inch and 1-ft white patch cables equal to the total number of Category 6 cables installed minus the number of yellow patch cables. Distribution between 9-inch and 1-ft will depend upon final patching requirements and shall be approved in writing prior to purchase and installation.

3. Category 6A **White** Patch Cables – 9-inch and 1-ft white patch cables equal to the total number of Category 6A cables installed. Distribution between 9-inch and 1-ft will depend upon final patching requirements and shall be approved in writing prior to purchase and installation.

4. Contractor shall provide 10% extra of each cable length and shall label both ends according to District Technology Standards.

C. Patch Cables at Workstation

1. Category 6 **Yellow** Patch Cables patch cables - 6-ft yellow patch cables equal to the number of surveillance cameras.

2. Category 6 **Yellow** Patch Cables patch cables - 3-ft yellow patch cables equal to the number of door access control outlets installed.

3. Category 6A **White** Patch Cables patch cables – 1-ft white equal to double the number of wall mounted wireless access points and 15-ft white equal to the number of 6A cables installed minus the number of cables for wall mounted wireless access points.

4. Contractor shall provide 10% extra of each cable length and shall label both ends according to District Technology Standards.

D. Fiber Optic Patch Cables

1. LC-LC 10G MM Duplex OM4 50/125 Aqua lengths of – 1-Meter, 2-Meter, 3-Meter. Distribution between lengths will depend upon final patching requirements and shall be approved in writing prior to purchase and installation.

E. Cable Support

1. Intra-Building Cable Plant

a. Intra-Building cables shall be supported using interior cable tray, conduit systems, cores, sleeves and J-Hooks as indicated on the technology drawings.

1) Wire Mesh Basket Cable Tray

a) Main pathways shall consist of 24” wire mesh basket cable tray provided by the Division 26 contractor as indicated for reference on the Technology drawings.

2) J-Hook Pathways

a) Horizontal cables shall be supported using Contractor furnished and installed Category 5 J-Hooks. The Contractor shall furnish and install Category 5 J-hooks to support all communications cable as segments leave cable tray, conduits, cores, or sleeves.

b) The contractor shall furnish J-hook for horizontal cables and shall supply a spare J-hook for future growth. All J-hooks shall be installed three (3’) feet to four (4’) feet on center, using only manufacturer approved installation methods and materials.

c) The Contractor is responsible for the establishment of all cable pathways supported by J-hooks and as such shall coordinate pathways with all other disciplines. Under no-circumstances shall J-hook pathways for communications cable plant be used to support other low-voltage applications such as HVAC, Fire Alarm, etc.

F. System Labeling

1. General Labeling Requirements

a. All labeling conventions must adhere to EIA/TIA 606 specifications. Labeling schemes must also follow pre-derived owner standards. This method of labeling shall be used unless otherwise directed by the owner’s representative prior to installation. Contractor must submit a sample of each type of label prior to its use to verify ability to comply. All labels shall exactly match the documentation as built drawings and Cable Record.

b. Contractor shall provide machine-generated unique identification labels on all infrastructure related items. This includes but is not limited to horizontal and backbone cables at both ends, patch panels, connector blocks, riser cable pairs, faceplates, jack inserts, fiber optic connector housings and coupler panels, racks, cabinets, and other items as applicable.

2. For horizontal cable runs, a temporary hand written cable label written with a Sharpie® on self protecting labels shall be placed (12) to (18) inches from the end of the cable. After cables are pulled and trimmed for termination, a permanent machine-generated label with the cable number shall be placed (6) inches from the termination point at each end of the cable. Contractor shall

replace any illegible labels. Contractor's project manager shall provide owner's representative with an updated record of cable numbers currently installed at any given time.

a. Using a machine/device printed cable label, both ends of the horizontal cable entering each termination side shall be labeled with the cable and room number being pulled. (Example: If a cable is added to room 38 and in TR1100 the last cable number on the existing patch panel/110 block is 107, then the new cable label should read "108-TR1100" on the Station side and "108-Rm038" on the Telecom side) Hand written labels are unacceptable.

b. Using a machine/device printed label, the patch panel/110 block on the Telecom side should be labeled <cable number>-<Building Room # pulled to> (Example: If the cable number is 108 and is located in room 38, then the label should read "108-Rm038". If for example the Gym office has no room number, then the label should read "108-GymOffice".) Hand written labels are unacceptable. Any unused patch panel/110 block blank addressable snap-ins must be left at the termination location or given to Judson ISD Infrastructure Services.

c. Using a machine/device printed label, the station side should be labeled <cable number>-<Telecom room #> or for a duel jack <cable number>-<Telecom room #>-<cable number> (Example: Using the above scenario with the cable pulling to TR1100, the label should read "108-TR1100" or "108-TR1100-109".) Hand written labels are unacceptable.

d. Using a machine/device printed cable label, both ends of the patch cable used to populate the Telecom side shall be labeled (<cable number>-<Building Room # pulled to>). (Example: If a cable 108 is located in room 38, the cable label should read "108-Rm038".) Hand written labels are unacceptable.

e. Using a machine/device printed cable label, both ends of the patch cable used to populate the Station side shall be labeled (<cable number>-< Telecom room # pulled to>). (Example: If a cable 108 is located in TR1100, the new cable label should read "108-TR1100".) Hand written labels are unacceptable.

f. For all new construction, each new Telecommunication Room, drops will be numbered consecutively following the above labeling standard. (Example: If there are two Telecommunications Rooms (TRA and TRB) with 100 drops each, then the patch panel in TRA will have labels reflecting 001-<Building Room#> to 100-<Building Room#>. The patch panel in TRB will have labels reflecting 001-<Building Room#> to 100-<Building Room#>.)

3. Backbone cables shall be labeled within 12" of the termination or splice point and periodically along the pathway to its destination. At a minimum, each backbone cable shall be labeled after exiting or entering a closet. For fiber optic cables contained within an innerduct, a label shall be permanently attached to the innerduct listing the cable numbers contained within.

a. For copper backbone cables, the label scheme shall contain the cable origin room number, the cable destination room number, and cable pairs (i.e. MDFB103-IDFC110/001-100).

b. Using a machine/device printed cable label, both ends of the patch cable used to populate shall be labeled in the following manner. Hand written labels are unacceptable.

c. **Security**-TR<Destination> F: <LIU ID LIU AP/x/x> SwPort: <ST/SW/SWP> 192.168.<CID>.xFiber optic backbone cable labels shall contain, <S#> STRAND <C><MODE> <OM#> <LIU AP> TO TR <Destination> (i.e. 24 STRAND 50MM OM4 TO TR A141)

Data: Data-TR<Destination> F: <LIU ID LIU AP/x/x> SwPort: <ST/SW/SWP> 10.x.x.x

S# = Numeric characters indicating the number of strands of fiber

C = Numeric characters indicating the fiber core diameter

Mode = Alpha characters indicating the fiber type

OM# = Alpha and Numeric characters indicating the fiber category if applicable.

LIU AP = Numeric characters indication the adaptor panel

Example: A security fiber at Wagner High School (CID=008) in IDF Rm 41 is to be patched to the MDF in Rm A135. One end of the fiber patch is connected to the first LIU in the first adaptor panel on the fourth pair. The other end of the fiber patch, it is connected to the first switch in the first stack on the fourth port of the network module. **Label should appear as follows:** Security-TRA135 F: A 01/07/08 SwPort: 01/01/G4 192.168.8.x

Fiber Backbone: Hand written labels are unacceptable. Using the standard Yellow and Black "CAUTION: FIBER OPTIC CABLE" label, add using a machine/device printed cable label
<S#> STRAND <C><Mode> <OM#> TO TR <Destination>
S# = Numeric characters indicating the number of strands of fiber
C = Numeric characters indicating the fiber core diameter
Mode = Alpha characters indicating the fiber type
OM# = Alpha and Numeric characters indicating the fiber category, if applicable
Example:
24 STRAND 50MM OM4 TO TR A141
Fiber Backbone Label Placements:
The fiber optic labels must be placed not less than three inches from the point the cable enters
the room and at the point just before the cable enters the LIU. All labels must be facing outward and clearly visible.

Wireless:
Wireless access points must have a label on the front of the unit visible from the ground.
The label must follow the following three line format.
Line 1: <site code>-<building and floor>-<building room #>. If in a hallway, <site code>-<building>-<building room #>HW.
Example: 045-BldgA1-A102HW. This shows the location of the AP at Judson Middle School, A building first floor, in the hallway near room A102.
Line 2: MAC address in bar code form
Line 3: MAC address
In the controllers, the Wireless Access Points must be named in the following format.
<Campus Code>-<Campus Abbreviation>-<Room Number>

4. Category 6 patch panels shall be labeled sequentially with sequential numbers for each port beginning with 1 and continuing throughout the patch field until all ports are numbered.(i.e.1-144).

5. 110 or 66 Voice Blocks shall contain the destination or origin room number, pair numbers, and binder pair number under each pair termination.

   a. All 110 or 66 Block labels shall be printed on product-specific label strips and placed into label holders.

6. Fiber optic patch panels shall be labeled <S> STRAND <C><MODE> <OM#> <LIU AP> TO TR <Destination>.

7. Racks shall be labeled with sequential numbers with a unique number for each rack in each MDF or IDF.

8. Both ends of the patch cable used to populate the Telecom side shall be labeled with the cable number and the building room number pulled to. (i.e. 108-Rm038)

9. Both ends of the patch cable used to populate the Station side shall be labeled with the cable number and the telecom room number pulled to. (i.e. 08-TRB103)

10. Both ends of the fiber patch cable used to populate the Telecom side shall be labeled with Security-TR Destination, F: LIU ID LIU AP/x/x, SwPort, ST/SW/SWP, 192.168, CID, x

    F = LIU ID/LIU AP/Fiber strand numbers

    LIU ID = Alpha character indicating the unique LIU

    LIU AP = Number Characters indicating the adaptor panel ST = Numeric characters indicating the switch stack

    SW = Numeric characters indicating the switch in the stack from top to bottom

    SWP = Numeric characters indicating the switch port

    CID = Numeric characters indicating the campus code

3.05 TESTING REQUIREMENTS

A. Fiber Optic Cable

1. All fiber optic cable links installed shall be tested in accordance with the field test specifications defined in ANSI/TIA/EIA-568-B standard.

2. 100% of the installed cable shall be tested and must pass the requirements of ANSI/TIA/EIA-568-B.

3. Failing links shall be diagnosed and corrected by the Contractor. Corrective actions shall be followed by a new test of the previously failing link(s). The Contractor shall promptly submit all link re-test data to Architect/Engineer in both hard and soft copy.

4. Only Certified Technicians shall perform all fiber optic link testing.

5. Field test equipment for multi-mode fiber optic cables shall meet the requirements of ANSI/TIA/EIA-526-14A.

6. The light source shall meet the launch requirements of ANSI/TIA/EIA-455-50B.

7. Field test equipment for single-mode fiber optic cables shall meet the requirements of ANSI/TIA/EIA-526-7.

8. All fiber optic launch cables and test adapters used for testing shall be of high quality and devoid of excessive wear or exhibit anomalies between strand tests. Test results that indicated anomalies between strands within the same sheath shall be declared a failure unless all strands within the same sheath unconditionally pass testing. The Contractor shall diagnose and repair any fiber optic cable exhibiting strand-to-strand anomalies that result in any test failure(s).

9. The Contractor shall test and certify all fiber optic cable plant with approved field tester(s) that are within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with un-approved test equipment or tester(s) that are not within their calibration period.

10. The Contractor shall invite the Architect/Engineer to witness/verify field testing prior to final acceptance. The Architect/Engineer shall randomly select 5% of the installed links for test verification purposes. The Contractor shall re-test these links in the presence of the Architect/Engineer and the results shall be compared to the previously Contractor submitted test results. In the event that 2% of the verification tests differ in terms of pass/fail from the previously submitted test results, testing shall be declared a failure and the Contractor shall re-test 100% of the installed links with the cost of such tests borne by the Contractor.

11. Fiber optic connector attenuation shall not exceed 0.75dB.

12. Fiber optic splice attenuation (if allowed) shall not exceed 0.3dB.

13. Multi-mode fiber optic cables shall be tested using the following attenuation coefficient parameters:

    a. 62.5/125 multi-mode 850nm $\leq$ 3.5dBlkm

    b. 62.5/125 multi-mode 1300nm $\leq$ 1.5dBlkm

    c. 50/125 Multi-mode 850nm $\leq$ 3.5dBlkm

    d. 50/125 multi-mode 1300nm $\leq$ 1.5dBlkm

14. Link attenuation for all fiber optic strands shall be calculated using the ANSI/EIA/TIA-568-8 Standards formula.

B. Category 6/6A UTP Cable

1. All Category 6/6A cable links installed shall be tested in accordance with the field test specifications defined in ANSI/TIA/EIA standard.

2. 100% of the installed cable shall be tested and must pass the requirements of ANSI/TIA/EIA standard.

3. Failing links shall be diagnosed and corrected by the Contractor. Corrective actions shall be followed by a new test of the previously failing link(s). The Contractor shall promptly submit all link re-test data to Architect/Engineer in both hard and soft copy.

4. Only Certified Technicians shall perform all Category 6/6A testing.

5. Field test equipment for Category 6/6A UTP cables shall meet or exceed the accuracy requirements for enhanced Level III and IIIe testers as defined in ANSI/TIA/EIA-526-8; Annex I: Section 1.4.

6. All test interfaces used for testing shall be of high quality and devoid of excessive wear or exhibit anomalies between pairs. Test results that indicated anomalies between pairs shall be declared a failure unless all pairs unconditionally pass testing. The Contractor shall diagnose and repair any Category 6 cable exhibiting pair-to-pair anomalies that result in any Fail, *Fail or *Pass conditions.

7. The Contractor shall test and certify all Category 6/6A cable plant with approved field tester(s) that are within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with un-approved test equipment or tester(s) that are not within their calibration period.

8. Any Fail or *Pass result yields a Fail for the link under test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass.

9. The Contractor shall invite the Architect/Engineer to witness/verify field testing prior to final acceptance. The Architect/Engineer shall randomly select 5% of the installed links for test verification purposes. The Contractor shall re-test these links in the presence of the Architect/Engineer and the results shall be compared to the previously Contractor submitted test results. In the event that 2% of the verification tests differ in terms of pass/fail from the previously submitted test results, testing shall be declared a failure and the Contractor shall re-test 100% of the installed links with the cost of such tests borne by the Contractor.

10. Reported test parameters for Category 6/6A shall comply with ANSI/TIA/EIA standard.

11. Testing shall indicate and record the following for each tested link:

    a. Wire Map

    b. Link Length

    c. Insertion Loss / Attenuation

    d. Near end cross talk Loss (NEXT)

    e. Power Sum NEXT Loss (PSNEXT)

    f. Pair to Pair Loss (ELFEXT)

    g. Power Sum Pair to Pair Loss (PSELFEXT)

    h. Return Loss (RL)

    i. Attenuation to Cross-talk Ratio (ACR)

    j. Power Sum ACR (PSACR)

    k. Propagation Delay

    l. Delay Skew

C. Grounding and Bonding System

1. The Telecommunications Ground & Bonding System shall be tested with an Earth Ground Resistance Tester used in the Two Point Test Method.

    a. Resistance shall be measured from each TGB to the TMGB, from the TMGB to the Service Ground Connection, and from the service ground connection to earth ground.

    b. Additional measurements shall be taken from each piece of grounded equipment to the TGB or TMGB in that room.

2. Values shall be in compliance with ANSI J-STD-607-A.

3. Non compliant grounds shall be replaced at no cost to the owner.

4. Contractor shall present a testing plan prior to carrying out any tests.

3.06 PROJECT CLOSEOUT DOCUMENTATION

A. The Contractor shall provide the following to the Owner upon final acceptance and completion of the cable plant installation:

1. Original Reproducible Drawing indicating the “as-built” condition of the Structure Cable System as it was installed. As-Built drawings must be provided in original hardcopy format and on a Flash Drive in AutoCAD 2017 or higher. The “as-built” drawings shall use the original scale, indicating exact dimensions and locations of all telecommunication rooms, frames, racks, trays, terminal blocks, patch panels, cable runs, cable pathways, workstation locations, and labeling scheme. These drawings shall be turned over to the Architect/Engineer at the time of final systems acceptance of the cable plant installation. Final payment will not be made until these drawings are received and approved by the Architect/Engineer.

2. Final Cable Record reflecting the as-built condition of the structured cable system and include all relevant data for each and every cable installed under this contract.

3. Test documentation for the Structured Cable System to the Architect/Engineer at the time of final systems acceptance. Test results shall be provided in original hardcopy format and on a CD-ROM. Test documentation shall include Power Meter and Light Source Fiber Optic Tests, attenuation and pin/pair mapping for copper backbone cables, and Category 6/6A test results for each cable drop in accordance with these specifications. Final payment will not be made until these test results are received and approved by the Architect/Engineer. Test documentation shall be bound, sectioned and tabbed in the following order (when applicable):

   a. Inter-Building Outside Fiber Optic Cable

   b. Inter-Building Outside Copper Cable

   c. Intra-Building Fiber Optic Cable

   d. Intra-Building Copper Cable

   e. Horizontal 4-Pair UTP Category 6/6A Cable

   f. Grounding system

4. The Contractor shall furnish the original Certificate of Warranty to the Architect/Engineer at the time of final systems acceptance. Final payment will not be made until this Certificate of Warranty is received and approved by the Architect/Engineer.

   a. Contractor shall provide warranty information to include the name, address and phone number contacts for warranty call outs. Final payment will not be made until this warranty information is received and approved by the Architect/Engineer.

5. One original Manufacturer Certificate of Warranty for the Structured Cable System

6. One original warranty information to include the name, address and phone number contacts for warranty call outs. Final payment will not be made until this warranty information is received and approved by the Architect/Engineer.

7. Two (2) duplicate copy sets of the above documentation.

END OF SECTION 27 1000

SECTION 27 4100

PROJECTION INFRASTRUCTURE

PART 1 - PART 1 GENERAL

1.01 This Section identifies the technical design, specifications, and requirements for a Projection Infrastructure System for Crestview Elementary School project in Judson Independent School District (Owner). The following applies for all Projection Infrastructure Systems.

A. Contractor shall provide all materials, equipment, methods, connections, testing, labor and all other incidental materials and appliances necessary as described herein and in the technology drawings to provide a complete and functional Projection Infrastructure System regardless of any materials and/or equipment not listed or described in these specifications and/or technology drawings.

B. Contractor shall provide and install a complete and functional Projector Infrastructure System that includes, but not limited to: lightweight suspended ceiling kit, universal projector mount, extension column, RapidPun HMDI and VGA Cabling, RapidRun flying leads, RapidRun wall plate to support owner-provided and installed ceiling mounted projectors and wall mounted monitors.

C. Contractor shall verify conditions and dimensions at the job site, including screen size and required throw distance prior to installation. Provide installation in accordance with these written specifications and the installation recommendations of products' manufacturer.

D. Contractor shall submit complete detailed shop drawings, system schematics, diagrams and details prior to the procurement of equipment or commencement of work.

E. Contractor shall provide a minimum one-year warranty on the system and all parts and labor.

F. All questions related to this specification are to be addressed in writing to Architect/Engineer for clarification.

1.02 RELATED SECTIONS

A. The general provisions of the Contract and the requirements of the following Sections apply to the Work specified in this Section.

B. All Work of this Section shall comply with the requirements of the Conditions of Contract (including, but not limited to, Bidding Requirements, Contract Forms, Conditions of Contract and Standard Forms), with all Specifications Sections of Division 01 General Requirements, with the Drawings, and with all other relevant and Contractual Documents.

C. Contractor shall participate in a pre-construction meeting with the General Contractor, Architect, Owner, and Consultant prior to the commencement of any work. Coordinate with Division Sections as required.

1.03 CONTRACTOR EXPERIENCE

A. Five (5) years experience in the installation of Projection Infrastructure Systems similar in scope and equipment applications.

B. Five (5) installed systems, comparable to the Owner's installation, where Projection Infrastructure Systems are installed, and the systems have been in continuous satisfactory operation for at least one (1) year. The Contractor shall submit as proof, supporting documents and the names, addresses and telephone numbers of the operating personnel who can be contacted regarding the installed systems.

C. A minimum of five (5) representative educational facilities projects must be submitted as references to include the school's name, school district, Architect or Engineer, cost of the project and the contact person at the school district to include phone number.

D. Installers must have been trained and experienced in the specific installation, termination, and testing of the equipment to be used in the installation. Contractor shall possess any and all relevant certifications required by the manufacturer prior to installation of the manufacturer's specific products. Contractor shall provide a list of their technical support staff together with their work experience, training history and manufacturer's certification.

E. Past performance with the Owner is a selection criterion. Experience related to any past or present project with the Owner should be disclosed with bid response.

F. Qualified Contractors should submit proof of all certifications and experience detail with bid response.

1.04 SUBMITTALS

A. To Be Submitted with Proposal

1. Contractor shall submit an itemized listing of all equipment, materials and labor required for the installation of the Projection Infrastructure System as specified herein prior to the procurement of equipment or commencement of work. This listing shall be provided in printed form and electronic format and shall contain: item number, item description, item model number, manufacturer's data sheet, item quantity, unit cost, extended material cost and extended labor and installation cost to provide a complete and functional system. Attachment "A" has been provided for this submittal.

2. Contractor shall submit an estimated projector infrastructure count indicating the quantity of projector infrastructure setups to be installed. This listing shall be provided in printed form and electronic format (Microsoft Excel).

B. To Be Submitted Prior to Installation

1. Original Equipment Manufacturer (OEM) documentation for each component proposed must be provided to Owner, which certifies performance characteristics. Contractor shall not purchase or install any equipment until OEM documentation has been received and approved by the Architect/Engineer.

2. Product data sheets for all proposed system components must be provided to the Owner. Product data sheets shall include an equipment schedule listing of all system components to be installed in the project and the manufacturer's product reference and specification literature for all products to the utilized and/or installed in the project. Contractor shall not purchase or install any equipment until product data sheets have been received and approved by the Architect/Engineer.

3. Contractor shall submit for approval, a detailed description of the procedures and equipment included for the commissioning and testing of the Projection Infrastructure System.

4. Contractor shall complete a mock up room, in which a complete system is installed. The mock up shall be approved in writing by the Architect/Engineer prior to the installation of additional systems by the Contractor.

5. Contractor shall provide to owner's representative shop drawings of the proposed layouts of equipment, plates, mounts, cabling, and devices. Shop drawings shall include complete installation drawings including block diagrams and functional diagrams of all sub-systems and integrated systems and terminal point to point wiring diagrams for each type of device including correct terminal or connector pin designations. Diagrams shall include all components of the system and each component is to be labeled on the diagram. Shop drawings shall include projector plate placement and distances from the screens. These

drawings shall be submitted on 30” X 42” bond paper. Contractor shall not install any equipment until shop drawings have been received and approved by the Architect/Engineer.

6. Contractor shall provide and keep current a construction schedule which shall be coordinated with the General Contractor. The schedule shall indicate milestones, tasks, manpower allocation, testing activities, and final completion.

C. To Be Submitted Post Installation

1. Contractor shall prepare, update and make available to the Architect/Engineer (3) sets of comprehensive drawings accurately depicting the “as-built” condition of the Projection Infrastructure System as it was installed. As-Built drawings must be provided in original hardcopy format and on a flash drive in AutoCAD 2017 or higher. The Contractor shall prepare, update, and make available to the Consultant a comprehensive set of "as built" drawings using the original scale, indicating exact dimensions and locations of all projector-related infrastructure installed under this specification. These drawings shall be turned over to the Consultant at the time of final systems acceptance of the Projection infrastructure System. Final payment will not be made until these drawings are received and approved by the Architect/Engineer.

2. The Contractor shall provide three (3) sets of test documentation for the Projection infrastructure System to the Architect/Engineer at the time of final systems acceptance. Test results shall be provided in original hardcopy format and on a CD-ROM. Final payment will not be made until these test results are received and approved by the Architect/Engineer.

3. In the absence of a test designed by the manufacturer, contractor will coordinate with the owner, Architect/Engineer, and consultant to derive at an appropriate testing methodology for the RapidRun Cables to determine faults prior to projector installation.

4. The Contractor shall furnish the original Certificate of Warranty to the Architect/Engineer at the time of final system acceptance. Final payment will not be made until this Certificate of Warranty is received and approved by the Architect/Engineer.

5. Contractor shall provide warranty information to include the name, address and phone number contacts for warranty call outs. Final payment will not be made until this warranty information is received and approved by the Architect/Engineer.

6. Contractor will submit a certificate of completion of installation and service training.

PART 2 - PRODUCTS

2.01 General

A. Contractor shall design and install a complete and functional Projection Infrastructure System in accordance with the technology drawings and the requirements specified herein. Contractor shall submit for approval specifications for all equipment used in the design and drawings describing the system prior to installation.

B. It is the intent of this Section and Drawings to call for finished work, tested, ready for operation and programmed for the specifics of this project and Owner's requirements.

C. The equipment listed below is a guideline and the Contractor is responsible for determining the exact equipment required to accomplish the intent of the design.

D. The Contractor shall be responsible for providing any incidental accessories and wiring necessary for complete Work even if not particularly specified without additional cost. No exclusion from, or limitations in, the language used in the drawings or specifications shall be interpreted as meaning that the appurtenance or accessories necessary to complete any required system or item of equipment are to be omitted.

E. In all cases wherein apparatus herein referred to in singular numbers, it is intended that such reference include as many such items as are required to complete the Work.

F. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of Work. None of these have any dimensional significance nor do they delineate every item required for the intended installations. The Work shall be installed in accordance with the intent diagrammatically expressed on the drawings and in conformity with the dimensions expressed on equipment shop drawings. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete Work are excluded.

G. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the Work. These details are intended only for the purpose of establishing general feasibility. They do not preclude field coordination for the indicated Work.

H. Equipment Standards

1. System and all components shall be brand new stock from manufacturer.

2. System and all components shall bear a U.L. Label.

I. Category 6 UTP cabling will be provided by the Division 27 1000 contractor for IP connectivity from each projector plate to the owner-provided network. All other wiring or cabling required to make the system functional shall be furnished and installed under this specifications as required for system operation. All wiring will conform to the air space rating it is installed in.

J. The following sections specifically list the acceptable equipment types and items for this project.

1. Proposed equivalent items must be pre-approved by the Architect/Engineer and meet or exceed these specifications and the specifications of the listed item. In the event a specified manufacturer's part number has changed or is no longer valid, Contractor shall substitute the appropriate equivalent manufacturer's part number, provided the newer model retains the essential characteristics of the item specified herein and maintains compatibility with integrated systems hardware and software.

2. The Architect/Engineer will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to installation. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished.

3. Contractor shall store all materials and equipment in accordance with manufacturers' instructions in a weather-tight, secure enclosure. Contractor shall be responsible for safety and security of all Owner-furnished materials until project is complete and accepted by Owner.

4. The Projection Infrastructure System shall be installed as indicated below and on the T-Drawings. The following equipment shall be utilized to make-up the Projection Infrastructure System. Adhere to the specifications, manufacturer, and model listed except if you have received written authorization for substitution from the system designer. All equipment (not specified by Manufacturer and Model number must be submitted for approval. Include documentation to demonstrate compliance with every detail specified. Where (or approved equal) is used, the word “approved” is not to be ignored.

2.02 LCD Projector

A. Hitachi CP-X2542WN - **Owner-Provided and Owner-Installed**

2.03 Projection Screens

A. 165” diagonal HD PRO 1.1 Perf. Tab Tensioned. Electrol **(coordinate Blackdrop with architect/technology consultant prior to ordering)**

2.04 Lightweight Suspended Ceiling Kit

A. Peerless CMJ455 Ceiling Plate

2.05 Lightweight Suspended Ceiling Kit Hanging Brackets and Clamps

A. Peerless ACC455

2.06 Adjustable Extension Column

A. Peerless AEC0305

2.07 Precision Projector Mount with Spider Universal Adaptor Plate

A. Peerless PRG-UNV

2.08 Interconnection Cables

A. 50ft RapidRun Optical Runner Cable – Plenum OFNP-Rated

1. 60119

B. RapidRun HDMI Transmitter Flying Lead

1. 60130

C. RapidRun HDMI Receiver Flying Lead

1. 60131

D. 50FT RapidRun Multi-Format Runner Cable – Plenum CMG-Rated

1. 60005

E. 3Ft RapidRun VGA (HD15) + 3.5MM Flying Lead

1. 60049

F. RapidRun HDMI, VHG + Stereo Audio Single Gang Wall Plate Transmitter – White

1. 60156

G. 10FT RapidRun High Speed HDMI Cable

1. 56784

H. 10FT Select VGA + 3.5MM Stereo Audio A|V Cable M/M

1. 50226

PART 3 - EXECUTION

3.01 GENERAL

A. In the installation of this work, the Contractor shall comply in every way with the requirements of local laws, ordinances and rules, the laws of the State of Texas, the National Board of Fire Underwriters, the National Fire Protection Association and the National Electrical Code. If, in the opinion of the Contractor, there is anything in the drawings or specifications that will not strictly comply with the above laws, ordinances and rules, the matter shall be referred to the attention of the Architect/Engineer for a decision before proceeding with that part of the work. Contractor shall be certain that all installation work areas are secure and made safe in accordance with Occupational Safety and Health Administration (OSHA) regulations.

B. No change in the drawings or in the Specifications shall be made without full consent in writing of the Owner and the Architect/Engineer.

C. Contractor shall obtain the Owner’s permission before proceeding with any work necessitating cutting into or through any part of building structures such as girders, beams, concrete or tile floors, or partition ceilings.

D. Contractor shall be responsible for and repair all damage to buildings due to carelessness of workers, and exercise reasonable care to avoid any damage to the Owner's property. Contractor will report to the Owner any damage to the building, which may exist or may occur during the occupancy of the quarters.

E. Contractor shall take necessary steps to ensure that required fire fighting apparatus is accessible at all times. Any flammable materials shall be kept and/or stored in suitable places outside the buildings at all times.

F. Contractor shall install the materials in accordance with the manufacturer's specifications.

G. Contractor shall promptly notify the Owner of the completion of the work or such portions thereof as are ready for inspection. Contractor will be provided (14) working days after substantial completion to correct all discrepancies and bring the site to acceptance.

H. Contractor shall give the Architect/Engineer written notice of completion of the installation at least 3 days prior to completion.

I. Contractor will make available to the Architect/Engineer a minimum of one (1) set of shop drawings prior to each consultant site inspection and for final inspection purposes.

J. Contractor shall ensure that all records and reports, city requirements, engineering, metering, inspections, testing, quality or service standards, and safety measures comply with standards applicable for the State of Texas.

K. Contractor shall remove all excess material and debris and return worksite to original state of cleanliness. Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items on a daily basis.

L. Contractor shall supply insurance certificates acceptable to Owner before work is begun.

M. An appropriate construction schedule shall be developed by the Contractor and will be subject to approval by the Architect/Engineer.

N. The construction schedule should include at least one installation supervisor, or lead technician, for on-site management of the project. Prior to starting the installation, the assigned installation supervisor, or lead technician, shall participate in a walk-through of the project location with Architect/Engineer to review the installation documentation, verify that all construction necessary for the installation has been completed, and verify all installation methods and cable routes. Contractor shall coordinate all work with Owner's assignee to be designated at a future date.

O. Contractor shall be responsible for completing a standardized report form addressing the weekly progress of the installation schedule.

P. Contractor shall maintain conductor polarity in accordance with industry practices.

Q. Contractor shall provide all screws, anchors, clamps, tie wraps, distribution rings, miscellaneous grounding and support hardware, etc., necessary to facilitate the proper installation and support of the projection infrastructure system.

R. Contractor shall furnish any special installation equipment or tools necessary to complete the installation properly.

S. Contractor shall have written approval for any and all additional work not included within the specifications or construction documents. The installation Contractor is to submit a written list of all additional work to be performed, with all incurred costs, prior to the commencement of the work. Payment for additional work shall not be made if this procedure is not followed.

T. Contractor shall plug all conduits and sleeves where cabling has been installed by the Contractor in all equipment rooms, backbone, horizontal and other cable entrance locations with re-enterable duct seal of flame retardant putty.

U. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.

V. Wiring, materials, and equipment will be delivered and stored in a clean dry space. They will be properly packaged in factory fabricated type containers and protected from damaging fumes, construction debris and traffic until job completion.

W. The wiring, materials, and equipment furnished for this request shall be essentially the standard product of the manufacturer.

X. All installation techniques and fixtures shall result in ease of maintenance and ready access to all components for testing measurements. All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used unless specifically approved by Owner. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass. All materials used in installation shall be resistant to fungus growth and moisture deterioration.

Y. Jacketing and insulation shall satisfy the Underwriters Laboratories (UL) listed fire rated cable insulation requirements in plenum areas.

Z. Contractor and material and equipment manufacturers shall warrant the system for parts and labor for a minimum of one (1) year.

AA. All equipment and materials used shall be standard components that are regularly manufactured and used in the manufacturer's system.

BB. All systems and components shall have been thoroughly tested and proven in actual use.

3.02 Installation

A. Install all components to provide aesthetically pleasing results. Coordinate the actual locations of all visible components in advance with the Owner.

B. All wiring and cable shall be plenum rated.

C. J-box locations, equipment locations, and special criteria are indicated on the drawings where necessary. Coordinate exact j-box locations with Owner prior to installation.

3.03 System Requirements

A. Lightweight Suspended Ceiling Kit

1. Contractor shall furnish and install lightweight suspended ceiling kit with hanging brackets and clamps, adjustable extension column and projector mount in each classroom, conference room, office, library and cafeteria as indicated on the technology drawings.

2. The approximate placement of the lightweight suspended ceiling kit shall be 10-feet from the front of the projection screen / surface. The exact placement shall be coordinated in the field to obtain the appropriate throw distance to properly fill the for the projection screen.

3. Lightweight suspended ceiling kit, hanging brackets and clamps, adjustable extension column and projector mount shall be installed utilizing manufacturer's instructions, guidelines and procedures.

4. Contractor shall create a typical mockup of one (1) typical room and gain written approval from the Owner, Architect/Engineer, and Consultant prior to installing the remaining systems.

B. Interconnection Cables

1. Contractor shall furnish and install a RapidRun Optical Runner Cable and RapidRun Multi-Format Runner Cable with RapidRun HDMI and VGA + 3.5MM Flying Leads and Wall Plate in each classroom, conference room, office, library and cafeteria as indicated on the technology drawings.

2. RapidRun cables shall be installed between the teacher input location (typically 18" AFF) and lightweight suspended ceiling kit and/or the wall mounted monitor location as indicated on the technology drawings.

3. RapidRun cables shall be attached directly to the ceiling mounted projectors at all projector locations.

4. Wall mounted monitor locations shall be provided with a RapidRun wall plate behind the monitor.

5. Contractor shall deliver the A|V jumpers to Owner upon request. This delivery shall be accompanied by a signed Letter of Transmittal.

3.04 Operational Demonstaration Test (Burn-In)

A. Following completion of the Final Test, the system shall undergo a 14-day Operational Demonstration Test (ODT) or Burn-In period. Final system acceptance of the entire project shall be withheld until after successful completion of this operational demonstration period for all systems and components.

B. Projection infrastructure contractor shall provide qualified personnel on site or sites for Operational Demonstration Test.

3.05 Cleaning, Touchup, and Protection

A. Cleaning and Touchup:Immediately after installation, including the completion of wiring and testing, clean all work and touchup all damaged factory finishes.

B. Protection: Provide protective covers, fenders, and barriers as necessary to maintain Work of this Section in same condition as installed.

3.06 Acceptance

A. System Warranty shall not start until Acceptance. Acceptance shall be withheld until the following activities have been successfully completed:

1. Acceptance of all submittals.

2. Delivery of final documentation.

3. Successful Final Test and Inspection

4. Successful Operational Demonstration Test

5. Successful training and demonstration, including operation of systems using the manuals.

Attachment “A”

Provide an itemized listing of all equipment and material required to meet the specifications for the Projection Infrastructure Systems. This listing shall include Part Number, Description, Unit of Measure Unit Cost, Quantity, Labor Cost and Extended Cost.

Part Number	Description	Unit of Measure	Unit Cost	Quantity	Labor Cost	Extended Cost

Total Equipment and Materials	$ -
Total Labor and Installation	$ -
Grand Total	$ -

END OF SECTION 274100

SECTION 28 13 00
ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section identifies the requirements, technical design, and specifications for the access control system at the Judson Independent School District Crestview Elementary School Modernization and Imporovements, located in Universal City, Texas (“Owner”). The access control system as specified is an Industry-Standard access control system and includes access control server, access control software, control panels, sub-controller panels, card readers, door position sensors, request to exit devices, cabling, power supplies, and any associated software, hardware, or licensing as specified.

B. It is the Contractor’s responsibility to review this specification and associated project specifications and drawings in their entirety, prior to bidding on the project. By bidding on this project, the contractor acknowledges that they have read and fully understand these specifications, with no exceptions. Contractor shall review the drawings, specifications, and existing conditions prior to bidding on the project. Any discrepancies shall be brought to the attention of the architect/Design Consultant via request for information (RFI) in writing for evaluation and or clarification. If these items are not brought to the attention of the architect/Design Consultant the more costly or difficult manner, and the better quality or greater quantity of work shall be provided by the contractor in accordance with the architect's/Design Consultant's interpretation at no additional cost to the owner.

C. Contractor shall furnish and install all materials, equipment, and labor necessary to provide the demolition and an expansion of the existing access control system regardless of any items not listed or described in this specification or associated drawings.

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3.6 Project Closeout Documentation

1.3 RELATED REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 28 and shall

be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.

B. In the execution of this work, the Contractor shall comply in every way with the requirements of local laws and ordinances, the laws of the State of Texas, the National Board of Fire Underwriters, OSHA, accepted industry standards and the National Electrical Code. If, in the opinion of the Contractor, there is anything in the specifications that will not strictly comply with the above laws, ordinances, and codes, the matter shall be referred to Architect for a decision before proceeding with that part of the work.

1.4 CONTRACTOR EXPERIENCE REQUIREMENTS

A. The Contractor shall be a certified Open Options Platinum Preferred Partner prior to submitting a bid for the work.

B. The Contractor shall possess all relevant Manufacturer Certifications (i.e. access control systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.

C. The Contractor shall have a manufacturer certified technician onsite throughout the duration of the installation phase of the project.

D. The Contractor's Project Manager shall be dedicated to this project for the duration of the project and shall be available for all onsite coordination meetings.

E. The Contractor shall have been in business for a minimum of five (5) years.

F. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.

G. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

H. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

I. The Contractor and related subcontractor will comply and provide proof of compliance to STATE of TEXAS OCCUPATIONS CODE,
   1. TITLE 10. OCCUPATIONS RELATED TO LAW ENFORCEMENT AND SECURITY
   2. CHAPTER 1702. PRIVATE SECURITY, OCCUPATIONS CODE CHAPTER 1702. PRIVATE SECURITY

1.5 SUBMITTAL REQUIREMENTS

A. Bid / Proposal Submittal
   1. Contractor shall provide as part of their bid/proposal:
      a. Breakdown of proposed parts and labor required for the completion of the project.
      b. Proposed construction schedule in a Gant chart format
      c. Detailed Safety Plan
      d. Detailed documentation of QA/QC

e. A detailed description of the installation team(s) that would perform the work.
f. A resume for each of the key project personal.
g. A list of all Sub Contractors and their scope of work shall be identified at the time of bid. All Sub Contractors will fully comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

B. Pre-Installation Submittal
1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect / Owner / Design Consultant.
2. The Contractor is responsible for notifying the Architect / Owner / Design Consultant in writing of any proprietary devices, software credentials or installation processes. Written approval must be obtained by the Architect / Owner / Design Consultant prior to proceeding.
3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements.
4. Contractor shall ensure submittals are submitted in 10 business days to ensure all products can be ordered and received on site in order to not cause any delays. Any products having long lead times (more than 60 days) that may negatively impact the schedule shall be clearly identified in writing so the review and approval can be expedited.
5. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e. product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.
6. Contractor shall provide the following as part of their submittal:
   a. Manufacturer product data sheets for each proposed system component.
      1) For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.
      2) Contractor shall identify any products that are discontinued, end of life, or near end of life, and shall propose equal alternate to the discontinued product in writing.
         a) Manufacturer Product Certifications for Company.
         b) Manufacturer Product Certifications for Installers.
         c) Manufacturer Warranty letters.
         d) Documentation indicating that Contractor has been in business for (5) years.
         e) Address of Contractor’s local office within a 75-mile radius of the project site.
         f) Quantity of full-time, local technicians within a 75-mile radius of the project site.
         g) List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.
         h) List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project:

Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

i) List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.

j) Manufacturer's certification letter confirming that the proposed access control system components do not have any known cybersecurity notices, bulletins, or alerts. If a vulnerability is discovered, the contractor shall notify the Architect / Owner / Design Consultant within 24 business hours. Provide the make and model of the associated equipment and the vulnerability.

k) Manufacturer cybersecurity hardening guide. If one is not available, provide documentation from the manufacturer stating such.

l) A complete set of shop drawings to include but not limited to:
   1) Device locations
   2) Cable Type and Pathways
   3) Panel Termination Schedule
   4) Elevation Drawings to illustrate the associated devices and the heights at which they will be installed.
   5) Naming Convention Information
   6) Signal Flow Diagram including full topology.

m) Supplemental documents to include but not limited to:
   1) Safety Plan
   2) Contractor QA/QC Document
   3) Construction Schedule in a Gant chart format
   4) Contractor Cybersecurity Hardening Guide
   5) Information on service calls, to include all rates and hours of operation

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. Unless otherwise stated, all wiring, equipment, and installation materials shall be Commercial Grade, new, and of the highest quality to meet or exceed the performance and features of the equipment and devices specified herein.

C. Architect / Owner / Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

D. Proposed equivalent items must be approved in writing by the Architect / Owner / Design Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

E. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.

F. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished at no additional cost to the owner.

G. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

H. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

I. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect / Owner / Design Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA 568-C standards where applicable.

J. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect / Owner / Design Consultant. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues and the Contractor will have all products on-site when needed to complete the job as per the project schedule.

K. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a fully functional system. Where quantities are not noted, they may be obtained from the drawings.

L. All software, hardware, and equipment (from the date of RFP) shall be tested, currently available and commercially off the shelf product. (COTS).

M. Written approval must be obtained from the Architect / Owner / Design Consultant for any proprietary or custom software and/or equipment prior to the beginning of the project.

2.2 SYSTEM REQUIREMENTS

A. The access control system as specified is an industry-standard and is a PoE based design with PoE **(OSDP)** door controllers, request to exit devices, door position switches, **(OSDP)** card readers, and an owner provided (existing) virtualized access control server. This access control system shall be provided to the owner as a full turn-key access control system, with no exceptions. Any design conflicts shall be brought to the security designer with 24 hours of discovering the problem, prior to bidding for this scope of work.

B. Contractor shall provide and install a complete and functional IP-based Open Options DNA Fusion Physical Access Control System that includes, but not limited to: any additional licenses, Physical Access Gateways/Controller, Access Card Reader, Input Modules, Magnetic door position switches, POE based power supplies, incidental wiring, and Category 6 patch cords at the module-end. All non-PoE locking hardware (DIV 8) will require local power and is not reflected in this specification. The Security Contractor will coordinate with Division 8 to assure the requirement of interface between Div. 28 and Div. 8 are in place in advance of installation of Div. 8 and Div. 28.

2.3 ACCEPTABLE MANUFACTURERS

A. Open Options
   1. Access Control System Software/License(s)
      a. Open Options DNA-SC-10
   2. Active Directory License
      a. Existing
   3. Client Workstation License
      a. Open Options DNA-CWS-1
   4. Web Portal License – (10) Users)
      a. FUSION-WEBSVC

B. Access Control System Hardware
   1. Access Control Database / File Server
      a. Existing
   2. Access Control Application Server
      a. Existing
   3. Client Workstations
      a. Existing
   4. Intelligent Controllers – Enclosed Wall Mounted
      a. Open Options D-CONTROLLER **(OSDP)**
   5. Door Controllers – Enclosed Wall Mounted
      a. Open Options NSC-200 **(OSDP)**
   6. Input Boards – Enclosed Wall Mounted
      a. Open Options ISC-16
   7. Output Boards – Enclosed Wall Mounted
      a. Open Options OSC-16
   8. Wall Mount Card Reader
      a. HID Signo 40 **(OSDP)**
   9. Mullion Mount Card Reader
      a. HID Signo 20 **(OSDP)**
   10. DPDT Recessed Door Position Switch
      a. GRI 195-12 (Exterior Card Reader Doors Only)
      b. Or approved equal
   11. SPST Recessed Door Position Switch
      a. GRI 190-12 (Interior Card Reader Doors Only)
      b. Or approved equal
   12. Request to Exit
      a. Bosch DS160
      b. Or approved equal
   13. Door Release
      a. Contractor shall program door release in Open Options DNA Fusion Software.
   14. Under Desk Lock Down
      a. United Security HUB-2B
      b. Or approved equal
   15. Wall Mount Lock Down
      a. STI SS24A1LD-EN
      b. Or approved equal
   16. Intercom Master Station
      a. AiPhone IX-MV
   17. Intercom Video Door Station
      a. AiPhone IX-DVF
         1) Stainless Steel Surface Mount Box (where required)
            a) AiPhone SBX-IDVF
   18. Intercom IP Relay Adaptor

a. AiPhone IXW-MA
19. Access Control System Power Supplies
    a. Altronix AL Series
    b. Or approved equal
20. Access Control System Power Supply Boards
    a. Altronix AL Series 12/24VDC
    b. Or approved equal
21. Power Controller Modules
    a. Altronix ACM8
    b. Or approved equal
22. Power Distribution Modules
    a. Altronix PD8
    b. Or approved equal
23. Battery
    a. Yuasa NP7-12
    b. Or approved equal

C. Access Control Cabling
1. Composite Banana Peel Cable (from networked door controller down to end devices)
    a. Superior Essex AC-A1x-68 Plenum Cable
    b. Southwire H91602-1 Plenum
    c. Belden 658AMJ Plenum
    d. Or approved equal
2. Card Reader Cable - Inside Building **(OSDP)**
    a. 22AWG-6 Conductor OAS Plenum
3. Door Position Switch Cable - Inside Building
    a. 22AWG-4 Conductor Plenum
4. RX Cable - Inside Building
    a. 22AWG-4 Conductor Plenum
5. Lock Power Cable - Inside Building
    a. 18AWG-4 Conductor Plenum
6. In Building Security Cable Jacket Color
    a. Yellow
7. Data Cable (from door controller to OFOI PoE switch)
    a. By Division 27

D. Pathway Cable Support
1. Panduit J-Mod Cable Support System
2. Erico – CADDY CAT LINKS J-Hook Series
3. Panduit Plenum Rated Velcro Hook & loop (Velcro) (Black)

E. Labeling
1. Permanent Labels for Copper Cables
2. Panduit Self-Laminating Labels
3. Or approved equal

F. Fire Stop / Sealants
1. Fire stop
2. STI Spec Seal
3. 3M Products
4. Or approved equal

G. Sealants

1. MasterSeal NP1
2. Or approved equal

H. Electrified Locking Mechanisms
1. Reference Division 8 Finish Hardware Specification and schedule for electrified locking hardware.

I. Electric Strike Locking Mechanism Power Supply (OFOI)
1. PoE Power
a. OFOI PoE Switch

J. Panic Electrified Locking Mechanism Power Supply (By Div. 8)
1. Coordinate with Division(s) 8 & 26

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)
1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

C. Alliance for Telecommunications Industry Solutions (ATIS)

D. Building Industry Consulting Service International (BICSI)
1. Telecommunications Distribution Methods Manual 13th Edition
2. Outside Plant Design Reference Manual 5th Edition
3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

E. Federal Communications Commission (FCC)
1. FCC Part 15, Radiated Emissions Limits, revised 1998
2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
3. FCC Part 76, Cable Television Service, revised 1998

F. Insulated Cable Design Consultants Association (ICEA)
1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

G. International Electrotechnical Commission (IEC)

H. Institute of Electrical and Electronics Design Consultants, Inc. (IEEE)
1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

I. International Organization for Standardization (ISO)
1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
3. ISO/IEC 14443-3:2011 – Identification Cards
4. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999

J. National Cable Television Association (NCTA)

K. National Electrical Contractors Association (NECA)
1. NECA 1-2015 Good Workmanship in Electrical Construction

L. National Electrical Manufacturers Association (NEMA)
1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits

M. National Fire Protection Association (NFPA)
1. NFPA-70, National Electrical Code
2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
3. NFPA-101, Life Safety Code
4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
5. NFPA-780, Standard for the Installation of Lightning Protection Systems.

N. National Institute Standards and Technology (NIST)

O. Occupational Safety and Health Administration (OSHA)

P. Security Industry Association (SIA)

Q. Telecommunications Industry Association (TIA)
1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
5. ANSI/TIA–569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.

7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

R. U.S. Department of Agriculture (USDA)
1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
2. RUS Bull 1751F-643 (2002) Underground Plant Design
3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)

S. Underwriters Laboratories, Inc. (UL)
1. UL 294 Standard for Access Control System Units
2. UL 294B Standard for Power Over Ethernet (PoE) Power Sources for Access Control Systems and Equipment
3. UL 109 Standard Method for Flame Tests of Flame-Resistant Fabrics and Films
4. UL 1076 Standard for Proprietary Burglar Alarm Units and Systems

3.2 EXECUTION - GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the ARCHITECT / DESIGN CONSULTANT / DESIGN CONSULTANT/ for direction before proceeding with that part of the work.

B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.

C. The Contractor shall install the materials in accordance with these specifications and the manufacturer’s installation guidelines. Equipment and materials installed by the Contractor shall be free of defects and damage.

D. No deviations from the plans, details or specifications shall be made without full consent in writing of the Architect / Owner / Design Consultant. The Contractor shall have written approval from the Architect / Owner / Design Consultant for any additional work beyond the Contract Documents prior to beginning such work.

E. In the event site conditions do not allow the contractor to follow the execution requirements specified herein or in the provided details, the Contractor shall submit via RFI an alternative means and methods that is approved in writing by the Architect / Owner / Design Consultant.

F. The Contractor shall obtain written permission from the Architect / Owner / Design Consultant before proceeding with any work that would necessitate cutting into or through

any part of the building structure such as, but not limited to: girders, beams, floors, walls, roofs, and/or ceilings.

G. If the Contractor does not obtain written approval from the Architect / Owner / Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

H. Contractor shall notify the Architect / Owner / Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect / Owner / Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

I. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

J. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

K. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

L. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect / Owner / Design Consultant.

M. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

N. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

O. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect / Owner / Design Consultant.

P. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

Q. Devices installed in public spaces shall be mounted and secured using tamper-proof security fasteners unless otherwise noted.

R. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

S. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

T. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

U. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

V. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:
1. The contractor shall scan contractor owned equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the contractor owned devices to the Owners network.
2. Ensure all technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics, i.e. servers, and other associated equipment.
3. All project documents shall be properly securely stored behind encryption and password protection to avoid unauthorized distribution of documents.

W. Labeled Doors and Frames
1. In no instance shall any UL labeled door or frame be drilled, cut, penetrated, or modified in any way.
2. The Contractor shall be responsible for replacing any labeled door or frame that is modified without written approval from the Architect.

3.3 COORDINATION REQUIREMENTS

A. The Contractor is responsible for the coordination of the following items and their respective disciplines included but not limited to.

B. Coordinate with the Architect to ensure that:
1. Adequate conduit is provided and that equipment backboxes are adequate for system installation.
2. Adequate power has been provided and properly located for the security system equipment.
3. Doors and door frames are properly prepared for electric locking hardware and door position switches.
4. Access hatch locations (when required) shall be submitted in writing via RFI and coordinated with the Architect.
5. Finishes and colors of all equipment visibly installed in public areas. Submit all finish and graphics for all equipment to the Architect for approval prior to installation.

C. Coordinate with the Division 8 contractor for the following:
1. Door hardware manufacturer installation and power requirements.
2. Installation, power, and requirements for integral request to exit switches.

D. Coordinate with the Division 26 contractor for the following:
1. High voltage power pathways, grounding, and bonding requirements.
2. Drive up pedestal pathways to the interior of the building.
3. Pathways, rough ins, back boxes, and conduit sizes for all access control peripheral devices.

E. Coordinate with the Division 27 contractor for the following:

1. Installation and power requirements of network infrastructure associated to the specified Access Control System
2. Associated patch cable lengths and quantities required for the specified Access Control System
3. Location, power, and backup requirements for rack mount equipment.

F. Coordinate with the Division 28 (Fire) contractor for the following:
1. Door hardware manufacturer installation and power requirements associated with fire alarm system(s).
2. Door hardware manufacturer installation and power requirements for all ACS electric locking mechanisms with time-delay (“delayed egress”) functions as defined by NFPA 101.

G. The Contractor is responsible for coordinating ACS locations and mounting preferences of all specified security devices with the Architect / Design Consultant / Design Consultant prior to installation.

H. The Contractor is responsible for coordinating all ACS programming requirements with the Architect / Owner.

I. The Contractor shall coordinate with the Owner for the following:
1. Credential reader card formats, LED, buzzer and associated visual/audio functionalities.
2. Credential card ordering, formats, facility codes, barcode and template requirements or standards prior to install. Coordinate timelines for delivery and distribution of the credentials to the Owner prior to procurement.
3. Naming Conventions of devices, controllers, doors, etc.

3.4 SYSTEM REQUIREMENTS

A. General
1. The Access Control System (ACS) shall consist of server(s), software, licensing, workstations, doors controllers, access control cabling, credentials and all other peripheral components as indicated on the drawing and specified herein.
2. Any devices associated with the installation shall have the latest firmware updates downloads via owner approved secure link from the system software and/or remotely from the manufacturer.
3. All Access Control software, equipment and system requirements shall be installed per their respective Manufacturer Installation Guidelines.
4. **All card readers and door controllers shall be configured and wired for OSDP.**

B. Access Control System (ACS) Software
1. Application / Client Workstation Software
   a. The ACS software shall be installed as the most current version; contractor shall coordinate with owner prior to the upgrade/install to identify and evaluate any software conflicts. Conflicts shall be brought to the attention of the design team prior to bidding via Request for Information (RFI).
   b. Contractor shall coordinate the install and configure software on workstation(s) as required to provide a full turnkey ACS system.
2. Programming and data entry to be completed by Owner.
   a. Contractor is responsible for ensuring the installed field devices, controllers, etc., are communicating to the head-end equipment, so that the Owner is

able to complete the necessary programming and shall assist in troubleshooting in the event they do not.

C. Access Control System Licensing
1. Contractor shall be responsible for providing and applying all necessary licensing key(s) for the specified system(s) as required by the manufacturer(s) for a fully functioning access control system.
2. Contractor shall maintain a secured document with all license key(s) information applicable to this project. All license key(s) are property of the owner and shall be kept secured at all times and then surrendered to the Owner at the end of the project.

D. Access Control System Hardware
1. ACS Server (Existing)
   a. The existing access control server shall be utilized
      1) Contractor shall coordinate with the Owner to ensure the Owner provided server meets the access control system manufacturer recommended specifications and requirements.
      2) Contractor shall coordinate with the Owner to verify existing server compatibilities and capacities for expansion as a result of the newly installed devices specified herein.
2. Communications
   a. Communication between servers, and workstations, networked based controllers/sub-controllers will communicate using the Owner provided data network unless otherwise noted. Coordinate with owner for network configuration requirements.
   b. The ACS shall also support end to end 128-bit encryption unless otherwise noted.
   c. Network device communications shall be via the Owner's LAN via network cabling as specified by Division 27 (where applicable).
      1) Data drop shall be provided by Division 27 and located inside the controller enclosure.
      2) Contractor shall coordinate with owner for addressing requirements
   d. Alternative communications means and methods shall be provided by Division 28 where applicable.

E. Access Control Workstations
1. Operator/Client Workstation
   a. Existing
2. Access Control System Controller(s)
   a. Coordination with the Division 8 consultant/designer may be necessary to integrate the locking hardware power to the Open Options NSC-100 door controller.
   b. Install Controller(s) in designated Above associated card reader door as indicated on drawings
      1) The Controller(s) shall be wall mounted in the ACS manufacturer's UL listed enclosure, unless a separate manufacturer enclosed power supply solution is specified that is specifically designed for the controller board(s) specified herein. The enclosure shall consist of the following
      2) Single cover, hinged, with identical key cylinder lock(s) for all enclosure(s). Hinged double doors will not be accepted.
      3) Contractor shall furnish, install, and connect tamper switch for all enclosure(s) to the controller(s) as specified. One alarm input is needed

per MDF/IDF to alarm via the ACS system when the enclosure is opened.
4) Contractor shall furnish, install, and connect Battery Fail/Power Loss alarm inputs to the controller(s) as specified. One alarm input is needed per MDF/IDF to alarm via the ACS system in the event of low battery/power loss conditions.
5) Enclosure(s) shall be mounted flush, plumb, and properly secured on fire-rated plywood using appropriate mounting hardware. Pathways to or from the enclosure(s) shall mechanically protected in a conduit or gutter system. Exposed cabling is not permitted.

c. Device power shall be provided from a UL listed power supply or PoE powered network switch where required in accordance with the manufacturer's requirements.
d. Controller(s) shall be installed per the construction documents.
e. Controller(s) shall be installed and configured in accordance with the most current manufacturer installation instructions.
f. The installation shall be performed or directly supervised by a manufacturer-certified technician.
1) The term "supervised" means the certified technician shall be on-site and supervising the installation.
2) The certified (on-site) technician shall have a copy of the manufacturer certification on-site readily available for review.
3) The manufacturer certification shall be current and valid.

F. Door Position Sensors (Door Position Switches, Tamper Switches)
1. Provide magnetic concealed door position switches, surface mount door position switches and overhead door position switches to monitor the open/closed status of doors as specified herein and as indicated on the drawings.
2. The contractor shall ensure the circuit of the door position sensor shall match the physical status of the door opening i.e. Normally Closed when the door is closed.
3. Exterior mounted door position sensors shall terminate using the appropriate outdoor-rated weatherproof connections and fasteners based on site conditions.
4. Provide flexible metallic conduit (as required) from the sensor location to the associated junction box as indicated on the drawings. Conduit shall be securely fastened to the structure using proper fasteners based on site conditions.
5. Contractor must ensure adequate spacing between contact and magnets to avoid abrasion / damage to the device.
6. Install end of line resistors for line supervision. Refer to manufacturer for recommended resistance values
7. Tamper shall be mounted inside the enclosure on key switch side.

G. Request-to-Exit
1. For doors equipped with electric locking mechanical that are free exiting at all times (i.e. mortise electric locks, electric strikes, etc.), the REX motion sensor shall only shunt the door position sensor from the Access Control System unless otherwise noted.
a. Integrated in Electrified Door Hardware
1) Security Contractor shall route cable from door controller to access controlled door as indicated on the drawings and terminate the specified cable to the top of the Division 8 installed Electrified Power Transfer Hinge.
a) At the time of installation of the door hardware, The Security Contractor shall provide and install all end of line resistors required by the PACS System Manufacturer.

b) Security Contractor shall not remove Division 8 Installed Door Hardware unless otherwise approved in writing by the Architect / Owner / Design Consultant.

b. Request-to-Exit Motion Sensor
1) Motion sensor shall be mounted flush, plumb, and properly secured on a single gang box or mechanical brace using appropriate mounting hardware and trim plate.
2) Motion sensors shall be positioned close to the door opening and angled to prevent tampering from forced entry. Contractor shall ensure devices mounted in the ceiling space are not obstructed or impacted when servicing in relation to other ceiling mounted devices (Exit signs, smoke detectors, lighting fixtures, etc.)

H. Lockdown
1. Provide desk-mounted and/or wall mounted personnel duress alarms with normally closed alarm output contacts as indicated on the drawings.
2. Lockdown shall be wired to the Access Control System input boards as scheduled.
a. The Lockdown button shall be mounted flush, plumb, and properly secured as scheduled.
1) The Lock down button shall be configured as momentary.
2) The Lock down shall be configured as latching.
a) Latching keys to be turned over to the Owner via the Construction Manager.
3) The Lockdown button shall be configured as latching.
b. Security device cabling installed in the knee space shall be mechanically protected with an armored flex from the rough-in back box to the edge device as scheduled. No exposed cabling is permitted.

I. Access Control Intercom Systems
1. Door Release via the (DNA Fusion Software) shall be initiated through programming and relay cabling from the intercom / intercom master station to the associated door relay board.
2. Coordinate audio recording requirements from intercom systems

J. Electrified Door Hardware Mechanical Connections (Division 8)
1. Contractor shall conceal security cabling in door frame, door channels, walls wherever possible. Submit RFI if site conditions do not allow and propose alternative methods of terminations.
2. The Division 28 Contractor shall not make any modifications to fire rated doors without obtaining written permission from the Architect.
3. The Division 28 Contractor is responsible for providing the following:
a. Provide relay signal cabling only from the ACS to the Division 8 power supply or relay board(s) located either at the door or centralized location
b. Termination of Lock Relay Power for PoE based networked door controllers up to the electrified door hardware
c. Device power provided by Owner-provided PoE networked switch.
4. The Division 8 Contractor is responsible for providing the following:
a. Final terminations of all internal wiring of electrified door hardware and door power supply connections.
b. Final terminations from the door power supply or relay board up the power transfer hinge or similar connection point of the electrified door hardware.

K. Access Control System Power Supplies

1. Unless otherwise noted, all power supplies shall be hardwired to the 120VAC circuit. No pigtails / plugs shall be acceptable.
2. Enclosed Wall Mounted Access Control Panel Power Supply
   a. The Security Contractor shall provide and install devices as indicated on the drawings.
   b. Security Contractor shall refer to Division 8 Finish Hardware schedules and system requirements for sizing and quantity of boards in the enclosed power supply.
   c. The Security contractor shall provide dual voltage power supply board as specified.
   d. The Security Contractor shall provide and install Power Control Modules as specified.
      1) Each Lock power output cable shall be terminated to a dedicated port on the Power Distribution Module specified.
   e. The Security Contractor shall provide and install Power Distribution Modules as specified.
      1) Each request-to-exit motion (where required) cable shall be terminated on a dedicated port on the Power Distribution Module.
   f. The Security Contractor shall size each enclosure(s) with dual voltage power supplies as specified to include an additional total amperage of at least for 20% additional maximum amperage output per enclosure for future expansion as required.
   g. The Security contractor shall provide (2) back up batteries as specified per each enclosure.
   h. 115VAC hardwired power shall be provided and installed by Division 26 Electrical Contractor.
   i. 30Amp dedicated circuit shall be provided and installed by the Division 26 Electrical Contractor.
   j. Provide U.L. Listed power supplies for all Access Control System panels as specified.
   k. Provide battery chargers and batteries for all power.
   l. Monitor low battery and power fail alarms for each power supply.
   m. Tampers shall be wired as recommended by the manufacturer.
3. Backup Battery(s)
   a. The Security Contractor shall provide and install (2) batteries per power supply enclosure.
   b. The Security Contractor shall label the install date for each battery with printed labels.

L. Access Control Cabling

1. Pathways
   a. Wires shall be routed utilizing the pathways as indicated in the technology drawings. Reference Division 27 specifications for additional requirements.
   b. Access control cabling shall be routed separate from the network data communication cables specified in Division 27. Contractor shall provide separate pathways and j-hooks for the cables specified herein.
2. Wiring Techniques
   a. All cables shall be pre-tested for shorts prior to final device terminations after cables are installed.
   b. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored in the provided enclosure(s) as detailed in the drawings. If an enclosure is not provided for the specified devices herein, the service loop

shall be installed on a j-hook in the nearest accessible ceiling space closest to the device.

c. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored at the access control panel.
d. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored on the wall above the ladder rack in the regional MDF/IDF room(s).
e. Install code compliant fire proofing techniques for all penetrations of fire rated partitions and slabs, where the penetrations are made by or used for installation of the ACS.
f. All wire and cable shall be continuous from device location to the final point of termination ("Home Run"). No mid-run cable splices shall be allowed.
g. Wire and cable within control panels, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied. Velcro cable ties shall be utilized.
h. Neatly bundle and wrap all horizontal / vertical runs (above accessible ceilings and not within conduit) wire and cable at intervals as code requires. Provide supports as required. All supports shall be UL listed for the application.
i. All system wiring within vertical riser shafts (as required) shall be bundled, wrapped, and tied to the structure at one-meter intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors using manufacturer approved vertical management hardware and installation methods. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.
j. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on wire and cable.

3. Splices / Transitions
   a. Home run cabling is the preferred method of installation for all Access Control System devices and panels.
   b. In the unlikely event that a splice or transition is required, the Contractor shall identify all splices / transition points required for the completion of the project and confirm, in writing, in advance, via RFI with the Architect / Owner / Design Consultant for acceptance of the proposed wiring techniques to be utilized.
   c. By not submitting an RFI, Contractor acknowledges that no major splicing is required for the completion of this project. Any splices not previously identified that are found to be faulty shall require the Contractor to re-install the affected cable in its entirety at no cost to the Owner.
   d. Contractor shall clearly mark splices / transition points on the shop drawings and As-Built drawings as part of the project close-out.
4. Cable Dressing
   a. No excessive cable slack shall be left in enclosures.
   b. Cables shall be dressed in a professional manor
   c. Cables shall be routed in 90-degree angles to termination points inside enclosures.
   d. Ty raps / zip ties are not permitted, hook and loop / Velcro is acceptable.
   e. Exposed wires are not acceptable
   f. Enclosures and equipment / Telecommunication room shall be left clean without debris including but not limited to: labels, connectors, screws, etc.
   g. All spare / unused cables shall be in the enclosure shall be neatly coiled and protected to avoid any shorts to ground.

5. Labeling
    a. Contractor shall verify room numbers and confirm the final room numbering scheme and Owner's current standard in writing in advance via RFI prior to generating any labels.
    b. Cables overall sheath shall be labeled within (6) inches from the point the cable enters/exits the enclosure inside the Equipment Room / Telecommunications / Security Control Location Rooms.
    c. Cables shall be labeled within (3) inches from the termination point inside the Equipment Room / Telecommunications / Security Control Location Rooms.
    d. Cables shall be labeled within (3) inches from the termination point at the device end.
    e. Cables shall be labeled identically at both ends.
    f. Label all controls as necessary to agree with their function.
    g. All labeling in the field shall match the same labeling scheme in the closeout documents.

M. Fire Stop / Smoke / Sound Sealants
1. Use proper sealant as recommended by the manufacturer for the specific application in compliance with per all applicable codes: City, State, Federal, LAHJ.
2. All existing pathways shall be resealed in compliance with per all applicable codes: City, State, Federal, LAHJ.

N. Grounding and Bonding
1. The Contractor shall ensure metal-to-metal contact for all grounding terminations.
2. All materials shall be UL Listed.
3. All connections shall be made with UL Listed compression 2-hole lugs.
4. Contractor shall use an anti-oxidation compound on all connections.
5. In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TMGB and TGB shall be bonded to the vertical steel metal frame using a minimum # 6 AWG plenum rated green insulated conductor.
6. A Grounding Equalizer conductor shall be installed when required by ANSI/TIA/EIA-607-B (Interconnects multiple TBBs on the top floor and every 3rd floor in between).
7. The connection to building steel does not eliminate the requirement for the TBB or EBC to the service ground.
8. Equipment Bonding Conductor (EBC)
    a. Contractor shall furnish and install a minimum #6 AWG plenum rated green insulated conductor from the TMGB or TGB as applicable to each ladder rack system, equipment rack, cabinet, metallic raceway, lightning protector, or multi-pair cable with a metallic element. Contractor shall use an anti-oxidation compound on all connections.
    b. When exceeding (13) feet the EBC shall be sized at (2) kcmil per linear foot of conductor length up to a maximum of 750 kcmil.

O. Conduit, Boxes and Raceways (For Reference Only - By Division 26)
1. Install all conduit necessary for a complete installation, but not provided for in the Security Drawings, in finished areas concealed in chases, furring's, concrete slabs and/or above suspended ceilings. No exposed conduit shall be installed within public areas.
2. Conduit shall be carefully installed, properly and adequately supported as required to comply with the requirements outlined herein and as required by the NEC to provide a neat, industry-standard installation. Horizontal conduit runs

shall be supported by clamps, pipe straps, special brackets, or heavy iron tie, tied to the black iron structural members supporting the ceiling. Fastening of conduit to masonry walls, floor or partitions require malleable pipe clips with screws and suitable expansion sleeves.

3. All conduit shall be cut accurately to measurements established at the building and shall be installed without springing or forcing.
4. All required inserts shall be drilled-in and all openings required through concrete or masonry shall be saw cut or core drilled with tools specifically designed for this purpose.
5. Swab out and remove all burrs from conduit before any wires are pulled.
6. Lay out and install conduit runs as to avoid proximity to hot pipes. In no case shall a conduit be run within 75 mm of such pipes, except where crossings are unavoidable and then the conduit shall be kept at least 25 mm from the covering of the pipe crossed.
7. Provide fire stops where conduits penetrate fire rated walls and/or floors.
8. All conduit installation, whether run exposed or concealed, shall be approved prior to installation by the Architect.

P. High Voltage (120VAC) Power Requirements (For Reference Only – by Division 26)

1. 120VAC AC power dedicated to security shall be provided by the electrical contractor for the Access control system as indicated on drawings. Coordinate with the Architect to establish locations of security dedicated 120VAC AC circuits.
2. Connect to the AC power (provided by electrical contractor) and provide UL listed power supplies and transformers to distribute low voltage power to the system components as required.
3. Provide all conduit and wiring from the AC power facilities to the Access Control / Power Supply Enclosures.
4. Provide Mechanical separation to isolate 120VAC wires from other low voltage cabling. Low voltage cabling shall not route over/under/parallel to 120VAC wires.

Q. Surge Protection / Lightning Arrestors

1. Protect all exterior or interior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.
2. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.
3. Surge devices shall be installed as close as accessibly possible to the equipment they are protecting.
4. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.
5. Include surge protection device locations on as-builts and shop drawings.
6. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.
7. Properly ground surge protection devices per the manufacturer installation requirements.

3.5 TESTING REQUIREMENTS

A. System Start-Up

1. The Work shall be complete and ready to operate prior to final acceptance.
2. The Architect shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner’s operation.

B. Substantial Completion

1. In order to qualify for the Architect's consideration of Substantial Completion, the Work must, at a minimum, meet the following requirements:
   a. Installation of all devices must be completed.
   b. All sub-system interfaces must be complete and operational.
2. Substantial Completion shall not be misconstrued as final acceptance of the Work.

C. System Acceptance
1. Final acceptance testing of the Work will be conducted by the Architect.
2. Prior to any final acceptance testing, the Contractor shall submit two sets of preliminary (draft) Record Drawings to the Architect. The preliminary Record Drawings are to be used by the Architect to conduct the system final test.
3. Before system acceptance testing the Security Contractor shall conduct a complete in-house QA/QC test of the entire Access Control System and provide a written report on the results of that test. During the QA/QC test the Security Contractor shall place the ACS in service mode and calibrate and test all equipment.
4. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test. The intent of the burn-in test shall be to prove the Access control system by placing it in near real operating conditions. During this period, the Access control system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.
5. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Architect that the installed complete Access control system has been calibrated, tested, and is fully functional as specified herein.
6. Prior to the final acceptance test, coordinate with the Architect for security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery, and all surplus materials.
7. Upon written notification from the Contractor that the Access control system is completely installed, integrated and operational, and the burn-in testing completed, the Architect will conduct a final acceptance test of the entire system.
8. During the course of the final acceptance test by the Architect, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing "as built" conditions of the Access control system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Access control system head-end equipment will be evaluated.
9. The functionality of the various interfaces between systems will be tested.
10. Following the Access control system head-end equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installations, complete functionality of each individual device, and mounting, backbox and conduit requirements compliance.
11. All equipment shall be on and fully operational during any and all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. Provide a minimum of two employees familiar with the system for

the final acceptance test. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two two-way radios for use during the test. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Architect or Owner, at no charge to the Architect or Owner.

12. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Architect will issue a letter of final acceptance.
13. The Architect retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner's/Architect's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the Drawings. The Contractor shall supply the Architect with a detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs, or modifications to the system will be conducted without the permission of the Architect.

3.6 PROJECT CLOSEOUT DOCUMENTATION REQUIREMENTS

A. As-Built Drawings
1. Drawings shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect / Owner / Design Consultant.
2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Architect / Owner / Design Consultant electronically.
3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
4. Drawings shall be provided in the original size as issued by the Architect/Design Consultant.
5. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect/Design Consultant.
6. Provide a conformed set of Drawings as related to the project, depicting the condition of the access control system as installed to include but not limited to:
   a. ASI, PR and Addendum items installed throughout the duration of the project.
7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Access Control System enclosure. Coordinate with Owner for final storage location.
8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:
   a. Access Control System Riser / Signal Flow Diagrams
   b. Access Control System Backboard Layouts
      1) To include access control boards, power supplies, pathways, etc.
   c. Sleeves, Backbone Cabling and Communication pathways
   d. Access Control System device locations and labeling scheme.

B. Operation & Maintenance Manuals

1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer's Product Warranty
1. Certificate of product warranty shall be provided to the Architect / Owner / Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect/Design Consultant.
2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
3. One original and two copies of the Manufacturer's product warranty shall be provided.

D. Contractor's Statement of Warranty
1. Statement of warranty shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect / Owner / Design Consultant.
2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 28 13 00

SECTION 28 16 00
INTRUSION DETECTION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section identifies the technical design, specifications, and requirements for the Intrusion Detection System the Judson Independent School District Crestview Elementary School Modernization and Improvements, located in Universal City, Texas (“Owner”). The Intrusion Detection System as specified is an industry-standard and includes demo, cabling and rough in for control panels, keypad, motion sensors, door position sensors, electronic siren, and intrusion detection cabling as specified.

B. It is the Contractor’s responsibility to review this specification and associated project specifications and drawings in their entirety, prior to bidding on the project. By bidding on this project, the contractor acknowledges that they have read and fully understand these specifications, with no exceptions. Contractor shall review the drawings, specifications, and existing conditions prior to bidding on the project. Any discrepancies shall be brought to the attention of the architect/Design Consultant via request for information (RFI) in writing for evaluation and or clarification. If these items are not brought to the attention of the architect/Design Consultant the more costly or difficult manner, and the better quality or greater quantity of work shall be provided by the contractor in accordance with the architect's/Design Consultant's interpretation at no additional cost to the owner.

C. Contractor shall furnish and install all materials, equipment, and labor necessary to provide the demolition and an expansion of the existing Intrusion Detection system regardless of any items not listed or described in this specification or associated drawings.

D. Judson ISD is in the process of re-evaluating the existing Intrusion Detection System due to Interlogix Concord-4 and all Interlogix products are no longer being manufactured. Changes may occur after project is awarded. At this time the intent is to re-use all existing wireless devices where possible and hard wire any new devices.

1.2 REQUIREMENTS

1. Contractor Experience Requirements
2. Submittal Requirements
3. Acceptable Manufacturers
4. Codes, Standards and Regulations
5. General Requirements
6. System Requirements
7. Testing Requirements
8. Training Requirements
9. Project Closeout Documentation

1.3 RELATED REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 28 and shall

be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.

B. In the execution of this work, the Contractor shall comply in every way with the requirements of local laws and ordinances, the laws of the State of Texas, the National Board of Fire Underwriters, OSHA, accepted industry standards and the National Electrical Code. If, in the opinion of the Contractor, there is anything in the specifications that will not strictly comply with the above laws, ordinances, and codes, the matter shall be referred to Architect for a decision before proceeding with that part of the work.

1.4 CONTRACTOR EXPERIENCE REQUIREMENTS

A. The Contractor shall be a certified Interlogix Preferred Partner prior to submitting a bid for the work.

B. The Contractor shall possess all relevant Manufacturer Certifications (i.e. Intrusion Detection systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.

C. The Contractor shall have a manufacturer certified technician onsite throughout the duration of the installation phase of the project.

D. The Contractor's Project Manager shall be dedicated to this project for the duration of the project and shall be available for all onsite coordination meetings.

E. The Contractor shall have been in business for a minimum of five (5) years.

F. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.

G. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

H. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

I. The Contractor and related subcontractor will comply and provide proof of compliance to STATE of TEXAS OCCUPATIONS CODE,
   1. TITLE 10. OCCUPATIONS RELATED TO LAW ENFORCEMENT AND SECURITY

   2. CHAPTER 1702. PRIVATE SECURITY, OCCUPATIONS CODE CHAPTER 1702. PRIVATE SECURITY

1.5 SUBMITTAL REQUIREMENTS

A. Bid / Proposal Submittal
   1. Contractor shall provide as part of their bid/proposal:
      a. Breakdown of proposed parts and labor required for the completion of the project.
      b. Proposed construction schedule in a Gant chart format
      c. Detailed Safety Plan
      d. Detailed documentation of QA/QC

e. A detailed description of the installation team(s) that would perform the work.
f. A resume for each of the key project personal.
g. A list of all Sub Contractors and their scope of work shall be identified at the time of bid. All Sub Contractors will fully comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

B. Pre-Installation Submittal
1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect / Owner / Design Consultant.
2. The Contractor is responsible for notifying the Architect / Owner / Design Consultant in writing of any proprietary devices, software credentials or installation processes. Written approval must be obtained by the Architect / Owner / Design Consultant prior to proceeding.
3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements.
4. Contractor shall ensure submittals are submitted in 10 business days to ensure all products can be ordered and received on site in order to not cause any delays. Any products having long lead times (more than 60 days) that may negatively impact the schedule shall be clearly identified in writing so the review and approval can be expedited.
5. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e. product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.
6. Contractor shall provide the following as part of their submittal:
   a. Manufacturer product data sheets for each proposed system component.
      1) For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.
      2) Contractor shall identify any products that are discontinued, end of life, or near end of life, and shall propose equal alternate to the discontinued product in writing.
         a) Manufacturer Product Certifications for Company.
         b) Manufacturer Product Certifications for Installers.
         c) Manufacturer Warranty letters.
         d) Documentation indicating that Contractor has been in business for (5) years.
         e) Address of Contractor’s local office within a 75-mile radius of the project site.
         f) Quantity of full-time, local technicians within a 75-mile radius of the project site.
         g) List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.
         h) List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project:

Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

i) List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.

j) Manufacturer's certification letter confirming that the proposed Intrusion Detection system components do not have any known cybersecurity notices, bulletins, or alerts. If a vulnerability is discovered, the contractor shall notify the Architect / Owner / Design Consultant within 24 business hours. Provide the make and model of the associated equipment and the vulnerability.

k) Manufacturer cybersecurity hardening guide. If one is not available, provide documentation from the manufacturer stating such.

l) A complete set of shop drawings to include but not limited to:
   (1) Device locations
   (2) Cable Type and Pathways
   (3) Panel Termination Schedule
   (4) Elevation Drawings to illustrate the associated devices and the heights at which they will be installed.
   (5) Naming Convention Information
   (6) Signal Flow Diagram including full topology.

m) Supplemental documents to include but not limited to:
   (1) Safety Plan
   (2) Contractor QA/QC Document
   (3) Construction Schedule in a Gant chart format
   (4) Contractor Cybersecurity Hardening Guide
   (5) Information on service calls, to include all rates and hours of operation

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. Unless otherwise stated, all wiring, equipment, and installation materials shall be Commercial Grade, new, and of the highest quality to meet or exceed the performance and features of the equipment and devices specified herein.

C. Architect / Owner / Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

D. Proposed equivalent items must be approved in writing by the Architect / Owner / Design Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

E. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.

F. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished at no additional cost to the owner.

G. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

H. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

I. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect / Owner / Design Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA 568-C standards where applicable.

J. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect / Owner / Design Consultant. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues and the Contractor will have all products on-site when needed to complete the job as per the project schedule.

K. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a fully functional system. Where quantities are not noted, they may be obtained from the drawings.

L. All software, hardware, and equipment (from the date of RFP) shall be tested, currently available and commercially off the shelf product. (COTS).

M. Written approval must be obtained from the Architect / Owner / Design Consultant for any proprietary or custom software and/or equipment prior to the beginning of the project.

2.2 ACCEPTABLE MANUFACTURERS

A. Intrusion Detection Control Panel
   1. Control Panel
      a. Interlogix Concord 4 80-968-4 (Existing in MDF)

B. 8 Supervised Hardwire Zone Input Expansion Module
   1. Zone Expander
      a. Interlogix 60-774

C. Wireless Alarm Signal Repeater– (As Required)
   1. Repeater Kit 319.5, w/Crystal Transmitter
      a. Interlogix 80-922-1
         1) Provide power supply as required by manufacturer.

D. Intrusion Detection Control Panel Cellular Interface
   1. Cellular Module (Existing in MDF)
      a. Alarm.com cell module kit 600-1053-LTE-AT
      b. Alarm.com software / mobile application licenses as required
      c. Provide mobile application licensing as required by owner

E. Intrusion Detection Arming/Disarming Device
1. Keypad
a. General Electric Alpha Keypad ATP1000

F. Intrusion Detection Motion Sensors
1. Long Range Motion Sensor - (Hard Wired)
a. Honeywell DT906
2. Passive Infrared Motion Sensor – (Hard Wired)
a. Bosch ISC-PDL1-W18G
b. Bosch Mounting Bracket, Gimbal – B328
c. Or approved equal

G. Door Contact
1. Recessed
a. SPST
1) GRI 190-12WG (Intrusion Doors Only)
2) Or approved equal
b. DPDT
1) GRI 195-12WG (Exterior Card Reader Doors Only)
2) Or approved equal
c. Sounders and Strobes
1) Electric Siren
a) Supplied with the Interlogix Concord 4

H. Power Equipment
1. Power Supply
a. 12V DC
1) Supplied with the Interlogix Concord 4
b. Altronix AL Series
c. Or approved equal
1) Power Distribution Boards
a) Altronix PD8
b) Or approved equal
2) Batteries
a) Yuasa NP7-12
b) Or approved equal

I. Intrusion Detection System Cabling (Plenum Rated - Yellow Overall Jacket)
1. Expansion Module Communication Cable
a. Belden18/4 Plenum Rated - Yellow Jacket
b. Or approved equal
2. Keypad Cable
a. Belden18/4 Plenum Rated - Yellow Jacket
b. Or approved equal
3. Motion Sensor cable
a. 18/4 Plenum Rated - Yellow Jacket
b. Or approved equal
4. Door Contact Cable
a. Belden 22/2 Plenum Rated – Yellow Jacket
b. Or approved equal
1) Acceptable Cable Manufacturers
a) Belden
b) Superior Essex
c) Tappan

d) Lake
e) Or approved equal

J. Pathway Cable Support
1. Panduit J-Mod Cable Support System
2. Erico – CADDY CAT LINKS J-Hook Series
3. Panduit Plenum Rated Hook & Loop (Black)
a. Or approved equal

K. Labeling
1. Permanent Labels for Copper Cables
a. Panduit Self-Laminating Labels
b. Or approved equal

L. Fire Stop
1. STI Spec Seal
2. 3M Products
3. Or approved equal

M. Unit Pricing
1. Security Contractor, at the time of bid, shall submit Unit Pricing as Follows:
a. Demo/Dispose (1) Door Contact Cable and then reinstall new and terminate (1) Door Contact Cable as specified.
1) 100 Linear Feet Cable.
2) 200 Linear Feet Cable.
3) 300 Linear Feet Cable.
b. Demo/Dispose (1) Motion Detector Cable and then reinstall new and terminate (1) Motion Detector Cable as specified.
1) 100 Linear Feet Cable.
2) 200 Linear Feet Cable.
3) 300 Linear Feet Cable.
c. Demo/Dispose (1) Keypad Cable and then reinstall new and terminate (1) Keypad Cable as specified.
1) 100 Linear Feet Cable.
2) 200 Linear Feet Cable.
3) 300 Linear Feet Cable.

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements – (May 2001)

B. TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces - (October 2004)

C. TIA/EIA-606-A Administration Standard for Commercial Telecommunications Infrastructure - (May 2002)

D. ANSI J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications - (October 2002)

E. TIA-758-A Customer-owned Outside Plant Telecommunications Infrastructure Standard - (August 2004)

F. AIA

G. Local

H. NEC

I. ISO

J. FCC

K. UL

L. OSHA

M. NFPA

N. NEMA

O. Plenum Applications

P. Applicable Flame Test: UL 910 (NFPA 262 1990).

3.2 EXECUTION - GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the ARCHITECT / DESIGN CONSULTANT / DESIGN CONSULTANT/ for direction before proceeding with that part of the work.

B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.

C. The Contractor shall install the materials in accordance with these specifications and the manufacturer’s installation guidelines. Equipment and materials installed by the Contractor shall be free of defects and damage.

D. No deviations from the plans, details or specifications shall be made without full consent in writing of the Architect / Owner / Design Consultant. The Contractor shall have written approval from the Architect / Owner / Design Consultant for any additional work beyond the Contract Documents prior to beginning such work.

E. In the event site conditions do not allow the contractor to follow the execution requirements specified herein or in the provided details, the Contractor shall submit via RFI an alternative means and methods that is approved in writing by the Architect / Owner / Design Consultant.

F. The Contractor shall obtain written permission from the Architect / Owner / Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to: girders, beams, floors, walls, roofs, and/or ceilings.

G. If the Contractor does not obtain written approval from the Architect / Owner / Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

H. Contractor shall notify the Architect / Owner / Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect / Owner / Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

I. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

J. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

K. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

L. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect / Owner / Design Consultant.

M. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

N. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

O. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect / Owner / Design Consultant.

P. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

Q. Devices installed in public spaces shall be mounted and secured using tamper-proof security fasteners unless otherwise noted.

R. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

S. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

T. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

U. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

V. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:
1. The contractor shall scan contractor owned equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the contractor owned devices to the Owners network.
2. Ensure all technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics, i.e. servers, and other associated equipment.
3. All project documents shall be properly securely stored behind encryption and password protection to avoid unauthorized distribution of documents.

W. Labeled Doors and Frames
1. In no instance shall any UL labeled door or frame be drilled, cut, penetrated, or modified in any way.
2. The Contractor shall be responsible for replacing any labeled door or frame that is modified without written approval from the Architect.

3.3 COORDINATION REQUIREMENTS

A. The Contractor is responsible for the coordination of the following items and their respective disciplines included but not limited to.

B. Coordinate with the Architect to ensure that:
1. Adequate conduit is provided and that equipment backboxes are adequate for system installation.
2. Adequate power has been provided and properly located for the security system equipment.
3. Doors and door frames are properly prepared for door position switches.
4. Access hatch locations (when required) shall be submitted in writing via RFI and coordinated with the Architect.
5. Finishes and colors of all equipment visibly installed in public areas. Submit all finish and graphics for all equipment to the Architect for approval prior to installation.

C. Coordinate with the Division 26 contractor for the following:
1. High voltage power pathways, grounding, and bonding requirements.
2. Pathways, rough ins, back boxes, and conduit sizes for all Intrusion Detection peripheral devices.

D. Coordinate with the Division 27 contractor for the following:
1. Installation and power requirements of network infrastructure associated to the specified Intrusion Detection System
2. Associated patch cable lengths and quantities required for the specified Intrusion Detection System
3. Location, power, and backup requirements for rack mount equipment.

E. The Contractor is responsible for coordinating Intrusion Detection System locations and mounting preferences of all specified security devices with the Architect / Design Consultant / Design Consultant prior to installation.

F. The Contractor is responsible for coordinating all Intrusion Detection System programming requirements with the Architect / Owner.

G. The Contractor shall coordinate with the Owner for the following:
1. Credential reader card formats, LED, buzzer and associated visual/audio functionalities.
2. Credential card ordering, formats, facility codes, barcode and template requirements or standards prior to install. Coordinate timelines for delivery and distribution of the credentials to the Owner prior to procurement.
3. Naming Conventions of devices, controllers, doors, etc.

3.4 SYSTEM REQUIREMENTS

A. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a complete and functioning system. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity shall be furnished.

B. Intrusion Detection Control Boards
1. Control Panels
a. Data Gathering Panel
1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact data gathering panel location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
5) The Contractor shall program the data gathering panel and ensure the panel can communicate with other intrusion detection devices.
b. Network Interface
1) The Contractor shall furnish and install the following as indicated on the technology drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact device location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
5) The Contractor shall program all network address information for data gathering panel and ensure communication is established between the network interface and the control panel.
2. Expansion Module

a. Eight Zone Expander
1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.

3) The Contractor shall coordinate exact expansion module location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
5) The Contractor shall program the expansion module and ensure the panel can communicate with other intrusion detection devices.

C. Intrusion Detection Arming/Disarming Device
1. Keypad
a. Alphanumeric
1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact keypad location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
5) The Contractor shall program the keypad and ensure communication is established between the keypad and the data gathering panel.
b. Alphanumeric with Zone Expander
1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact keypad location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
5) The Contractor shall program the keypad and ensure communication is established between the keypad and the data gathering panel.

D. Intrusion Detection Components
1. Motion Sensor
a. Wall Mount
1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact motion sensor location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
b. Ceiling Mount
1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact motion sensor location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
c. Long Range

1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact motion sensor location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.

2. Door Contact
   a. Recessed
      1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
      2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
      3) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
   b. Surface Mount
      1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
      2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
      3) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
3. Sounders and Strobes
   a. Electric Siren
      1) The Contractor shall furnish and install the following as indicated on the security drawings and associated equipment schedules and diagrams.
      2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
      3) The Contractor shall coordinate exact electric siren location prior to installation.
      4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines
      5) The Contractor shall ensure data gathering panel activates siren upon alarm input.

E. Power Equipment
1. Power Supply
   a. 12 VDC
      1) The Contractor shall furnish and install the following as indicated on the technology drawings and associated equipment schedules and diagrams.
      2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
      3) The Contractor shall coordinate exact power supply location prior to installation.
      4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
      5) The Contractor shall be responsible for all low voltage terminations, high voltage power supply terminations will be provided by others (Div. 26).
   b. 24 V DC

1) The Contractor shall furnish and install the following as indicated on the technology drawings and associated equipment schedules and diagrams.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact power supply location prior to installation.
4) The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
5) The Contractor shall be responsible for all low voltage terminations, high voltage power supply terminations will be provided by others (Div. 26).

F. Equipment Housing
1. Enclosures
a. Indoor Enclosure
1) The Contractor shall furnish and install the following.
2) The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
3) The Contractor shall coordinate exact enclosure location prior to installation.

G. Intrusion Detection System Cabling
1. Pathways
a. Wires shall be routed utilizing the pathways as indicated in the technology drawings. Reference Division 27 specifications for additional requirements.
b. Intrusion Detection cabling shall be routed separate from the network data communication cables specified in Division 27. Contractor shall provide separate pathways and j-hooks for the cables specified herein.
2. Wiring Techniques
a. All cables shall be pre-tested for shorts prior to final device terminations after cables are installed.
b. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored in the provided enclosure(s) as detailed in the drawings. If an enclosure is not provided for the specified devices herein, the service loop shall be installed on a j-hook in the nearest accessible ceiling space closest to the device.
c. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored at the Intrusion Detection panel.
d. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored on the wall above the ladder rack in the regional MDF/IDF room(s).
e. Install code compliant fire proofing techniques for all penetrations of fire rated partitions and slabs, where the penetrations are made by or used for installation of the ACS.
f. All wire and cable shall be continuous from device location to the final point of termination ("Home Run"). No mid-run cable splices shall be allowed.
g. Wire and cable within control panels, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied. Velcro cable ties shall be utilized.
h. Neatly bundle and wrap all horizontal / vertical runs (above accessible ceilings and not within conduit) wire and cable at intervals as code requires. Provide supports as required. All supports shall be UL listed for the application.

i. All system wiring within vertical riser shafts (as required) shall be bundled, wrapped, and tied to the structure at one-meter intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors using manufacturer approved vertical management hardware and installation methods. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.
j. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on wire and cable.

3. Splices / Transitions
   a. Home run cabling is the preferred method of installation for all Intrusion Detection System devices and panels.
   b. In the unlikely event that a splice or transition is required, the Contractor shall identify all splices / transition points required for the completion of the project and confirm, in writing, in advance, via RFI with the Architect / Owner / Design Consultant for acceptance of the proposed wiring techniques to be utilized.
   c. By not submitting an RFI, Contractor acknowledges that no major splicing is required for the completion of this project. Any splices not previously identified that are found to be faulty shall require the Contractor to re-install the affected cable in its entirety at no cost to the Owner.
   d. Contractor shall clearly mark splices / transition points on the shop drawings and As-Built drawings as part of the project close-out.
4. Cable Dressing
   a. No excessive cable slack shall be left in enclosures.
   b. Cables shall be dressed in a professional manor
   c. Cables shall be routed in 90-degree angles to termination points inside enclosures.
   d. Ty raps / zip ties are not permitted, hook and loop / Velcro is acceptable.
   e. Exposed wires are not acceptable
   f. Enclosures and equipment / Telecommunication room shall be left clean without debris including but not limited to: labels, connectors, screws, etc.
   g. All spare / unused cables shall be in the enclosure shall be neatly coiled and protected to avoid any shorts to ground.
5. Labeling
   a. Contractor shall verify room numbers and confirm the final room numbering scheme and Owner's current standard in writing in advance via RFI prior to generating any labels.
   b. Cables overall sheath shall be labeled within (6) inches from the point the cable enters/exits the enclosure inside the Equipment Room / Telecommunications / Security Control Location Rooms.
   c. Cables shall be labeled within (3) inches from the termination point inside the Equipment Room / Telecommunications / Security Control Location Rooms.
   d. Cables shall be labeled within (3) inches from the termination point at the device end.
   e. Cables shall be labeled identically at both ends.
   f. Label all controls as necessary to agree with their function.
   g. All labeling in the field shall match the same labeling scheme in the closeout documents.

H. Fire Stop / Smoke / Sound Sealants
1. Use proper sealant as recommended by the manufacturer for the specific application in compliance with per all applicable codes: City, State, Federal, LAHJ.

2. All existing pathways shall be resealed in compliance with per all applicable codes: City, State, Federal, LAHJ.

I. Grounding and Bonding
1. The Contractor shall ensure metal-to-metal contact for all grounding terminations.
2. All materials shall be UL Listed.
3. All connections shall be made with UL Listed compression 2-hole lugs.
4. Contractor shall use an anti-oxidation compound on all connections.
5. In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TMGB and TGB shall be bonded to the vertical steel metal frame using a minimum # 6 AWG plenum rated green insulated conductor.
6. A Grounding Equalizer conductor shall be installed when required by ANSI/TIA/EIA-607-B (Interconnects multiple TBBs on the top floor and every 3rd floor in between).
7. The connection to building steel does not eliminate the requirement for the TBB or EBC to the service ground.
8. Equipment Bonding Conductor (EBC)
   a. Contractor shall furnish and install a minimum #6 AWG plenum rated green insulated conductor from the TMGB or TGB as applicable to each ladder rack system, equipment rack, cabinet, metallic raceway, lightning protector, or multi-pair cable with a metallic element. Contractor shall use an anti-oxidation compound on all connections.
   b. When exceeding (13) feet the EBC shall be sized at (2) kcmil per linear foot of conductor length up to a maximum of 750 kcmil.

J. Conduit, Boxes and Raceways (For Reference Only - By Division 26)
1. Install all conduit necessary for a complete installation, but not provided for in the Security Drawings, in finished areas concealed in chases, furring's, concrete slabs and/or above suspended ceilings. No exposed conduit shall be installed within public areas.
2. Conduit shall be carefully installed, properly and adequately supported as required to comply with the requirements outlined herein and as required by the NEC to provide a neat, industry-standard installation. Horizontal conduit runs shall be supported by clamps, pipe straps, special brackets, or heavy iron tie, tied to the black iron structural members supporting the ceiling. Fastening of conduit to masonry walls, floor or partitions require malleable pipe clips with screws and suitable expansion sleeves.
3. All conduit shall be cut accurately to measurements established at the building and shall be installed without springing or forcing.
4. All required inserts shall be drilled-in and all openings required through concrete or masonry shall be saw cut or core drilled with tools specifically designed for this purpose.
5. Swab out and remove all burrs from conduit before any wires are pulled.
6. Lay out and install conduit runs as to avoid proximity to hot pipes. In no case shall a conduit be run within 75 mm of such pipes, except where crossings are unavoidable and then the conduit shall be kept at least 25 mm from the covering of the pipe crossed.
7. Provide fire stops where conduits penetrate fire rated walls and/or floors.
8. All conduit installation, whether run exposed or concealed, shall be approved prior to installation by the Architect.

K. High Voltage (120VAC) Power Requirements (For Reference Only – by Division 26)

1. 120VAC AC power dedicated to security shall be provided by the electrical contractor for the Intrusion Detection system as indicated on drawings. Coordinate with the Architect to establish locations of security dedicated 120VAC AC circuits.
2. Connect to the AC power (provided by electrical contractor) and provide UL listed power supplies and transformers to distribute low voltage power to the system components as required.
3. Provide all conduit and wiring from the AC power facilities to the Intrusion Detection / Power Supply Enclosures.
4. Provide Mechanical separation to isolate 120VAC wires from other low voltage cabling. Low voltage cabling shall not route over/under/parallel to 120VAC wires.

L. Surge Protection / Lightning Arrestors
1. Protect all exterior or interior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.
2. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.
3. Surge devices shall be installed as close as accessibly possible to the equipment they are protecting.
4. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.
5. Include surge protection device locations on as-builts and shop drawings.
6. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.
7. Properly ground surge protection devices per the manufacturer installation requirements.

3.5 TESTING REQUIREMENTS

A. System Start-Up
1. The Work shall be complete and ready to operate prior to final acceptance.
2. The Architect shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner's operation.

B. Substantial Completion
1. In order to qualify for the Architect's consideration of Substantial Completion, the Work must, at a minimum, meet the following requirements:
   a. Installation of all devices must be completed.
   b. All sub-system interfaces must be complete and operational.
2. Substantial Completion shall not be misconstrued as final acceptance of the Work.

C. System Acceptance
1. Final acceptance testing of the Work will be conducted by the Architect.
2. Prior to any final acceptance testing, the Contractor shall submit two sets of preliminary (draft) Record Drawings to the Architect. The preliminary Record Drawings are to be used by the Architect to conduct the system final test.
3. Before system acceptance testing the Security Contractor shall conduct a complete in-house QA/QC test of the entire Intrusion Detection System and provide a written report on the results of that test. During the QA/QC test the Security Contractor shall place the Intrusion Detection System in service mode and calibrate and test all equipment.
4. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test. The intent of the burn-in test shall

be to prove the Intrusion Detection system by placing it in near real operating conditions. During this period, the Intrusion Detection system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.

5. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Architect that the installed complete Intrusion Detection system has been calibrated, tested, and is fully functional as specified herein.
6. Prior to the final acceptance test, coordinate with the Architect for security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery, and all surplus materials.
7. Upon written notification from the Contractor that the Intrusion Detection system is completely installed, integrated and operational, and the burn-in testing completed, the Architect will conduct a final acceptance test of the entire system.
8. During the course of the final acceptance test by the Architect, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing "as built" conditions of the Intrusion Detection system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Intrusion Detection system head-end equipment will be evaluated.
9. The functionality of the various interfaces between systems will be tested.
10. Following the Intrusion Detection system head-end equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installations, complete functionality of each individual device, and mounting, backbox and conduit requirements compliance.
11. All equipment shall be on and fully operational during any and all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. Provide a minimum of two employees familiar with the system for the final acceptance test. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two two-way radios for use during the test. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Architect or Owner, at no charge to the Architect or Owner.
12. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Architect will issue a letter of final acceptance.
13. The Architect retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner's/Architect's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the Drawings. The Contractor shall supply the Architect with a detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent

punch list retest. During the final acceptance test, no adjustments, repairs, or modifications to the system will be conducted without the permission of the Architect.

3.6 PROJECT CLOSEOUT DOCUMENTATION REQUIREMENTS

A. As-Built Drawings
1. Drawings shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect / Owner / Design Consultant.
2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Architect / Owner / Design Consultant electronically.
3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
4. Drawings shall be provided in the original size as issued by the Architect/Design Consultant.
5. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect/Design Consultant.
6. Provide a conformed set of Drawings as related to the project, depicting the condition of the Intrusion Detection system as installed to include but not limited to:
a. ASI, PR and Addendum items installed throughout the duration of the project.
7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Intrusion Detection System enclosure. Coordinate with Owner for final storage location.
8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:
    a. Intrusion Detection System Riser / Signal Flow Diagrams
    b. Intrusion Detection System Backboard Layouts
        1) To include Intrusion Detection boards, power supplies, pathways, etc.
    c. Sleeves, Backbone Cabling and Communication pathways
    d. Intrusion Detection System device locations and labeling scheme.

B. Operation & Maintenance Manuals
1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer's Product Warranty
1. Certificate of product warranty shall be provided to the Architect / Owner / Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect/Design Consultant.
2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
3. One original and two copies of the Manufacturer's product warranty shall be provided.

D. Contractor's Statement of Warranty
1. Statement of warranty shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be

recommended until statement of warranty is received and approved by the Architect / Owner / Design Consultant.

2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 28 16 00

SECTION 28 2300
VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section identifies the technical design, specifications, and requirements for the Video Surveillance System for the Judson Independent School District Crestview Elementary School Modernization and Improvements, located in Universal City, Texas ("Owner"). The Video Surveillance System as specified is an Industry-Standard Video Surveillance System and includes, Demo, IP cameras, mounts, power, cabling and any associated software, licensing as specified.

B. It is the Contractor's responsibility to review this specification and associated project specifications and drawings in their entirety, prior to bidding on the project. By bidding on this project, the contractor acknowledges that they have read and fully understand these specifications, with no exceptions. Contractor shall review the drawings, specifications, and existing conditions prior to bidding on the project. Any discrepancies shall be brought to the attention of the Architect/Design Consultant via request for information (RFI) in writing for evaluation and or clarification. If these items are not brought to the attention of the architect/Design Consultant the more costly or difficult manner, and the better quality or greater quantity of work shall be provided by the contractor in accordance with the Architect's/Design Consultant's interpretation at no additional cost to the owner.

C. Contractor shall furnish and install all materials, equipment, and labor necessary to provide the demolition and an expansion of the existing Video Surveillance system regardless of any items not listed or described in this specification or associated drawings.

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1.3 RELATED REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 28 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.

B. In the execution of this work, the Contractor shall comply in every way with the requirements of local laws and ordinances, the laws of the State of Texas, the National Board of Fire Underwriters, OSHA, accepted industry standards and the National Electrical Code. If, in the opinion of the Contractor, there is anything in the specifications that will not strictly comply with the above laws, ordinances, and codes, the matter shall be referred to Architect for a decision before proceeding with that part of the work.

1.4 CONTRACTOR EXPERIENCE REQUIREMENTS

A. The Contractor shall be a certified Video Insight Preferred Partner prior to submitting a bid for the work.

B. The Contractor shall possess all relevant Manufacturer Certifications (i.e. Video Surveillance systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.

C. The Contractor shall have a manufacturer certified technician onsite throughout the duration of the installation phase of the project.

D. The Contractor's Project Manager shall be dedicated to this project for the duration of the project and shall be available for all onsite coordination meetings.

E. The Contractor shall have been in business for a minimum of five (5) years.

F. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.

G. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

H. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

I. The Contractor and related subcontractor will comply and provide proof of compliance to STATE of TEXAS OCCUPATIONS CODE,
   1. TITLE 10. OCCUPATIONS RELATED TO LAW ENFORCEMENT AND SECURITY
   2. CHAPTER 1702. PRIVATE SECURITY, OCCUPATIONS CODE CHAPTER 1702. PRIVATE SECURITY

1.5 SUBMITTAL REQUIREMENTS

A. Bid / Proposal Submittal
   1. Contractor shall provide as part of their bid/proposal:

a. Breakdown of proposed parts and labor required for the completion of the project.
b. Proposed construction schedule in a Gant chart format
c. Detailed Safety Plan
d. Detailed documentation of QA/QC
e. A detailed description of the installation team(s) that would perform the work.
f. A resume for each of the key project personal.
g. A list of all Sub Contractors and their scope of work shall be identified at the time of bid. All Sub Contractors will fully comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

B. Pre-Installation Submittal
1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect / Owner / Design Consultant.
2. The Contractor is responsible for notifying the Architect / Owner / Design Consultant in writing of any proprietary devices, software credentials or installation processes. Written approval must be obtained by the Architect / Owner / Design Consultant prior to proceeding.
3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements.
4. Contractor shall ensure submittals are submitted in 10 business days to ensure all products can be ordered and received on site in order to not cause any delays. Any products having long lead times (more than 60 days) that may negatively impact the schedule shall be clearly identified in writing so the review and approval can be expedited.
5. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e. product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.
6. Contractor shall provide the following as part of their submittal:
    a. Manufacturer product data sheets for each proposed system component.
        1) For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.
        2) Contractor shall identify any products that are discontinued, end of life, or near end of life, and shall propose equal alternate to the discontinued product in writing.
            a) Manufacturer Product Certifications for Company.
            b) Manufacturer Product Certifications for Installers.
            c) Manufacturer Warranty letters.
            d) Documentation indicating that Contractor has been in business for (5) years.
            e) Address of Contractor’s local office within a 75-mile radius of the project site.
            f) Quantity of full-time, local technicians within a 75-mile radius of the project site.
            g) List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project

Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.

h) List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

i) List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.

j) Manufacturer's certification letter confirming that the proposed Video Surveillance system components do not have any known cybersecurity notices, bulletins, or alerts. If a vulnerability is discovered, the contractor shall notify the Architect / Owner / Design Consultant within 24 business hours. Provide the make and model of the associated equipment and the vulnerability.

k) Manufacturer cybersecurity hardening guide. If one is not available, provide documentation from the manufacturer stating such.

l) A complete set of shop drawings to include but not limited to:
   (1) Device locations
   (2) Cable Type and Pathways
   (3) Panel Termination Schedule
   (4) Elevation Drawings to illustrate the associated devices and the heights at which they will be installed.
   (5) Naming Convention Information
   (6) Signal Flow Diagram including full topology.

m) Supplemental documents to include but not limited to:
   (1) Safety Plan
   (2) Contractor QA/QC Document
   (3) Construction Schedule in a Gant chart format
   (4) Contractor Cybersecurity Hardening Guide
   (5) Information on service calls, to include all rates and hours of operation

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. Unless otherwise stated, all wiring, equipment, and installation materials shall be Commercial Grade, new, and of the highest quality to meet or exceed the performance and features of the equipment and devices specified herein.

C. Architect / Owner / Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

D. Proposed equivalent items must be approved in writing by the Architect / Owner / Design Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

E. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.

F. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished at no additional cost to the owner.

G. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

H. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

I. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect / Owner / Design Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA 568-C standards where applicable.

J. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect / Owner / Design Consultant. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues and the Contractor will have all products on-site when needed to complete the job as per the project schedule.

K. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a fully functional system. Where quantities are not noted, they may be obtained from the drawings.

L. All software, hardware, and equipment (from the date of RFP) shall be tested, currently available and commercially off the shelf product. (COTS).

M. Written approval must be obtained from the Architect / Owner / Design Consultant for any proprietary or custom software and/or equipment prior to the beginning of the project.

2.2 SYSTEM REQUIREMENTS

A. The Video Surveillance system as specified is an industry-standard and is a PoE based design with IP cameras, mounts, cabling, PoE power and an owner provided (existing) virtualized Video Surveillance server. This Video Surveillance system shall be provided to the owner as a full turn-key Video Surveillance system, with no exceptions. Any design conflicts shall be brought to the security designer with 24 hours of discovering the problem, prior to bidding for this scope of work.

B. Contractor shall provide and install a complete and functional IP-based Video Insight Video Surveillance System that includes, but not limited to: any additional licenses, IP cameras, mounts, rough-ins and cabling. The Security Contractor will coordinate with Division 27 & 26 Contractors to assure the requirements for the rough-in and cabling for Div. 28. Security Contractor shall verify all Div. 27 & 26 rough-ins and cabling are in place in advance of installation of Div. 28 networked devices.

2.3 ACCEPTABLE MANUFACTURERS

A. VMS Server
   1. Video Insight VI Monitor 6
      a. Existing; virtualized
   2. Camera IP Licensing
      a. All camera licensing shall be Unlimited
         1) Contractor shall confirm exact version of unlimited IP camera license required with JISD Security Department prior to purchasing.

B. Cameras
   1. ACTi
      a. Interior Fixed
         1) E63A
            a) Wall Mount
               (1) PMAX -0807
            b) Ceiling Tile Support
               (1) T-Grid Box Hangers
               (2) Caddy – 512HD (By Div. 26)
               (3) Double Gang Backbox (By Div.26)
               (4) Dual Gang Mud Ring (By Div. 26)
      b. Interior 180/360
         1) B511A
            a) Wall Mount
               (1) PMAX -0338
            b) Ceiling Tile Support
               (1) T-Grid Box Hangers
               (2) Caddy – 512HD (By Div. 26)
               (3) Double Gang Backbox (By Div.26)
               (4) Dual Gang Mud Ring (By Div. 26)
      c. Exterior Fixed
         1) E73A
            a) Wall Mount
               (1) PMAX - 0804
      d. Exterior 180
         1) B76A
            a) Wall Mount
               (1) PMAX-0338

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)
   1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
   2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
   4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

C. Alliance for Telecommunications Industry Solutions (ATIS)

D. Building Industry Consulting Service International (BICSI)
1. Telecommunications Distribution Methods Manual 13th Edition
2. Outside Plant Design Reference Manual 5th Edition
3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

E. Federal Communications Commission (FCC)
1. FCC Part 15, Radiated Emissions Limits, revised 1998
2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
3. FCC Part 76, Cable Television Service, revised 1998

F. Insulated Cable Design Consultants Association (ICEA)
1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

G. International Electrotechnical Commission (IEC)

H. Institute of Electrical and Electronics Design Consultants, Inc. (IEEE)
1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

I. International Organization for Standardization (ISO)
1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
3. ISO/IEC 14443-3:2011 – Identification Cards
4. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999

J. National Cable Television Association (NCTA)

K. National Electrical Contractors Association (NECA)
1. NECA 1-2015 Good Workmanship in Electrical Construction

L. National Electrical Manufacturers Association (NEMA)
1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits

M. National Fire Protection Association (NFPA)
1. NFPA-70, National Electrical Code
2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
3. NFPA-101, Life Safety Code
4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
5. NFPA-780, Standard for the Installation of Lightning Protection Systems.

N. National Institute Standards and Technology (NIST)

O. Occupational Safety and Health Administration (OSHA)

P. Security Industry Association (SIA)

Q. Telecommunications Industry Association (TIA)
1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
5. ANSI/TIA–569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.
7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

R. U.S. Department of Agriculture (USDA)
1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
2. RUS Bull 1751F-643 (2002) Underground Plant Design
3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)

S. Underwriters Laboratories, Inc. (UL)
1. UL 294 Standard for Access Control System Units
2. UL 294B Standard for Power Over Ethernet (PoE) Power Sources for Access Control Systems and Equipment
3. UL 109 Standard Method for Flame Tests of Flame-Resistant Fabrics and Films
4. UL 1076 Standard for Proprietary Burglar Alarm Units and Systems

3.2 EXECUTION - GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the

matter shall be referred to the Architect / Owner / Design Consultant for direction before proceeding with that part of the work.

B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.

C. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines. Equipment and materials installed by the Contractor shall be free of defects and damage.

D. No deviations from the plans, details or specifications shall be made without full consent in writing of the Architect / Owner / Design Consultant. The Contractor shall have written approval from the Architect / Owner / Design Consultant for any additional work beyond the Contract Documents prior to beginning such work.

E. In the event site conditions do not allow the contractor to follow the execution requirements specified herein or in the provided details, the Contractor shall submit via RFI an alternative means and methods that is approved in writing by the Architect / Owner / Design Consultant.

F. The Contractor shall obtain written permission from the Architect / Owner / Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to: girders, beams, floors, walls, roofs, and/or ceilings.

G. If the Contractor does not obtain written approval from the Architect / Owner / Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

H. Contractor shall notify the Architect / Owner / Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect / Owner / Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

I. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

J. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

K. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

L. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect / Owner / Design Consultant.

M. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

N. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

O. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect / Owner / Design Consultant.

P. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

Q. Devices installed in public spaces shall be mounted and secured using tamper-proof security fasteners unless otherwise noted.

R. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

S. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

T. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

U. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

V. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:
   1. The contractor shall scan contractor owned equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the contractor owned devices to the Owners network.
   2. Ensure all technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics, i.e. servers, and other associated equipment.
   3. All project documents shall be properly securely stored behind encryption and password protection to avoid unauthorized distribution of documents.

W. Quantities are not provided the contractor is responsible for furnishing materials as required to provide a complete and fully functioning video surveillance system. Quantities may be obtained from the drawings/schedule. In the event of a discrepancy between video surveillance specifications and the drawings, the greater quantity shall be furnished. The contractor shall also notify the Design Consultant of any discrepancies immediately.

X. This contract involves interoperability with currently functioning systems at other campuses. Coordination with the Owner is critical. Do not interrupt any functioning system without prior approval from the Owner.

Y. Install all components to provide aesthetically pleasing results. Coordinate the actual locations of all visible components in advance with the Owner.

Z. All wiring and cable shall be plenum rated.

AA. J box locations, equipment locations and special criteria are indicated on the drawings where necessary. Coordinate exact j box locations with Owner prior to installation.

BB. All exterior cameras shall be connected to the local power circuit for environmental features by means of a contractor-provided power supply.

CC. Contractor shall coordinate with the Owner, network integrator, and Division 27 contractor for the patching, configuration, and commission of the network-attached cameras.

DD. Contractor shall create and test each view in conjunction with the Owner.

EE. The contractor shall provide and install the cameras, associated hardware, and camera mounts. Judson ISD will configure the devices.

FF. The contractor shall make at least one visit after the configuration of cameras by Judson ISD to make any physical installation adjustments and or corrections to camera installations as required by Judson ISD.

GG. The contractor will make a minimum of (1) viewing adjustment per camera (physical or logical) to the cameras as directed by Judson ISD prior to being released from the project.

HH. Prior to aiming and focusing cameras, Contractor shall coordinate live camera views with approved JISD Security Department Personnel.

3.3 COORDINATION REQUIREMENTS

A. The Contractor is responsible for the coordination of the following items and their respective disciplines included but not limited to.

B. Coordinate with the Architect to ensure that:
1. Adequate conduit is provided and that equipment backboxes are adequate for system installation.
2. Adequate power has been provided and properly located for the security system equipment.
3. Access hatch locations (when required) shall be submitted in writing via RFI and coordinated with the Architect.
4. Finishes and colors of all equipment visibly installed in public areas. Submit all finish and graphics for all equipment to the Architect for approval prior to installation.

C. Coordinate with the Division 26 contractor for the following:
1. High voltage power pathways, grounding, and bonding requirements.
2. Pathways, rough ins, back boxes, and conduit sizes for all Video Surveillance peripheral devices.

D. Coordinate with the Division 27 contractor for the following:
1. Installation and power requirements of network infrastructure associated to the specified Video Surveillance System

2. Associated patch cable lengths and quantities required for the specified Video Surveillance System
3. Location, power, and backup requirements for rack mount equipment.

E. The Contractor is responsible for coordinating Video Surveillance locations and mounting preferences of all specified security devices with the Architect / Design Consultant / Design Consultant prior to installation.

F. The Contractor is responsible for coordinating all Video Surveillance System programming requirements with the Architect / Owner.

3.4 SYSTEM REQUIREMENTS

A. Video Surveillance System Software/Hardware
1. Video Surveillance Management System
   a. Video Insight (Latest Version)
      1) Existing Video Insight and Contractor to provide an extension to the existing system.
      2) The Contractor shall configure all associated video surveillance system software to include video viewing clients. The number and location of video viewing clients to be determined by Owner.
      3) The Contractor shall provide and then install the software in accordance with Manufacturer's installation instructions.
      4) The Contractor shall ensure communication is established between the electronic surveillance management system and installed surveillance cameras:
   b. Video Surveillance System Licensing
      1) The Contractor shall furnish and install camera and licensing as required per facility to furnish a fully operational video surveillance system.
      2) The Contractor shall provide installation and configuration of the files in accordance with Manufacturer's installation instructions.
2. Video Surveillance System Server
   a. Network Server
      1) Owner Furnished / Owner Installed (OFOI).

B. Surveillance Cameras - Interior Cameras
1. Interior Fixed
   a. The Contractor shall furnish and install the following cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
   b. The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
   c. The Contractor shall coordinate exact camera location prior to installation.
   d. The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
   e. The Contractor shall program all network address information for the camera and ensure the camera can communicate with the electronic surveillance system server.
   f. Provide camera mounts which are compatible with the respective camera.
   g. Camera will receive power through PoE Power of Ethernet.
2. Interior 180/360
   a. The Contractor shall furnish and install the following cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
   b. The Contractor shall provide installation in accordance with Manufacturer's installation instructions.

c. The Contractor shall coordinate exact camera location prior to installation.
d. The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
e. The Contractor shall program all network address information for the camera and ensure the camera can communicate with the electronic surveillance system server.
f. Provide camera mounts which are compatible with the respective camera.
g. Camera will receive power through PoE Power of Ethernet.

C. Surveillance Cameras - Exterior Cameras
1. Exterior Fixed
a. The Contractor shall furnish and install the following cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
b. The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
c. The Contractor shall coordinate exact camera location prior to installation.
d. The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
e. The Contractor shall program all network address information for the camera and ensure the camera can communicate with the video surveillance system server.
f. Provide camera mounts which are compatible with the respective camera.
g. Camera will receive power through PoE Power of Ethernet.
h. Seal and make watertight all exterior wall and or roof penetrations.
2. Exterior 180
a. The Contractor shall furnish and install the following cameras as indicated on the technology drawings and associated equipment schedules and diagrams.
b. The Contractor shall provide installation in accordance with Manufacturer's installation instructions.
c. The Contractor shall coordinate exact camera location prior to installation.
d. The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.
e. The Contractor shall program all network address information for the camera and ensure the camera can communicate with the video surveillance system server.
f. Provide camera mounts which are compatible with the respective camera.
g. Camera will receive power through PoE Power of Ethernet.
h. Seal and make watertight all exterior wall and or roof penetrations.

D. Video Surveillance Cabling (By Div. 27)
1. Pathways
a. Wires shall be routed utilizing the pathways as indicated in the technology drawings. Reference Division 27 specifications for additional requirements.

E. Grounding and Bonding
1. The Contractor shall ensure metal-to-metal contact for all grounding terminations.
2. All materials shall be UL Listed.
3. All connections shall be made with UL Listed compression 2-hole lugs.
4. Contractor shall use an anti-oxidation compound on all connections.
5. In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TMGB and TGB shall be bonded to the vertical steel metal frame using a minimum # 6 AWG plenum rated green insulated conductor.

6. A Grounding Equalizer conductor shall be installed when required by ANSI/TIA/EIA-607-B (Interconnects multiple TBBs on the top floor and every 3rd floor in between).
7. The connection to building steel does not eliminate the requirement for the TBB or EBC to the service ground.
8. Equipment Bonding Conductor (EBC)
   a. Contractor shall furnish and install a minimum #6 AWG plenum rated green insulated conductor from the TMGB or TGB as applicable to each ladder rack system, equipment rack, cabinet, metallic raceway, lightning protector, or multi-pair cable with a metallic element. Contractor shall use an anti-oxidation compound on all connections.
   b. When exceeding (13) feet the EBC shall be sized at (2) kcmil per linear foot of conductor length up to a maximum of 750 kcmil.

F. Conduit, Boxes and Raceways (For Reference Only - By Division 26)
1. Install all conduit necessary for a complete installation, but not provided for in the Security Drawings, in finished areas concealed in chases, furring's, concrete slabs and/or above suspended ceilings. No exposed conduit shall be installed within public areas.
2. Conduit shall be carefully installed, properly and adequately supported as required to comply with the requirements outlined herein and as required by the NEC to provide a neat, industry-standard installation. Horizontal conduit runs shall be supported by clamps, pipe straps, special brackets, or heavy iron tie, tied to the black iron structural members supporting the ceiling. Fastening of conduit to masonry walls, floor or partitions require malleable pipe clips with screws and suitable expansion sleeves.
3. All conduit shall be cut accurately to measurements established at the building and shall be installed without springing or forcing.
4. All required inserts shall be drilled-in and all openings required through concrete or masonry shall be saw cut or core drilled with tools specifically designed for this purpose.
5. Swab out and remove all burrs from conduit before any wires are pulled.
6. Lay out and install conduit runs as to avoid proximity to hot pipes. In no case shall a conduit be run within 75 mm of such pipes, except where crossings are unavoidable and then the conduit shall be kept at least 25 mm from the covering of the pipe crossed.
7. Provide fire stops where conduits penetrate fire rated walls and/or floors.
8. All conduit installation, whether run exposed or concealed, shall be approved prior to installation by the Architect.

G. Surge Protection / Lightning Arrestors
1. Protect all exterior or interior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.
2. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.
3. Surge devices shall be installed as close as accessibly possible to the equipment they are protecting.
4. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.
5. Include surge protection device locations on as-builts and shop drawings.
6. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.
7. Properly ground surge protection devices per the manufacturer installation requirements.

3.5 TESTING REQUIREMENTS

A. System Start-Up
1. The Work shall be complete and ready to operate prior to final acceptance.
2. The Architect shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner's operation.

B. Substantial Completion
1. In order to qualify for the Architect's consideration of Substantial Completion, the Work must, at a minimum, meet the following requirements:
   a. Installation of all devices must be completed.
   b. All sub-system interfaces must be complete and operational.
2. Substantial Completion shall not be misconstrued as final acceptance of the Work.

C. System Acceptance
1. Final acceptance testing of the Work will be conducted by the Architect.
2. Prior to any final acceptance testing, the Contractor shall submit two sets of preliminary (draft) Record Drawings to the Architect. The preliminary Record Drawings are to be used by the Architect to conduct the system final test.
3. Before system acceptance testing the Security Contractor shall conduct a complete in-house QA/QC test of the entire Video Surveillance System and provide a written report on the results of that test. During the QA/QC test the Security Contractor shall place the Video Surveillance in service mode and calibrate and test all equipment.
4. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test. The intent of the burn-in test shall be to prove the Video Surveillance system by placing it in near real operating conditions. During this period, the Video Surveillance system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.
5. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Architect that the installed complete Video Surveillance system has been calibrated, tested, and is fully functional as specified herein.
6. Prior to the final acceptance test, coordinate with the Architect for security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery, and all surplus materials.
7. Upon written notification from the Contractor that the Video Surveillance system is completely installed, integrated and operational, and the burn-in testing completed, the Architect will conduct a final acceptance test of the entire system.
8. During the course of the final acceptance test by the Architect, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing "as built" conditions of the Video Surveillance system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Video Surveillance system head-end equipment will be evaluated.

9. The functionality of the various interfaces between systems will be tested.
10. Following the Video Surveillance system head-end equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installations, complete functionality of each individual device, and mounting, backbox and conduit requirements compliance.
11. All equipment shall be on and fully operational during any and all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. Provide a minimum of two employees familiar with the system for the final acceptance test. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two two-way radios for use during the test. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Architect or Owner, at no charge to the Architect or Owner.
12. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Architect will issue a letter of final acceptance.
13. The Architect retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner's/Architect's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the Drawings. The Contractor shall supply the Architect with a detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs, or modifications to the system will be conducted without the permission of the Architect.

3.6 PROJECT CLOSEOUT DOCUMENTATION REQUIREMENTS

A. As-Built Drawings
1. Drawings shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect / Owner / Design Consultant.
2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Architect / Owner / Design Consultant electronically.
3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
4. Drawings shall be provided in the original size as issued by the Architect/Design Consultant.
5. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect/Design Consultant.
6. Provide a conformed set of Drawings as related to the project, depicting the condition of the Video Surveillance system as installed to include but not limited to:
   a. ASI, PR and Addendum items installed throughout the duration of the project.
7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Video Surveillance System enclosure. Coordinate with Owner for final storage location.

8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:
   a. Video Surveillance System Riser / Signal Flow Diagrams
   b. Video Surveillance System Backboard Layouts
      1) To include Video Surveillance cameras, pathways, etc.
   c. Sleeves, Backbone Cabling and Communication pathways
   d. Video Surveillance System device locations and labeling scheme.

B. Operation & Maintenance Manuals
1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer's Product Warranty
1. Certificate of product warranty shall be provided to the Architect / Owner / Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect/Design Consultant.
2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
3. One original and two copies of the Manufacturer's product warranty shall be provided.

D. Contractor's Statement of Warranty
1. Statement of warranty shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect / Owner / Design Consultant.
2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 28 23 00

SECTION 28 31 00

FIRE ALARM SYSTEM AND SMOKE DETECTION SYSTEM

PART 1 – GENERAL

1.1 SCOPE

A. The contractor shall maintain the existing Simplex fire alarm system panel as specified herein and indicated on the drawings. The system shall include, but not be limited to, modifications of control equipment, power supplies, signal initiating and signaling devices, conduit, wire, fittings, and all other accessories required to maintain the existing system in operation throughout construction. Provide and install new devices and relocate existing devices as required. Refer to Section 26 03 13 for additional requirements.

B. The system shall operate as a non-coded, continuous sounding system, which will sound alarm devices until manually silenced, as herein specified.

C. The system shall be wired as a Class B and style 4 supervised system for all circuits.

1.2 CODES AND STANDARDS

A. The system shall comply with the applicable Codes and Standards as follows:
1. National Electrical Code - Article 760.
2. National Fire Protection Association Standards:
   NFPA 70 NEC
   NFPA 72 Protective Signaling Systems (current State adopted version)
   NFPA 90A Air Conditioning
   NFPA 101 Life Safety Code
   UL 1971 Visual Devices
   ANSI 117.1 Visual Devices
3. Local & State Building Codes
4. Requirements of Local Authorities having Jurisdiction. If local authorities design requirements differ substantially from contract drawings, the design engineer shall be notified no less than 10 days prior to bid date, to allow time for addendum to be provided to all contractors. Contractor to provide additional devices as required by local authorities in bid pricing.
5. Underwriters Laboratory Requirements and Listings for use in Fire Protective Signaling Systems as follows:
   UL 864 Control Panels 9th Edition
   UL 268 Smoke Detectors - Systems
   UL 268A Duct Smoke Detectors
   UL 521 Heat Detectors
   UL 228 Door Holder-Closers
   UL 464 Audible Signaling Appliances
   UL 1971 Visual Signaling Appliances
   UL 38 Manual Alarm Stations

1.3 ACCEPTABLE MANUFACTURERS

A. The existing equipment installed is that of the Simplex Fire Systems as provided by Johnson Controls Inc. San Antonio, Texas.

B. All equipment, materials, accessories, devices, etc. covered by the specifications and/or noted on the contract drawings shall be new and unused and be U.L. listed for their intended use.

C. Provide the following manufacturer:
   1. Johnson Controls – Simplex Fire Alarm

1.4 GENERAL REQUIREMENTS

A. Contractor Qualifications:
   1. The equipment supplier shall be an authorized and designated representative of the Fire Alarm Manufacturer to sell, install, and service the proposed manufacturer's equipment.
   2. The equipment supplier and installing contractor shall be licensed by the State Fire Marshall to sell, install, and service fire alarm systems as required by Article 5.43-2 of the Texas Insurance Code.
   3. The installing contractor and/or equipment supplier shall have on his staff a minimum of three (3) installation superintendents who are licensed by the State Fire Marshall's office for such purpose and under whose supervision installation, final connections, and check out will take place as required by the Texas Insurance Code.
   4. The installing contractor or equipment supplier shall have on staff a minimum of one (1) certified NICET Level III state licensed fire alarm planner under whose supervision system design shall take place.
   5. The installing contractor shall provide 24 hour, 365 days per year emergency service with qualified and state licensed service technicians.
   6. The installing contractor shall have been actively engaged in the business of selling, installing, and servicing fire alarm systems for at least ten (10) years.

1.5 SUBMITTALS

A. The installing contractor and/or equipment manufacturer shall provide complete and detailed shop drawings and include:
   1. Control panel configuration including wiring and interconnection schematics.
   2. Complete point to point wiring diagram showing terminal connections to all system devices.
   3. Riser wiring diagram and associated zoning/addressing configurations with associated conduit sizes.
   4. Complete floor plan drawings locating all devices associated with the fire alarm system. Floor plan drawings shall include conduit and wiring routing complete with conduit sizing and number of conductors by type.
   5. Factory data sheets on each piece of equipment to be used and so marked as to model, dimensions, size, voltage, and configuration.
   6. Detailed system description in this specification format describing system functions and operation. All specification variations and deviations shall be clearly noted and marked.
   7. Complete Bill of Material for reference.
   8. Programming matrix defining all input/output functions and zoning.
   9. Power supply and battery calculations.
   10. A letter from the manufacturer stating that the fire alarm system contractor is authorized to sell, service and install the submitted equipment.

B. Submittal shall include documentation confirming all qualifications in 1.04-A have been met. Submittals without qualification documentation shall be rejected.

C. All submittal data will be in bound form with contractor's name, supplier's name, project name, and state fire alarm license number adequately identified.

D. Only basic equipment devices have been shown on the contract drawings. Specific wiring between equipment/devices has not been shown. It is the contractor's responsibility to submit for approval the COMPLETE ENGINEERED system configuration and layout showing all devices, wiring, conduit, and locations along with other required information as specified herein.

1.6 COORDINATION

A. It shall be the responsibility of the installing contractor to coordinate all requirements surrounding installation of the fire alarm system with all trades including, but, not exclusive of: electrical contractor, sprinkler contractor, and HVAC/controls contractor and intercom system. Adequate coordination shall be provided to insure proper installation and interface to all peripheral items required to interact with the fire alarm and communication system to provide a complete and functional life safety system.

PART 2 – PRODUCTS

2.1 SYSTEM FUNCTIONAL OPERATION

A. Alarm Detection
   1. When a fire alarm condition is detected by any of the system alarm initiating devices, the following functions shall occur:
      a. The system common alarm LED on the CPU Module shall flash. The internal audible trouble device shall sound. Acknowledgement or silencing the alarm condition shall silence the alarm signals and cause flashing alarm LED's to illuminate steady.
      b. A 160 character back-lit LCD display shall indicate all applicable information associated with the alarm condition including: zone, device type, divide location, and time of alarm. Location and zoning messages shall be custom field programmed to respective premises.
      c. Any remote or local annunciator LED's associated with the alarm zone shall be illuminated as herein specified.
      d. A three-channel digital alarm communicator shall be integrally provided and transmit trouble and alarm signals to an approved remote station (remote station connection and service provided by Owner).
      e. All automatic events programmed to the alarm point shall be executed and the associated indicating devices and/or outputs activated.
      f. Activate all audible and visual alarm notification devices.
      g. De-activate HVAC systems over 2000 CFM.
      h. Display system status changes on the remote annunciator(s).
      i. Release all smoke doors, fire doors, fire coiling doors, fire smoke dampers and fire shutters.
      j. Recall elevators to ground floor as specified herein, or to the alternate floor if the alarm condition originates on the ground floor. Each elevator lobby shall be provided with a smoke detector. Activation of this smoke detector shall recall the respective elevator cars to the ground floor. In the event of a fire on the ground floor, the elevator cars shall be recalled to level 2.
      k. Printer the status change messages on the system printer.

B. System Trouble Detection
   1. When a trouble condition is detected by the CPU, one of the system initiating, alarm or SLC circuits, the following functions shall immediately occur:
      a. The system trouble LED on the CPU module shall flash and the internal

audible trouble device shall sound. Acknowledgement of the trouble condition shall silence the audible trouble device and cause all trouble LED's to illuminate steady.

b. The 160-character alphanumeric LCD annunciator shall display all applicable information via the alphanumeric display associated with the respective trouble condition and its location.

C. Auxiliary Control

1. All designated "non-silenceable" auxiliary control functions shall remain in operation (even upon silencing of audible alarms) until such time as the control panel is cleared and reset manually (i.e. fan control outputs, central station interface, elevator recall interface, etc.).
2. Activation of duct smoke detectors associated fans shall shutdown their respective units immediately in addition to identifying the condition as herein specified.

D. System Supervisory Detection

1. When a supervisory condition is detected by the fire alarm control panel, the following functions shall occur:
   a. The fire alarm control panel supervisory indicator shall flash and the internal audible device shall sound. Acknowledgment of the supervisory condition shall silence the audible device and cause the supervisory indicator to illuminate steady.
   b. The 160-character liquid crystal display shall display all applicable information associated with the respective supervisory condition.
   c. Activate a supervisory contact closure to interface with the owner provided central station monitoring service.
   d. Print the status change messages on the system printer.
   e. Display the system status change on the remote annunciator(s).

2.2 ZONING

A. The system shall have the inherent capability to employ "Intelligent' smoke detectors and addressable interface devices capable of being recognized and annunciated at the main control panel on an individual basis. All zoning/device location information shall be totally field programmable to exact job requirements as approved by the Architect/Engineer.

2.3 FIRE ALARM CONTROL PANEL

A. The existing fire alarm control panel is a JCI Simplex 4100U Fire Alarm system. The control panel shall utilize DISTRIBUTED solid state MICROPROCESSORS. The microprocessor based CPU shall be completely FIELD PROGRAMMABLE. CPU module shall provide for programmable non-volatile EEPROM memory. All circuitry shall be U.L. listed for power-limited application. System shall be sized to accommodate the capacity of the system specified and shown on the drawings. System shall be capable of being networked for future expansion.

B. Central Processing Unit Module (CPU)

1. The CPU shall contain and execute all custom time control functions or control-by-event programs for specified events including 'Holiday' exceptions. Time control event/programs shall be automatically overridden by priority fire alarm events. All programs shall be held in non-volatile programmable EEPROM memory, and shall be lost if both system primary and secondary power failure occurs
2. System CPU shall also provide for non-alarm points for non-fire, low priority building functions. The CPU shall provide capability of multi-stage signaling,

tornado warning, positive alarm sequencing as well as remote control system operation.

C. Display

1. The DIA shall provide an 80-character backlit, supertwist Liquid Crystal Display (LCD). It shall provide Light-Emitting Diodes (LED's) for AC POWER; SYSTEM ALARM; SYSTEM TROUBLE; SUPERVISORY; CPU FAIL; and ALARM SILENCED.
2. The display shall provide power to a 21-key membrane keypad with control capability to command all system functions, status readouts, manual control action, and entry of any alphanumeric or numeric information. The keypad shall include means to enter multiple five digit passwords to prevent unauthorized manual control programming.

D. Control Switches

1. Acknowledge/Step Switch
2. Signal Silence Switch
3. Evacuate
4. Lamp Test/Reset

E. System Outputs

1. The system shall provide the following outputs:
   a. One port for CRT, modem, and/or printer (RS-232c)
   b. One port for supervised remote LED annunciators (RS-485)
   c. Four Style Y supervised alarm signaling circuits

F. Loop Interface (SLC)

The CPU shall communicate and provide power to all devices on its loop over a single pair of wires. The CPU shall receive digital/ANALOG information from all "intelligent" detectors and shall process this information to determine normal, alarm, trouble, and sensitivity conditions. The analog information may be used for automatic test and determination of maintenance requirements, and be U.L. listed for such use. The CPU module shall individually monitor all "intelligent" detectors for sensitivity variation initiating a trouble condition should detector sensitivity "drift" become excessive. The system control unit shall have the capability to remotely read each detector's sensitivity in % obscuration, and if need be, electronically adjust the detector sensitivity as required for existing conditions within U.L. recommended limits. In addition, the system shall incorporate a "day/night" sensitivity feature. The system shall provide capability to program each individual detector for multiple 'pre-alarm' conditions. Each 'pre-alarm' level shall be field programmable as a function of the programmed alarm level. The system shall allow designated control-by-event actions to occur as may be required prior to any sensor reaching the designated alarm point.

G. Non-Lock Walk Test

The system shall include a special non-lock "walk test" mode. The walk test mode shall incorporate a one hour time-out feature to return system to normal. Test results shall be capable of being generated and displayed on LCD annunciator or printed out on system printer.

H. Automatic Detector Test

The system shall include a special automatic detector test feature, which permits reading and adjustment of the sensitivity of all intelligent detectors from the main control panel. In addition, the automatic test feature shall also permit the functional testing of any "intelligent" detector or addressable interface device individually from the main control panel. An automatic detector test shall occur automatically a minimum of every two hour

period or be initiated manually from the FACP as desired. Automatic detector test sequencing shall be terminated upon receipt of a true alarm condition.

I. Special System Reports

The system shall have the ability to generate and print, upon command, system and point status reports. Selection of 'system' read status provides the operator with global system programming information as well as providing the operator with all individual point programming data. The system shall also provide the capability to print out a detailed 'history' report from system history file upon command.

J. Field Programming

The system shall be 100% field programmable without the need for external computers or, PROM programmers, and shall NOT require replacement of memory IC's. All programs shall be stored in non-volatile EEPROM memory. Programming shall be accomplished only after entering an appropriate and pre-selected five digit password security code. System programming mode shall **NOT** require the system to be taken off-line nor prohibit the system from performing its normal operations and routines. The system shall be capable of revising/changing programmed functions or system expansion at any time subsequent to initialization as described herein without factory modifications or factory programming. Field programming via the use of external computers may be considered provided programming can be accomplished on-site and the owner is permanently furnished with the required programming apparatus and software as part of this contract.

K. Event History

The main fire alarm panel shall have the resident ability to store a minimum of 600 system events in chronological order of occurrence. Event history shall include all system alarms, troubles, operator actions, unverified alarms, circuit/point alterations, and component failures. Events shall be time and date stamped. Events shall be stored in non-volatile buffer memory. Access to history buffer shall be secured via five digit password security code. Systems not employing event history memory storage shall be required to furnish a printer/recorder for recording system events.

L. Power Supply

The power supply shall provide all control panel and peripheral power needs with filtered power as well as rectified 24VDC power for external audio-visual devices. All power supplies shall be designated to meet UL and NFPA requirements for POWER-LIMITED operation on all external signaling lines, including initiating circuits and indicating circuits. Provide a spare back-up amplifier for each cabinet containing one.

Input power shall be 120VAC 60Hz. The power supply shall provide internal supervised batteries and automatic charger. The power supply shall provide both positive and negative ground fault supervision, battery/charger fail condition, A.C. power fail indicators. The power supply shall also provide supervision of modular expansion power supplies as may be required.

2.4 FIELD DEVICES

A. Multi Criteria Detector (Smoke, Heat and CO)

1. Provide intelligent multi criteria acclimating detector shall be provided where shown on the drawings. The intelligent multi criteria detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine it's environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration.

This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.

2. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
3. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.
4. The detectors shall provide address-setting via a DPU unit.
5. The CO Detector shall include a redundant optical/thermal sensor with a carbon monoxide sensor.
6. The detector shall be semi-flush ceiling mounted and be provided with modular detector head with twist-lock base.

B. Intelligent Duct Detector

Duct mounted “intelligent” photoelectric smoke detectors shall be provided where shown on the drawings per applicable codes. Detectors shall operate on the same principles and exhibit the same basic characteristics as area type “intelligent” smoke sensors. The detector shall operate in air velocities of 300 FPM to 4,000 FPM. Each detector shall interface directly to the system SLC loop without the use of zone modules.

The unit shall consist of a clear noryl molded plastic enclosure with integral conduit knockouts. The unit shall be provided with clear faceplate cover to provide visual viewing of detector/sensor for monitoring sensor operation and chamber condition. The duct housing shall be provided with gasket seals to insure proper seating of the housing to the associated ductwork. Each unit’s sampling tubes shall extend the width of the duct and be provided with porosity filters to reduce sensor/chamber contamination. Detectors shall be installed per IMC, and be listed with the fire alarm control panel. A remote LED shall be located on the corridor ceiling adjacent to the respective detector where detectors are not plainly visible or concealed from view.

C. Intelligent Thermal Detectors

1. Simplex analog, fixed temperature and rate of rise thermal detectors shall be provided where indicated on the drawings. The detectors shall use dual electronic thermostats to measure temperature levels in the chamber and shall, on command from the control panel, send data to the panel representing the analog temperature level.
2. The detectors shall provide address-setting via a DPU unit.
3. The detectors shall provide power/status LED's. Status LED's shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
4. The detector shall be semi-flush ceiling mounted and be provided with modular detector head with twist-lock base.

D. Addressable Manual Stations

1. Simplex manual stations shall be provided where indicated on the drawings. The manual station shall provide address-setting via a DPU unit.
2. Manual stations shall be designed for semi-flush mounting on standard electrical box. The station shall be constructed of hi-impact red molded Lexan with

instructions for station operation in raised white letters. Stations shall be of the dual action type.

3. Provide all manual stations with STI Stopper II Covers with integral horn. Mount flush where possible.

E. Monitor Module

1. Simplex addressable monitor modules shall be provided where required to interface to contact alarm devices. The monitor module shall be used to connect a supervised zone of conventional initiating devices to an intelligent SLC loop.
2. The monitor module shall provide address-setting via a DPU unit.

F. Control Module

1. Simplex control and relay modules shall be provided where required to provide audible alarm interface and/or relay control interface. The control module shall be used to connect a supervised zone of conventional indicating devices to an intelligent loop. The zone may be wired class A or class B - field selected. The control module may be optionally wired as dry contact (form C) relay.
2. The control module shall provide address-setting via a DPU unit. A status LED shall be provided which shall flash under normal conditions, indicating that the control module is operational and in regular communication with the control panel. The LED shall illuminate steady when the device is actuated via the fire alarm control panel.

G. Electronic Audio Visual Devices

Audible/Visual alarm devices shall be Simplex electronic horn/strobe units, to be located where indicated on the drawings. Devices shall be wall or ceiling mounted as indicated on the drawings. AV devices shall be provided with the ability to provide multiple candela settings. Units shall operate at 24VDC and be polarized supervised. The visual device shall use Xenon strobe type producing a minimum of 15 candela on a 24 VDC limited energy supervised circuit and meet the requirements of ADA and TAS. Strobe unit shall automatically flash upon operation of the horn. Horn/strobe unit shall be provided in textured white finish and be flush mounted.

All visual devices shall be synchronized.

H. Alarm Horn

Provide Simplex solid state electronic alarm horn where indicated on the contract drawings. Units shall operate at 24 VDC and be polarized supervised. Preferred alarm signal shall be a temporal tone producing a sound pressure level of 84 dBA.

Units shall be flush mounted and molded of high-impact white plastic.

I. Exterior Audio Visual Devices

All audio visual devices located outside or labeled weatherproof shall be weatherproof. Provide the following devices:

1. Wheelock ASWP Series for audio/visual devices.

All devices shall be provided with a weather proof type back box.

J. High Intensity Visual Signals

Provide Simplex visual signal device. High intensity visual signals shall be installed where shown on the drawings and as may be required by the Americans with Disabilities Act (Public Law 101-336) and TAS.

High intensity visual alarms shall be Xenon strobe type producing a minimum of 15 candela on a 24 VDC limited energy supervised circuit. Alarm devices shall be designated to be wall or ceiling mounted as indicated on the drawings. Signals shall operate in unison with audible alarm appliances. All visual devices shall be synchronized. Units shall be flush mounted and shall be provided in textured white.

K. Auxiliary AHU Relays

Simplex relays or approved equal shall be provided for HVAC and AHU control and interface. Relays shall be heavy duty type and rated up to 10 amps at 24 VDC, 60 HZ. Relays shall be provided with NEMA I dust cover assembly and be provided with SPDT contacts as well as (fail safe) so that if the cable is broken, disconnected etc., the AHU will automatically shutdown.

L. Field Charging Power Supplies

Provide Simplex power supplies with battery backup as required for additional notification circuits and auxiliary power. Electrical Contractor shall provide and install a 120-volt dedicated circuit to each power supply.

M. Door Hold-open Device

Provide Simplex 24/120V Door hold-open device. Coordinate with Division 26 Installer for 120V supply or include with battery calculations for 24V from remote Power Supply. Provide ceiling mounted smoke detector within 5'-0" on each side of door opening to drop power to door hold-open device upon detection of smoke.

N. Remote LCD Alpha-Numeric Annunciators

Provide where indicated on the drawings a remote LCD alpha-numeric annunciator to annunciate all system events and duplicate the displayed status at the main FACP. The annunciator shall be a backlit eighty-character LCD display and operate via the system RS485 and RS232 serial output terminal from main FACP. The LCD display shall automatically illuminate upon receipt of an alarm or trouble condition. The illuminary source shall extinguish during normal/standby model to conserve power. The unit shall operate from FACP 24VDC power and function during system power failure while the system resides on standby batteries. The remote LCD annunciator shall include:

- Integral time-date clock
- Time-date select clock
- Time-date/contrast adjust
- Display/step switch
- System reset
- System silence
- System acknowledge
- Integral trouble buzzer

Annunciator shall upon command display the first system alarm, last alarm, and system alarm count. The unit shall be equipped with an integral lamp test feature. The unit shall be semi flush mounted where shown.

O. Protective Covers

Provide protective covers on all fire alarm devices indicated. These protective covers shall be manufactured by Safety Technology International, Inc. (STI). These covers shall be provided on all devices including but not limited to audible an visual devices and pull stations. The mounting of a device shall be reinforced to enable the protective covers to protect the fire alarm devices.
See 2.4.D (3) above for manual stations covers.

P. Additional Devices

(1) In addition to the devices indicated on the Drawings and/or specified, the Contractor shall include the following listed fire alarm devices. Include contract price, completely installed, connected and identified as directed by Owner's Representative, as the project progresses at no additional cost. Refer to Paragraph 3.4

PART 3 – EXECUTION

3.1 INSTALLATION

A. Wiring:

1. All wiring shall be in accordance with NFPA 72 and the National Electrical Code, Local Codes, and article 760 of NFPA Standard 70. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.
2. All wire shall be U.L. Listed, limited energy (300 volt) FPLP or MPP wire and shall be run open in return air ceiling plenums. The wire shall be listed to U.L. TEST 910 for such applications and is of the low smoke producing fluorocarbon type and complies with NEC Article 760 if so approved by the local authority having jurisdiction. Provide conduit in all inaccessible locations, inside concealed wall, all mechanical/electrical rooms, or other areas where wiring might be exposed and subject to damage.
3. Support wire clear of knock out panels, access panels, and maintenance spaces for equipment. Wire and cable shall be run using wire management techniques supporting cable as close as possible to within one foot of the floor or roof rafters. Wire supports shall be directly fastened to the structure on a maximum of five foot centers. Wire routing shall be parallel and perpendicular to building lines. The wire and cable shall be secured with tie wraps or carrier wire. Sagging in excess of three inches will not be allowed nor will bending of the supporting ring structure.
4. All wiring for SLC signaling circuits shall be of the twisted low capacitance type to guard against outside RF and EMF interference and induced noise.
5. All wiring shall be run in a supervised fashion (i.e. no branch wiring or dog-legged wiring) per NFPA requirements such that any wiring disarrangement will initiate the appropriate trouble signals via the main control panel per NFPA and U.L. requirements.
6. Wiring splices shall be kept to a minimum with required splices to be made in designated terminal boxes or at field device junction boxes. Transposing or color code changes of wiring will not be permitted. End-of-line supervisory devices shall be installed with the last device on the respective circuit. Said device shall be appropriately marked designating it as the terminating device on the respective circuit.
7. No A.C. wiring or any other wiring shall be run in the same conduit as fire alarm wiring.

B. Conduit/Raceway
1. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per NEC.
2. Conduit and raceway system shall be installed as specified under the general electrical section of the specifications, and per NEC.
3. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings.

C. Minimum Wire Sizes Shall Be As Follows:
1. Signaling Line Circuit: 18 AWG
2. Notification Appliance Circuit: 14 AWG
3. Relay Control Circuits: 18 AWG

D. Sprinkler Valves
1. Contractor shall connect all tamper switches and post indicator valves to the supervisory circuit. Connect all water flow switches to the alarm circuit. Coordinate exact locations of water vaults valves and flow switches with sprinkler contractor.

3.2 NOTIFICATION APPLIANCE CIRCUITS SYNCHRONIZATION

A. All visual and audible devices shall be synchronized per the current state adopted version of NFPA 72. Provide all components required.

B. Ensure intelligibility of recorded and voice messages over the speakers meet the requirements of the local AHJ.

3.3 TEST AND REPORTS

A. A state licensed factory trained technical representative of the manufacturer shall perform the final control panel connections and supervise testing of the system and it shall be subject to the approval of the responsible engineer and owner. Upon completion of the acceptance tests, the owner and/or his representatives shall be instructed in the proper operation of the system.

B. The installing contractor shall functionally test each and every device in the entire system for proper operation and response. In addition, each circuit in the system shall be fully tested for wiring supervision to insure proper wiring installation. Any items found not properly installed or non-functioning shall be replaced or repaired and re-tested. All testing shall be supervised by a licensed fire alarm superintendent.

C. The installing contractor shall provide a complete written report on the functional test of the entire system. The test and report shall verify the function of each device in the system, operation of all auxiliary control functions, and the proper operation of the main fire alarm control panel. A copy of the test report shall be provided with maintenance manuals. The test report shall be signed and dated by the licensed fire alarm superintendent responsible for supervising the final system test and checkout.

D. The installing contractor's fire alarm superintendent shall test the entire system in the presence of the local authorities having jurisdiction.

3.4 SPARE DEVICES

A. The fire alarm contractor shall include in his bid the cost to provide and install the additional spare parts and attic stock and associated cabling as indicated on the schedule below. Each additional device shall include 25’-0” of cable and 3/4”C. All devices on this schedule not used during construction shall be turned over to the owner at the time of job completion:

1) Multi-Criteria Smoke Detectors – 3
2) Smoke/Heat/CO Detectors - 3
3) Duct Detectors (w/test switch and shut down relay) – 2
4) Heat Detectors – 2
5) Horn/Strobes – 4
6) Horns - 3
7) Strobes – 4
8) Manual Stations (w/Stopper II covers) – 2

3.5 WARRANTY

A. The fire alarm system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy, whichever shall occur first. Any equipment shown to be defective shall be repaired, replaced or adjusted during normal working hours at no cost to the owner.

3.6 GRAPHIC FLOOR PLANS

A. Provide 1/16” = 1’-0” floor plan showing all devices and zoning. Zoning shall correspond to the zone on the fire alarm control panel. The floor plans shall be framed with a glass cover and located by the fire alarm control panel. This graphic floor plan shall use the actual room numbers based on the architectural graphics package. Verify specific requirements with Owner. Provide a sample for approval.

END OF SECTION

SECTION 31 00 00

EARTHWORK

1PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Division 31 Section 23 23.13 “Backfill” to sub-grade elevations.

C. Division 31 Section 10 00 “Site Clearing” for site stripping, grubbing, topsoil removal and tree protection.

D. Division 31 Section 22 13 “Rough Grading” for grading and rough contour site.

E. Division 31 Section 23 16 “Excavation” for building foundations.

F. Division 31 Section 23 33 “Trenching and Backfilling”

G. Division 03 Section 30 00 “Cast-In-Place Concrete” for encasings, cradles, and appurtenances for utility systems.

1.02 SUMMARY

A. Contractor shall furnish all labor, materials, equipment and incidentals as shown, specified and necessary to complete the work of site preparation, erosion control, surface drainage, subsurface drainage, ground water control, construction of compacted fills, excavation, installation and removal of sheeting and bracing, backfilling and final site grading, including underfloor areas.

B. Contractor shall provide all backfill materials, including select backfill, crushed stone, backfill, clay, granular embedment, topsoil, porous granular fill and the satisfactory disposal of surplus and unacceptable materials.

C. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.

D. Contractor shall perform all earthwork, including backfilling all demolition areas.

1.03 DEFINITIONS

A. Excavation: Consists of the removal of material encountered to sub-grade elevations and the reuse or disposal of materials removed.

B. Sub-grade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Sub-base Course: The layer placed between the sub-grade and base course in a paving system or the layer placed between the sub-grade and surface of a pavement or walk.

E. Flexible Base Course: The layer placed between the sub-base and surface pavement in a paving system.

F. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.

G. Unauthorized Excavation: Consists of removing materials beyond indicated sub-grade elevations or dimensions without direction by the Project Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor’s expense.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

I. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.04 COORDINATION

A. The Contractor shall expedite placement of compacted fills and embankments as per the Project Schedule.

1.05 PROJECT CONDITIONS

A. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active. All existing underground utilities within the areas of buildings must be removed.

1.06 SOURCES OF MATERIALS

A. Fill materials for backfill and site grading may be obtained from on-site excavation work and/or obtained by the Contractor from off-site sources at Contractor's expense.

B. Select backfill (Flexible Base) materials shall be obtained by the Contractor from off-site sources at Contractor's expense.

C. Topsoil, except for topsoil stripped from the new work areas that meets the specific requirements for this material, shall be obtained by the Contractor from off-site sources at Contractor's expense. Reference Landscape plans.

D. Granular embedment materials shall be obtained by the Contractor from off-site sources at Contractor's expense.

E. Crushed stone fill materials shall be obtained by the Contractor from off-site sources at Contractor's expense.

F. Porous granular fill shall be obtained by the Contractor from off-site sources at Contractor's expense.

G. Pit run sand shall be obtained by the Contractor from off-site sources at Contractor's own expense.

H. Clay materials for backfill shall be obtained from on-site excavation work and/or obtained by the Contractor from offsite sources at Contractor's expense.

1.07 QUALITY ASSURANCE

A. Owner will employ a Testing Laboratory to perform Soil Testing and Inspection Service for quality control testing during grading and excavation operations.

1.08 TESTING SERVICES

A. The testing of products: Testing for moisture content during placement and compaction of fill materials, and of compaction requirements for compliance with technical requirements of the Specifications shall be performed by the testing laboratory as designated in Section 01 40 00.

B. Testing Agency shall:
   1. Test the Contractor's proposed materials in the laboratory and/or field for compliance with the Specifications.
   2. Perform field moisture content and density tests to assure that the specified compaction of backfill materials has been obtained.
   3. Report all test results to the Owner, Project Architect, Project Engineer and the Contractor.

C. Authority and Duties of Testing Agency: Technicians representing the testing laboratory shall inspect the materials in the field and perform tests, and shall report their findings to the Owner, Project Architect, Project Engineer and the Contractor. When the materials furnished or Work performed fails to fulfill Specifications requirements, the technician will direct the attention of the Owner, Project Architect and the Contractor to such failure.

D. Technicians representing the Testing Agency: Shall not act as foreman or perform other duties for the Contractor. Work will be checked as it progresses, but failure to detect any defective work or

materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Project Architect for final acceptance. Technicians are not authorized to revoke, alter, relax, enlarge, or release any requirements of the Specifications, nor to approve or accept any portion of the Work.

E. Responsibilities and Duties of the Contractor: The use of testing services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in full compliance with the Drawings and Specifications.
   1. Contractor shall secure and deliver to the testing agency, without cost, preliminary representative samples of the materials he proposes to use and which are required to be tested.
   2. Contractor shall furnish such casual labor as is necessary to obtain and handle samples at the Project or at other sources of material.
   3. Contractor shall advise the Owner and the Testing Agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.

1.09 REFERENCE STANDARDS: The Contractor shall comply with applicable provisions and recommendations of the following:

A. ASTM A 36, Structural Steel.

B. ASTM A 328, Steel Sheet Piling.

C. ASTM D 422, Particle-Size Analysis of Soils.

D. ASTM D 423, Liquid Limit of Soils.

E. ASTM D 427, Shrinkage Factors of Soils.

F. ASTM D 698 Moisture-Density Relations of Soils, using 5.5 lb Rammer and 12-in drop.

G. ASTM D 1140, Amount of Material in Soils Finer than the No. 200 Sieve.

H. ASTM D 1556, Density of Soil in Place by the Sand-Cone Method.

I. ASTM D 1557, Moisture-Density Relations of Soils, using 10.0 lb (4.5 kg) Rammer and 18- in. Drop.

J. ASTM D 2166, Unconfined Compressive Strength of Cohesive Soil.

K. ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.10 SUBMITTALS

A. Should sheet and shoring be necessary, the Contractor shall prepare Drawings for the following: Sheeting and bracing for excavations over 5 feet deep. The Drawings shall be prepared by a Professional Engineer licensed in the State of Texas. The Drawings shall be submitted to the Project Architect for establishing that the terms of the Specifications are complied with. Calculations shall not be submitted. Drawing submissions will not be checked and will not imply approval by the Project Architect of the Work involved. The Contractor shall be wholly responsible for designing, installing and operating whatever system is necessary to accomplish satisfactory sheeting, bracing, dewatering, and protection.

B. Test Reports: Testing Laboratory shall submit copies of the following reports directly to the Owner, Project Architect and Contractor:
   1. Pavement sub-grade.
   2. Field density tests.
   3. Optimum moisture - maximum density curve for each soil used for backfill.
   4. Tests of actual unconfined compressive strength or bearing test of each strata.

C. Samples of all select backfill, backfill, flowable fill, clay, drainage material, granular embedment, porous granular fill, pit run sand and topsoil shall be submitted by the Contractor to the testing laboratory. Samples of the proposed material shall be submitted at least fourteen days in advance of its anticipated use.

1.11 SITE CONDITIONS

A. Geotechnical Information: A Geotechnical Investigation has been performed for the Owner by others. This report is available for review by Bidders. The Owner makes no warranty or representation as to the accuracy of said report. Bidders are encouraged to perform their own tests and draw their own conclusions from those tests before submitting bids. Owner is not responsible for Bidders' conclusions which result from the Geotechnical information found in the Owner's report.

11.2PART 2 - PRODUCTS

2.01 MATERIALS

A. Backfill and Fill Materials:
   1. Materials acceptable for use as backfill or fill shall be materials obtained from excavations on site or from off-site sources whose gradation shows not more than 15 percent passing the No. 200 standard sieve as determined by ASTM D 1140, and whose Plasticity Index is not in excess of 20 percent as determined by ASTM D 4318. The material shall contain no vegetative matter.
   2. All material for use as backfill and fill shall be tested by the testing laboratory and approved by the Project Architect.

B. Select Backfill (Flexible Base - Base Material):
   1. Select backfill for compaction backfill shall conform to the 2014 Texas Department of Transportation Standard Specifications Items 247 gradation Type A, Grades 1 or 2 as follows:

Sieve Size	Percent Retained on Sieve
2 – ½" inch	0
1 – ¾" inch	0-10
No. 4	45 - 75
No. 40	60 - 85

   2. The select backfill mixture shall contain no clay lumps or organic matter. The fraction passing No. 40 sieve shall have a liquid limit not greater than 40 and a plasticity index between 7 and 15 as determined by ASTM D 4318. The select backfill shall be deposited in uniform layers not exceeding 8 inches in uncompacted thickness. The backfill shall be compacted by a suitable vibratory roller or platform vibrator to not less than 95 percent of laboratory maximum density as determined by ASTM D 1557, unless otherwise noted on plans.
   3. Select backfill (Flexible Base Material) to be from a pit run quality-controlled source. Offsite stockpiled material will not be accepted as select backfill (Flexible Base Material).

C. Granular embedment material shall be crushed rock or pea gravel with not less than 95 percent passing a ½-inch sieve and not less than 95 percent retained on a No. 4 sieve.

D. Crushed stone shall be crushed rock conforming to the following gradation:

Sieve Size	Percent Retained on Sieve
3 inch	0
2-1/2 inch	0 -10%
2 inch	30 - 65%
1-1/2 inch	85 - 100%
3/4 inch	95 - 100%

E. Porous Granular Fill:
   1. Porous granular fill for compaction backfill shall conform to the following:

Sieve Size	Percent Retained on Sieve
1-3/4 inch	0% - 10%
No. 4	45% - 75%
No. 40	60% - 85%
No. 200	90% - 100%

2. The porous granular fill material shall contain no clay lumps or organic matter. The fraction passing the No. 40 sieve shall be non-plastic. The porous granular fill shall be deposited in uniform layers not to exceed 6 inches in uncompacted thickness. The backfill shall be compacted to not less than 100% of the laboratory maximum density as determined by ASTM D-1557.
3. All material for porous granular fill must be tested by the testing laboratory and approved by the Project Architect.
4. No porous granular fill shall be placed without the Project Architect's approval.

F. Pit Run Sand:
1. Pit run sand for compaction backfill for use as shown conform to the following:

Sieve Size	Percent Retained on Sieve
No. 4	0
No. 200	90 - 100%

2. Pit run sand material shall contain no organic material. The maximum plastic limit of the material shall be less than 10. The pit run sand shall be deposited in uniform layers not to exceed 8 inches in uncompacted thickness. The backfill shall be compacted to not less than 95% of laboratory maximum density as determined by ASTM-D-698.
3. All material for pit run sand must be tested by the testing laboratory and approved by the Project Architect.
4. No pit run sand shall be placed without the approval of the Project Architect

G. Clay
1. Material for use as clay liner over top of backfill and/or select backfill or as otherwise shown shall conform to the following:

Sieve Size	Percent Retained on Sieve
No. 4	0 - 15%
No. 200	30 - 100%

2. The minimum plastic limit shall be 25. Clay shall be deposited in uniform layers not to exceed 8 inches in uncompacted thickness. The clay shall be compacted to not less than 98% of maximum density as determined by ASTM D- 698.
3. All material for clay must be tested by the testing laboratory and approved by the Project Architect.
4. No clay shall be placed without the approval of the Project Architect.

H. Drainage Material:
1. Drainage material for use as shown on the Drawings shall conform to the following:

Sieve Size	Percent Retained on Sieve
2 inch	0%
1-1/2 inch	0 - 10%
1 inch	45 - 75%
3/4 inch	90 - 100%

½ inch	95 - 100%

2. The drainage material shall be crushed rock. The drainage material shall be compacted by two passes of a hand activated vibratory compactor. The material shall have a LA abrasion number of 35 or less.
3. All drainage material must be tested by the testing laboratory and approved by the Project Architect.
4. No drainage material shall be placed without the Project Architect approval.

I. Accessories:
1. Detectable Warning Tape: Acid-and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, six (6) inches wide and four (4) mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep. Detectable Warning Tape to be used on all PVC piping except perforated subsurface piping.
   a) Tape Colors: Provide tape colors to utilities as follows:
      (1) Red: Electric.
      (2) Yellow: Gas, oil, steam, and dangerous materials.
      (3) Orange: Telephone and other communications.
      (4) Blue: Water systems.
      (5) Green: Sewer systems.
      (6) Brown: Force mains
2. Filter Fabric: Manufacturer's standard nonwoven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
3. Provide Filter Fabrics: That meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
   a) Grab Ensile Strength (ASTM D 4632): 100 lb.
   b) Apparent Opening Size (ASTM D 4751): #100 U.S. Standard Sieve.
   c) Permeability (ASTM D 4491): 150 gallons per minute per sq. ft.

D.PART 3 - EXECUTION

3.01 SITE PREPARATION

A. The portions of the site on which the Work is to be constructed shall be cleared of all objectionable materials and debris (see Section 31 10 00, Site Clearing). Trees within the project limits except those indicated in Drawings to remain shall be completely removed, including stumps and roots. All materials and debris shall be disposed off site in accordance with applicable regulations.

3.02 STRIPPING AND STORING OF TOPSOIL

A. Those portions of the site on which the new Work is to be constructed shall be stripped of all topsoil to a minimum depth of 6 inches prior to other earthwork operations. Stripped materials shall not be used for compacted fill.

B. The stripped topsoil shall be stockpiled at the place or places approved by the Project Architect.

C. Topsoil to be suitable for re-use shall meet the requirements for topsoil described by Landscape Architect above, and shall be free from trash, debris, and surface vegetation.

D. After all of the other Work has been completed in each area, topsoil shall be placed and graded in accordance with the Grading Plan and as specified in the Landscape Drawings and Specifications.

3.03 EROSION CONTROL AND DEWATERING

A. In general, the construction procedures outlined herein shall be implemented to ensure minimum damage to the environment during construction.

B. Whenever possible, access and temporary roads shall be located and constructed to avoid environmental damage. Provisions will be made to regulate drainage, avoid erosion and minimize damage to vegetation.

C. Where areas must be cleared for storage of materials or temporary structures, provisions shall be made for regulating drainage and controlling erosion, subject to Project Architect approval.

D. Temporary measures shall be applied to control erosion and to minimize the siltation of the project site and adjacent property. Such measures shall include, but not be limited to, the use of silt fences, berms, baled straw silt barriers, gravel or crushed stone, mulch, grasses, slope drains and other methods. These temporary measures shall be applied to erodible materials exposed by any activities associated with the construction of this Project.
   1. Special care shall be taken to eliminate depressions that could serve as mosquito pools.
   2. Temporary measures shall be coordinated with the construction of permanent drainage facilities and other Work to the extent practicable to assure economical, effective, and continuous erosion and siltation control.
   3. Contractor shall provide special care in areas with steep slopes. Disturbance of vegetation shall be kept to a minimum to maintain stability.

E. Remove only those trees, shrubs and grasses indicated in the Drawings as such. Protect the rest to preserve their aesthetic and erosion-control values.

F. Install erosion and sediment control practices according to soil conservation district standards and specifications. The practices shall be maintained in effective working condition during construction and until the drainage area has been permanently stabilized.

G. In the event of any temporary work stoppage, the Contractor shall take steps to prevent any temporary or permanent environmental damage to the area undergoing construction.

H. In the event the Contractor fails to satisfactorily control erosion and siltation, the Owner reserves the right to employ outside assistance or to use its own forces to provide the corrective measures indicated. The cost of such Work, plus engineering costs, will be deducted from monies due the Contractor.

I. Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein is inspected by the Project Architect and backfill operations have been completed and approved.
   1. The different working areas on the site shall be kept free of surface water at all times. The Contractor shall install drainage ditches and dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations and fill areas. The diversion and removal of surface water shall be performed in a manner that will prevent the accumulation of water behind temporary structures or at any other locations within the construction area where it may be detrimental.
   2. The Contractor will be held responsible for the condition of any pipe, conduit or channel which he may use for drainage purposes and all such pipes, conduits or channels shall be left clean and free of sediment.

J. Refer to Article 3.19 of this Section for the TPDES General Permit requirements.

3.04 EXCAVATION

A. Contractor shall excavate and backfill in advance of the construction, test pits to determine conditions or location of the existing utilities. Contractor shall perform all Work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, backfilling and replacing pavement for the test pits.

B. Contractor shall be responsible for the definite location of each existing utility involved within the area of his excavation for Work under this Contract. Care shall be exercised during such location

work to avoid damaging and/or disrupting the affected utility. The Contractor shall be responsible for repairing, at his expense, damage to any structure, piping or utility caused by his Work.

C. Explosives will not be permitted on this project.

D. Contractor and/or Contractor's independently retained employee or structural design/geotechnical/safety/equipment consultant, if any, shall review the Drawings and any available geotechnical information and the anticipated installation site(s) within the project Work area in order to develop the Contractor's plans to implement the project described in the Contract Documents. The Contractor's plans shall provide for adequate trench safety systems that comply with, as a minimum, OSHA standards for trench excavations. Specifically, Contractor and/or Contractor's independently retained employee or safety consultant shall develop and implement a trench safety program in accordance with OSHA standards governing the presence and activities of individuals working in and around trench excavation. Contractor shall be required to provide an on-site representative to insure compliance and review of the trench safety program. Contractor shall be required throughout the construction process to insure that the appropriate safety system(s) is utilized for the soil condition encountered during the construction of the project.

E. Sheeting and shoring shall be provided as necessary for the protection of the Work and for the safety of personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the approval of the Project Architect, but the Contractor shall be responsible for the adequacy of all sheeting, bracing, cofferdamming, etc. No separate payment is to be made for providing or removing steel or wood sheet piling; payment shall be considered as having been included in the price bid for the Contract. All shoring, bracing and sheeting shall be removed as the excavations are backfilled and in a manner such as to prevent injurious caving; or, if so directed by the Project Architect, because in his opinion, removal would be damaging to structures or personnel, shall be left in place. Sheeting left in place shall be cut off 3 feet below the surface. Payment for sheeting left in place shall be considered as having been included in the Contract Price. All sheeting and bracing must be maintained until replaced by other sheeting and bracing or until the permanent construction is able to withstand lateral pressures from soil and water. Remove sheeting and bracing from excavations unless otherwise ordered in writing by the Project Architect. Removal shall be done so as to not cause injury to the Work. Removal shall be equal on both sides of excavations to ensure no unequal loads on pipe or structure. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete until the following conditions are satisfied:
   1. Concrete has cured a minimum of 7 days.
   2. Wall and floor framing up to and including grade level floors are in place.

F. Excavation of every description and of whatever substances encountered within the grading limits of the Project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the Work.
   1. Excavation Work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations shall provide adequate working space and clearances for the Work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.
   2. Slope sides of open excavations to a slope of two horizontal to one vertical.
   3. Subgrades for parking areas and trench bottoms shall be firm, dense, and thoroughly compacted to a 95% maximum density. The finished elevation or stabilized subgrades shall not be above subgrade elevations shown on the Drawings.
   4. Exposed soil after excavations have been made shall be protected against detrimental damage and change in condition from physical disturbance and rain. Wherever possible, concrete footings shall be done the same day the excavation is made. If this is not done, the footing excavations shall be properly protected.

G. All excavated materials that meet the requirements for backfill shall be stockpiled within the site (but not less than 25 feet from the surface borders of any excavation) for use as backfill, or for providing

final site grades. All excavated materials which are not considered suitable for fill, and any surplus or excavated material which is not required for fill shall be disposed of off the site by the Contractor. Upon completion of the Work all on-site waste and disposal areas shall be cleaned and the debris removed from the site.

1. Materials deposited off the site shall be transported and placed in accordance with all applicable rules and regulations of all authorities having jurisdiction thereof. No surplus or unacceptable excavated materials of any kind shall be deposited in any stream or water course or dumped on public property. The different Work areas on the site shall be kept free of surface water at all times.

3.05 EXCAVATIONS FOR STRUCTURES

A. Excavations for the construction of structures and foundations shall be carefully made to the depths indicated or required. Bottoms for footings, slabs, and grade beams shall be level, clean and clear of loose material, the lower sections to be true to size. Footings slab and grade beam bottoms shall be approved by the Project Architect before any concrete is placed thereon.

B. When the excavation has reached the design subgrade, the exposed subgrade shall be proof rolled. Proof rolling operation shall be inspected by the Project Engineer. Any soft or unconsolidated zones or area detected by proof rolling operations shall be undercut as directed by the Project Engineer. The undercut subgrade shall be scarified to a minimum depth of 6-inches and compacted to a minimum of 95% of the maximum density as determined by ASTM-D-698. After the undercut subgrade has been scarified and compacted the undercut shall be backfilled with select backfill to the design subgrade elevation in accordance with these specifications. The final subgrade shall be inspected and approved by the Project Engineer.

C. In excavations for structures, where, in the opinion of the Project Architect, the ground, not affected by high water level, is spongy or otherwise unsuitable for the contemplated foundation, the Contractor will be required to remove such unsuitable earth and replace it with suitable material properly compacted.

D. Excavations for structures which have been carried below the depths indicated shall be refilled to the proper grade with select backfill material properly compacted, in accordance with these Specifications.

E. All pavement structure excavations shall be hand-trimmed to permit the placing of full widths, and subsurface drainage piping. Rounded and undercut edges will not be permitted.

F. Excavation shall be extended a minimum of two feet on each side of structures, footings, etc., unless otherwise indicated on the Drawings.

3.06 DRIVEWAY ENTRANCE DRIVE EXCAVATIONS

A. Excavation shall consist of excavation for the Driveway entrance drive in conformity with the lines, grades, cross sections, and dimensions shown on the Drawings and shall include the excavation of all unsuitable material from the subgrade.

B. The subgrade shall be compacted to 95% maximum dry density at optimum moisture.

3.07 TRENCH EXCAVATIONS

A. Trenches shall be excavated to a width which will provide adequate working space and clearances for proper pipe installation, jointing, and embedment, and subsurface drainage installation:

1. Where pipe elevations are not shown on the Drawings, trenches shall be excavated to a depth sufficient to provide a minimum cover over the top of the pipe of 4 feet.

B. Except where otherwise required, pipe trenches shall be excavated 6 inches below the underside of the pipe to provide for the installation of granular embedment pipe foundation material.

C. Where in earth, trench bottoms for 6 inch or smaller pipe may be excavated below the pipe subgrade and granular embedment material provided as specified or the trench bottom may be

graded to provide uniform and continuous support (between bell holes or end joints) or the installed pipe.

D. Over-depths in trench excavation shall be backfilled with select backfill material properly compacted. Whenever unsuitable material that is incapable of properly supporting the pipe is encountered in the undercut required for bedding material, the unsuitable material shall be removed to the depth required and the trench backfilled to the proper grade with select backfill material properly compacted.

E. Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

F. Where existing piping cross the new pipeline trench excavation, they shall be adequately supported and protected from damage due to construction. All methods for supporting and maintaining these facilities shall be subject to approval by the Project Architect. Care shall be taken to insure that the existing pipeline grades and alignment are maintained and that the pipe joints are not disturbed. Backfill shall be carefully placed and tamped to prevent damage or future settlement. Any damage or misalignment of the existing piping due to construction or settlement shall be repaired by the Contractor at his expense. Where sanitary sewer lines cross potable water lines, encase sewer line in concrete. Reference Utility drawings for locations.

3.08 TRENCH AND EXCAVATION SAFETY PROGRAM (Refer to Section 01 50 00)

A. Contractor shall provide trench excavation protection.

B. Trench excavation protection shall be accomplished as required by the provisions of CFR 29, Part 19261, Subpart P - Excavations, Trenching and Shoring of the Occupational Safety and Health Administration Standards and Interpretations.

C. Contractor shall submit a trenching plan, which has been approved and sealed by a professional engineer registered in the State of Texas, to Project Architect prior to commencing construction.

D. The trenching plan submitted by Contractor shall, as a minimum, comply with the requirements of the OSHA Safety and Health Standards.

E. It is the sole duty, responsibility and prerogative of the Contractor, not the Owner, Engineer, or Project Architect to determine the specific applicability of the designed trench safety systems to each field condition and to make inspections of the trench safety systems.
   1. The Contractor shall maintain a permanent record of inspections.

F. The Contractor shall protect persons from injury at excavations, by barricades, warnings and illumination. Any work within the Public Right-of-Way shall comply to the latest revisions and requirements of the Texas Manual on Uniform Traffic Control Devices.

G. Contractor shall coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.

H. Prior to commencing excavation, Contractor shall give written notice to emergency medical service (EMS) stating location and nature of work. Contractor shall post phone number of emergency medical service near phone at each site.

I. See Sections 01 50 00 and 31 23 33 for additional trenching requirements.

3.09 UNAUTHORIZED EXCAVATION

A. All excavation outside the lines and grades shown, and which is not approved by the Project Architect, together with the removal and disposal of the associated material shall be at the Contractor's expense. The unauthorized excavation shall be filled and compacted with approved backfill by the Contractor at his expense.

3.10 PLACEMENT OF FILL AND BACKFILL

A. All select backfill and backfill required for structures, trenches and site demolition backfill required to provide the finishes grades shown and as described herein shall be furnished, placed and compacted by the Contractor.

B. Backfill excavations as promptly as Work permits, but not until completion of the following:
   1. Acceptance by the Project Architect of construction below finish grade.
   2. Inspection, testing, approval, and recording of locations of underground piping.
   3. Removal of concrete formwork.
   4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
   5. Removal of trash and debris.

C. Fill containing organic materials or other unacceptable material shall be removed and replaced with approved fill material.

3.11 PLACEMENT OF SELECT BACKFILL, BACKFILL, AND FILL

A. Select backfill shall be placed to the grades shown on the Drawings. The lift thickness and compaction moisture content range given herein are approximate. These values will be determined from the laboratory test results on the fill materials. Every lift of fill material shall be tested unless the Project Architect determines that less quality control testing is acceptable.

B. All select backfill shall be placed in horizontal loose lifts not exceeding 8 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness after placing. Each lift shall be compacted by not less than two complete coverages of the specified compactor. Select backfill shall be placed to the underside of all compactor. Select backfill shall be placed to the underside of all concrete slabs. The maximum slope of select backfill to the subgrade shall be one vertical to one horizontal.

C. Backfill and fill around and outside of structures and over select backfill shall be deposited in layers not to exceed 8 inches in uncompacted thickness and mechanically compacted, using platform type tampers. Compaction of structure backfilled by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of select backfill and/or backfill by inundation with water will not be permitted. All materials shall be deposited as specified herein and shown on the Drawings.

D. The material shall be placed at a moisture content that falls in the range of laboratory optimum moisture content of minus two (-2) to plus two (+2) percentage points. It shall be compacted to a density as determined by ASTM D 1557 at 95% to the maximum laboratory dry density for that material. The contractor shall provide equipment capable of adding measured amounts of water to the backfill and/or select backfill material to bring it to a condition within the range of the required moisture content. The Contractor shall provide equipment capable of disking, aerating, and mixing the soil to insure reasonable uniformity of moisture content throughout the fill material and to reduce the moisture content of the borrow material by air drying if necessary. If the subgrade or lift of earth material must be moisture conditioned before compaction, the fill material shall be sufficiently mixed or worked on the subgrade to insure uniform moisture content throughout the lift of material to be compacted. Materials at moisture content in excess for the specified limit shall be dried by aeration or stockpiled for drying. The moisture content shall be maintained as described above until the fill is permanently covered.

E. No backfill or fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed. No compaction of fill will be permitted with free water on any portion of the fill to be compacted. No fill shall be placed or compacted in a frozen condition or on top of frozen material. Any fill containing organic materials or other unacceptable material previously described shall be removed and replaced with approved fill material prior to compaction.

F. Each lift of compacted material shall be compacted by the designated number of coverages of all portions of the surface of each lift by a smooth-drum vibratory roller for granular material having a static weight not less than 5,500 pounds, a sheepsfoot roller for cohesive material exerting a pressure of 250 psi on the surface of the feet, or equivalent equipment approved by the Project

Engineer prior to commencement of the Work. One coverage is defined as the condition obtained when all portions of the surface of the fill material have been subjected to the direct contact of the compactor. The compactor shall be operated at a forward speed not exceeding 40 feet per minute.

G. Compaction shall be performed with equipment suitable for the type of fill material being placed. The Contractor shall select equipment which is capable of providing the minimum density required by these Specifications. The gross weight of compacting equipment shall not exceed 7,000 pounds within a distance of ten feet from the wall of any completed structure. Equipment shall be provided that is capable of compacting in restricted areas next to structures and around piping. The effectiveness of the equipment selected by the Contractor shall be tested at the commencement of compacted fill Work by construction of a small section of fill within the area where fill is to be placed. If tests on this Section of fill show that the specified compaction is not obtained, the Contractor shall increase the amount of coverages, decrease the lift thickness or obtain a different type of compactor.

H. Levels of backfill against concrete walls shall not differ by more than 2 feet on either side of walls unless walls are adequately braced or all floor framing is in place up to and including grade level slabs. Particular care shall be taken to compact structure backfill which will be beneath pipes, roads, or other surface construction or structures. In addition, wherever a trench passes through structure backfill, the structure backfill shall be placed and compacted to an elevation 12 inches above the top of the pipe before the trench is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.

I. The compaction requirements specified are predicated on the use of normal materials and compaction equipment. In order to establish criteria for the placement of a controlled fill so that it will have compressibility and strength characteristics compatible with the proposed structural loadings, a series of laboratory compaction and/or compressive strength tests will be performed on the samples of materials submitted by the Contractor. From the results of the laboratory tests, the final values of the required percent compaction, the acceptable compaction moisture content range, and the maximum permissible lift thickness will be established for the fill material and construction equipment proposed.

3.12 BACKFILL IN PIPE TRENCHES

A. Pipeline trenches may be backfilled prior to pressure testing, but no structure shall be constructed over any pipeline until it has been tested.

B. All pipe larger than 6 inches in diameter shall be placed on granular embedment material. Pipe 6 inches in diameter and smaller shall be placed in granular embedment material unless the trench bottom has been graded to provide uniform and continuous support of the installed pipe.

C. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the following requirements:

D. Granular embedment shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle. After each pipe has been graded, aligned, and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations. Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

1. Compacted backfill will be required for the full depth of the trench above the granular pipe embedment material. Where the trench for one pipe passes beneath the trench for another pipe or electrical ductbank, for the lower trench shall be compacted to the level of the bottom of the upper trench.
2. Each layer of embedment material shall be compacted by at least two complete coverages of all portions of the surface of each lift using approved compaction equipment. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of the compacting surface of the compactor.
3. The method for compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.
4. The degree of compaction required for granular embedment is expressed as a percentage of the maximum density obtained by the test procedure presented in TEX-113-E.

3.13 BACKFILL IN ELECTRICAL DUCTBANK TRENCHES

A. Compacted backfill will be required for the full depth of the trench above the electrical ductbank. Where the trench for one ductbank passes beneath the trench for another pipe or ductbank select backfill shall be placed to the level of the bottom of the upper trench.

B. Placement and compaction of backfill in electrical ductbank trenches shall conform to the requirements of these Specifications.

C. The electrical ductbank shall be placed in sand envelopes shown on the Drawings.

3.14 COMPACTION DENSITY REQUIREMENTS

A. The degree of compaction required for all types of fills and exposed subgrades shall be as listed below. Material shall be moistened or aerated as necessary to provide the moisture content that will facilitate obtaining the specified compaction.

Material	ASTM	Required Density	Lift Thickness
Exposed Subgrade Crawl In Underfloor Space	D698	90%	6 inches
Select Backfill (Playground/ Non-use Open Areas)	D698	90%	6 inches
Select Backfill Below Parking Areas	D1557	95%	6 inches
Moisture Conditioned Subgrade	D698	98%	8 inches
Backfill/Around Structures	D698	95%	8 inches
All Other Backfill	D698	95%	8 inches
Backfill/Flexible Base	D1557	95%	8 inches
Backfill/Pipe Trenches	D698	98%	12 inches

Backfill/Electrical	D698	95%	
Porous Granular Fill	D698	95%	6 inches
Porous Granular Embedment/Pipe Trenches	D698	95%	8 inches
Pit Run Sand around Utility Trenches	D698	95%	8 inches
Clay	D698	90%	8 inches

The testing laboratory shall perform tests necessary to provide data for selection of fill material and control of placement water content.

C. Field density tests to insure that the specified density is being obtained will be performed by testing laboratory during each day of compaction work. Number of test shall be approved by Project Architect.

D. If the tests indicate unsatisfactory compaction, the Contractor shall provide the additional compaction necessary to obtain the specified degree of compaction. All additional compaction work shall be performed by the Contractor at no additional cost to the Owner until the specified compaction is obtained. This Work shall include complete removal of unacceptable (as determined by the Project Architect) fill areas and replacement and recompaction until acceptable fill is provided.

3.15 CRUSHED STONE PLACEMENT

A. Crushed stone shall be placed where shown on the Contract Drawings.

3.16 SHEETING, SHORING AND BRACING

A. Excavations for structures and pipe lines shall be open excavation, sheeted, shored and braced where necessary to prevent injury to workmen, structures, or pipe lines.

B. All municipal, county, state and federal ordinances, codes, regulations and laws shall be observed.

C. Used material shall be in good condition, not damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary work.

D. All timber used for breast boards (lagging) shall be new or used, meeting the requirements for Douglas Fir Dense Construction grade or Southern Pine No. 2 Dense S3.

E. All steel work for sheeting, shoring, bracing, cofferdams etc., shall be designed in accordance with the provisions of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", of the AISC except that field welding will be permitted.

F. Steel sheet piling shall be manufactured from steel conforming to ASTM A 328. Steel for soldier piles, wales and braces shall be new or used and shall conform to ASTM A 36.

G. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

H. Unless otherwise shown, specified, or ordered, all materials used for temporary construction shall be removed when work is completed. Such removal shall be made in a manner not injurious to the structure or its appearance or to adjacent Work.

3.17 SHEETING LEFT IN PLACE

A. Steel sheet piling shown to be left in place or ordered in writing to be left in place by the Project Architect, shall consist of rolled sections of the continuous interlocking type unless otherwise approved. The type and design of the sheeting and bracing shall conform to the above specifications for all steel work for sheeting and bracing. Steel sheeting installed but not removed shall be new.

B. Steel sheet piling to be left in place shall be driven straight to the lines and grades as shown or directed. The piles shall penetrate into firm materials with secure interlocking throughout the entire length of the pile. Damaged piling having faulty alignment shall be pulled and replaced by new piling.

C. The type of guide structure used and method of driving for steel sheet piling to be left in place shall be subject to the approval of the Project Architect. Jetting will not be permitted.

D. Contractor shall cut off piling left in place to the grades shown or ordered by the Project Architect and shall remove the cutoffs from the site.

E. Contractor shall thoroughly clean wales, braces and all other items to be embedded in the permanent structure, and shall make provisions that the concrete surrounding the embedded element is sound and free from air pockets or harmful inclusions. The provisions shall include the cutting of holes in the webs and flanges of wale and bracing members, and the welding of steel diaphragm waterstops perpendicular to the centerline of brace ends which are to be embedded.

F. Subsequent to removal of the inside face forms, and when removal of bracing is permitted, steel shall be cut back at least 2 inches inside the wall face and the opening patched with cement mortar. The concrete shall be thoroughly worked beneath wales and braces, around stiffeners and in any other place where voids may be formed.

G. Portions of sheeting or soldier piles and breast boards which are in contact with the foundation concrete shall be left in place, together with wales and bracing members which are cast into the foundation or superstructure concrete.

3.18 FINAL GRADING AND EMBANKMENTS

A. To the extent available backfill material from excavations shall be placed in accordance with these Specifications to final grades with a minimum compacted depth of 6 inches.

B. After other outside Work has been finished, and backfilling and embankments completed and settled, all areas on the site of the Work which are to be graded shall be brought to a subgrade suitable with the indicated elevations, slopes, and contours with suitable excess excavation material. Subgrade shall be left below the finished grades shown on the Drawings to allow for topsoil placement. Reference Landscape Specifications for topsoil depth, where applicable.

3.19 TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM (TPDES) GENERAL PERMIT

A. The Contractor shall prepare and submit the following items to the Owner.

1. Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity. This notice shall be prepared and filed with the TCEQ at least 48 Hrs. before the start of construction.
2. Conform to the storm water pollution prevention plan.
3. Notice of Termination (NOT) of coverage under the TPDES General Permit.
4. The above documents will be filed with the TCEQ by the General Contractor. Contractor is to coordinate with Project Civil Engineer as necessary.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.01 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.

1.02 DESCRIPTION OF WORK

A. Extent of site clearing is shown on drawings.

B. Site clearing includes, but is not limited to:

1. Removal of unwanted vegetation in the areas to receive site improvements, buildings, pavements, or fill and/or other areas of the site as directed by the Architect.
2. Topsoil stripping.
3. Clearing and grubbing.
`4. Removing above-grade improvements.
5. Removing below-grade improvements.

1.03 JOB CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
1. Protect improvements on adjoining properties and on Owner's property.
2. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

C. No trees shall be removed until the building, drives, pavement areas, walks and other proposed improvements have been staked-out. After these areas have been staked-out, the Owner, and Architect shall meet at the site with the Contractor to concur on which trees can be removed and which shall remain. The Contractor shall make minor modifications if directed to save existing trees which the Owner desires to have remain.

D. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation not indicated or directed to be removed, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards as directed by the Architect at all trees near areas affected by the construction to protect trees and vegetation to be left standing.

E. Provide protection for roots over 1-1/2" diameter cut during construction operations. Cut faces shall be coated with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

5.1PART 2 - PRODUCTS

Not applicable to work of this section.

PART 3 - EXECUTION

3.01 SITE CLEARING

A. General: Prior to site clearing, the Contractor shall stake-out the limits of new construction. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions within the limits

of new construction. Remove such items elsewhere on site or premises as specifically indicated or directed. Removal includes digging out stumps and roots. The Contractor shall not remove any trees which are located outside the limits of new construction unless indicated on the drawings to be removed or unless directed to do so by the Architect. The Contractor shall take necessary precautions to protect all trees which are to remain, including providing barricades around trees located within ten feet (10') of any area of new construction.

B. Topsoil: Topsoil is defined as fertile, friable clay loam (less than 60% clay content) surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 1" in diameter, and without weeds, roots, and other objectionable material. Topsoil must be capable of sustaining vigorous root growth.
   1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
   2. Remove heavy growths of grass from areas before stripping.
   3. Stockpile acceptable topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust. The Contractor shall, however, be responsible for providing any and all additional topsoil as required.
   4. Dispose of unsuitable or excess topsoil same as waste material, herein specified.

C. Clearing and Grubbing: Clear entire site of shrubs and other vegetation, including all underbrush.
   1. Completely remove stumps, roots, and other debris protruding through ground surface.
   2. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
   3. Place acceptable fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compact to a density equal to adjacent original ground.

D. Removal of Improvements: Remove all existing above-grade and below-grade improvements.

3.02 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning will not be permitted.

B. Removal from Owner's Property: Remove all waste materials and unsuitable and excess topsoil from Owner's property and dispose of off site in a legal manner.

END OF SECTION

SECTION 31 22 13
ROUGH GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Remove topsoil and stockpile for later reuse.

B. Excavate subsoil and stockpile for later reuse.

C. Grade and rough contour site.

1.02 RELATED WORK

A. Section 31 00 00 – Earthwork.

B. Section 31 23 16 – Excavation.

C. Section 31 23 23.13 – Backfill.

D. Section 31 23 33 – Trenching and Backfilling

1.03 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01 77 00 ‘Closeout Procedure’.

B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 PROTECTION

A. Protect benchmarks, existing structures, fences, and roads.

B. Protect above or below grade utilities that are to remain.

C. Repair all damage.

1.05 QUALITY ASSURANCE

A. Owner is to employ a Testing Laboratory to perform Soil Testing and Inspection Service for quality control testing during grading and excavation operations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Excavated material, graded free of roots, rocks larger than one (1) inch, subsoil, debris, and large weeds.

B. Subsoil: Excavated material, graded free of lumps larger than six (6) inches, rocks larger than three (3) inches, and debris.

C. Borrow: Borrow material for this project should consist of non-expansive select materials. Borrow material for this project shall be approved by the Architect before use.

D. Site Excavated Materials: Site materials may be used for fill, provided they are re-compacted to 95 percent (minimum) of the maximum dry density as obtained in the Standard Compaction Procedure (ASTM D-698) and placed in maximum eight-inch thick loose lifts. The width of actual compacted material will extend 2 feet beyond the edges of the proposed walkways and pavement areas. All areas that are not designated as walkways will be compacted to a minimum of 90%.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify the site conditions before beginning Work.

B. Verify that survey benchmark and intended elevations for the Work are as indicated on Survey. Contractor will be responsible for verifying all horizontal distances for new and existing improvements.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known below grade utilities. Stake and flag locations.

C. Identify and flag above grade utilities.

D. Maintain and protect existing utilities remaining which pass through Work areas.

E. Notify utility companies to remove and relocate utilities.

F. Upon discovery of unknown utility or concealed conditions, discontinue affected Work; notify Project Architect.

3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be re-landscaped, or re-graded and stockpile in area designated on site.

B. Do not excavate wet topsoil.

C. Stockpile topsoil to depth not exceeding eight (8) feet. Cover to protect from erosion.

3.04 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be re-landscaped or re-graded marked areas and stockpile in area designated on site.

B. Do not excavate wet subsoil.

C. Stockpile subsoil to depth not exceeding eight (8) feet.

D. When excavating through roots is necessary, perform Work by hand.

3.05 TOLERANCES

A. Top Surface of Subgrade: Plus or minus one (1) inch.

3.06 FILLING

A. Fill areas to new contours and elevations with approved materials only.

B. Granular Fill: Place and compact materials in continuous layers not exceeding eight (8) inches uncompacted depth compacted to 95 percent.

C. Subsoil and Topsoil Fill: Place and compact material in continuous layers not exceeding eight (8) inches uncompacted depth, compacted to 95 percent.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building a minimum of two (2) inches in ten (10) feet, unless indicated otherwise in Drawings.

F. Make grade changes gradual. Blend slope into level areas.

G. Remove surplus fill materials from site.

3.07 FIELD QUALITY CONTROL

A. Field inspection and compaction testing of fill material will be performed under provisions of Section 01 40 00 ‘Quality Requirements’ and as specified on Drawings.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

C. Frequency of Tests: Perform one test for every 5,000 S.F. per lift, with a minimum of 3 each per test location.

END OF SECTION

SECTION 31 23 16
EXCAVATION

1PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General, Supplementary Conditions, Special Conditions and Division-1 Specification Sections, apply to Work of this Section.

1.02 SECTION INCLUDES

A. Excavation for building foundations.

B. Excavation for paving, trenching and drainage fill course.

C. Excavation for utility trenches.

D. Excavation for retaining walls.

1.03 RELATED SECTIONS

A. Section 01 40 00 - Quality Requirements.

B. Section 31 00 00 - Earthwork.

C. Section 31 22 13 - Rough Grading.

D. Section 31 23 23.13 - Backfilling.

E. Section 31 23 33 – Trenching and Backfilling

1.04 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated on the Boundary Survey.

1.1PART 2 - PRODUCTS

2.01 Fill Material outside of building area to comply with ASTM D2487. Use only approved fill material, free of clay, rock, gravel larger than 3" in any dimension, debris, frozen materials, vegetable and other deleterious matter.

A.PART 3 - EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

C. Notify Project Architect if unidentified below grade utilities are encountered during excavation operations for instructions on how to proceed.

D. Protect above and below grade utilities which are to remain.

E. Protect features remaining as a portion of final landscaping.

F. Protect benchmarks, existing sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.02 EXCAVATION

A. Excavate subsoil required to accommodate pavement structures, slabs-on-grade, paving and site structures and construction operations.

B. Excavate to working elevations for foundation and underfloor Work. Coordinate all special requirements; reference Structural Drawings and Specifications.

C. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

D. Grade top perimeter of excavation to prevent surface water from draining into excavation.

E. Hand trim excavation. Remove loose matter.

F. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Larger material will also be removed under this Section.

G. Notify Project Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.

H. Correct unauthorized excavation at no extra cost to Owner.

I. Correct areas over-excavated by error in accordance with Section 31 23 23.13 'Backfill'.

J. Remove excess material from site.

K. Compact fill in areas to receive paving and walkways to 95% soil density; See Structural and Civil Drawings and Specifications for compaction requirements for structural components.

L. Compact the exposed sub-grade areas in the underfloor to 90% soil density.

M. Trenching: trenching for utilities to be carried to the building unless otherwise indicated in Drawings.

3.03 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 40 00 'Quality Requirements'.

B. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation, from flooding and freezing.

END OF SECTION

SECTION 31 23 23.13

BACKFILL

1.1PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building perimeter and site structure backfilling to subgrade elevations.

B. Site filling and backfilling at all demolition areas that are excavated.

C. Fill under pavement structures and walkways.

D. Backfilling for retaining walls.

E. Consolidation and compaction.

F. Fill for over-excavation.

G. Geotextile fabric.

1.02 RELATED SECTIONS

A. Section 01 40 00 - Quality Requirements: Testing Laboratory Services: Testing Fill compaction.

B. Section 31 00 00 - Earthwork.

C. Section 31 23 16 - Excavation.

D. Section 31 23 33 – Trenching and Backfilling.

1.03 REFERENCES

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D-698- Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ASTM D-1557- Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 33 00 ‘Submittals’.

B. Samples: Submit 10 lb. sample of each type of fill to testing laboratory, in air-tight containers.

C. Mix designs and testing information for Lean Concrete and Controlled Low Strength Material.

5PART 2 - PRODUCTS

2.01 FILL MATERIALS

A. Fill as specified on Drawings.

B. Lean Concrete: concrete conforming to Section 03 30 00 with a compressive strength of 2,000 psi.

C. Controlled Low Strength Material (CLSM – Flowable Fill): concrete conforming to City of San Antonio Standard Specification Item No. 413, or approved equal, with a 28 day unconfined compressive strength of 80 to 150 psi.

2.02 ACCESSORIES

A. Vapor Retardant: 10 mil thick, polyethylene.

B. Geotextile fabrics as shown on Drawings.

A.PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify fill materials to be reused are acceptable.

3.02 PREPARATION

A. Generally, compact sub-grade to density requirements for subsequent backfill materials.

B. Cut out soft areas of sub-grade not capable of in-situ compaction. Backfill with approved fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy sub-grade surfaces.

C. Maintain optimum moisture content of backfill materials to attain required compaction density.

D. Slope grade away from walkways minimum 2%, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Remove surplus backfill materials from site unless otherwise directed by project Architect.

G. Leave fill material stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus one inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. Owner will employ a Testing Laboratory to perform soil testing and inspection services for quality control testing. Field inspection and testing will be performed under provisions of Section 01 40 00 ‘Quality Requirements’.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D1557 and with Section 01 40 00 ‘Quality Requirements’.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1556 and with Section 01 40 00 ‘Quality Requirements’.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Proof roll compacted fill surfaces under paving.

3.06 PROTECTION OF FINISHED WORK

A. Recompact fills subjected to vehicular traffic. Reference Final Site Grading Plan for special Flexible Base requirements.

END OF SECTION

SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavate trenches for utilities from outside of new building and new building additions to new utilities.

B. Compacted bedding under fill over utilities to subgrade elevations.

C. Backfilling and compaction.

1.02 RELATED SECTIONS

A. Section 01 40 00- Quality Requirements

B. Section 01 50 00 - Construction Facilities and Temporary Controls

C. Section 31 00 00 – Earthwork

D. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface

E. Section 31 23 16 – Excavation

F. Section 31 23 23.13 - Backfilling

1.03 REFERENCES

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D-698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, using 5.5 lb rammer and 12 inch drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D-1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb rammer and 18 inch drop.

1.04 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings. Coordinate with other utilities, including new storm piping.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

A. Materials as specified in Section 31 00 00- Earthwork.

2.02 BED MATERIALS

A. Type 1 - Coarse Stone, Crushed Gravel Pit run, Angular, washed natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Percent Passing
2 inches	100
One inch	95
3/4 inch	95 to 100
5/8 inch	75 to 100
3/8 inch	55 to 85
No. 4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

B. Type 2 - Pea Gravel: Natural stone, washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:

Minimum Size: 1/4 inch.

Maximum Size: 5/8 inch.

C. Type 3 - Sand: Natural river or bank sand, washed; free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

D. Subsoil: Reused, Imported, free of gravel larger than 3 inch size, and debris.

E. Concrete: Flowable fill, Lean concrete with a compressive strength of 750 psi to be used where over excavation occurs.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify fill and bedding materials to be reused, is acceptable.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Maintain and protect existing utilities remaining, which pass through work area.

C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

D. Protect above and below grade utilities which are to remain.

E. Cut out soft areas of subgrade not capable of in-situ compaction. Backfill with Type 2 fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 EXCAVATION

A. Excavate subsoil required for sanitary sewer, water, gas, storm sewer, electrical duct bank and underground telephone conduits piping to existing utilities or as shown on Drawings.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.

D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

F. Correct unauthorized excavation at no cost to owner.

G. Correct areas over-excavated by error in accordance with Part 2 of the Bed Materials section on this spec.

H. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.04 BEDDING

A. Bedding for utility lines - Where acceptable materials are encountered at the pipe bearing level, they shall be acceptable for bedding purposed. Where unacceptable materials, such as water, silt, mulch, trash, debris, or rock, in ledge or boulder are found at the pipe-bearing level, if flexible pipe is used, the trench should be over excavated as directed and backfilled with crushed stone or gravel, 1/4" to 1-3/4" size. The embedding shall extend up the sides of the pipe sufficiently to embed the lower quadrant of the pipe.

3.05 BACKFILLING

A. Initial Backfill - Shall extend from the bedding surface to 12” above the top of the pipe. Where acceptable laying conditions exist, the excavated materials may be used as initial backfill material. Where unacceptable laying conditions, and materials are encountered, or where flexible pipe is to be laid, the initial backfill shall consist of well graded gravels, crushed screenings or sand, or material approved by the Architect.

B. Secondary backfill shall extend from 12” above the pipe to the top of the trench, and shall consist of materials removed from the trench, and shall be free from brush, debris, and junk, and contain no stones greater than 6”.

C. Initial backfill material shall be on job site at time of inspection.

D. Backfill trenches to contours and elevations with unfrozen materials.

E. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

F. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth.

G. Soil Backfill Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.

H. Maintain optimum moisture content of backfill materials to attain required compaction density.

I. Remove surplus backfill materials from site.

J. Leave fill material stockpile areas completely free of excess fill materials.

3.06 TOLERANCES

A. Top Surface of Backfilling: Under Paved Areas: Plus or minus one inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus one inch from required elevations.

3.07 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00 Quality Requirements.

B. Tests and analysis of fill material will be performed in accordance with ASTM- D698 and with Section 01 40 00 Quality Requirements.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1556, ASTM D-1557, ASTM D698 and with Section 01 40 00 Quality Requirements.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Frequency of Tests: Perform one test for every 200 lineal feet of pipe per lift.

3.08 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 40 00 Quality Requirements.

B. Recompact fills subjected to vehicular traffic.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

1PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Asphaltic concrete paving and surface sealer.

B. Aggregate base course.

1.02 RELATED SECTIONS

A. Section 31 00 00 – Earthwork

B. Section 31 22 13 - Rough Grading.

C. Section 31 23 23.13 - Backfill

1.03 REFERENCES

A. Texas Department of Transportation Standard Specifications, 2014 Edition.

1.04 PERFORMANCE REQUIREMENTS

A. Paving: Designed for parking.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with Texas Department of Transportation Standard Specifications.

B. Mixing Plant: Conform to Texas Department of Transportation Standards.

C. Obtain materials from same source throughout.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable Texas Department of Transportation Standards for paving Work on public property.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

7.2PART 2 - PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: In accordance with Texas Department of Transportation Standards Item 340, Hot Mix Asphaltic Concrete Pavement, Type D Virgin Mix (No RAP or RAS will be accepted) and as indicated in Drawings.

2.02 ACCESSORIES

A. Primer: Homogeneous, medium curing, liquid asphalt. In accordance with Texas Department of Transportation Standards Item 300, Asphaltic, Oils and Emulsions.

B. Tack Coat: Homogeneous, medium curing, liquid asphalt. In accordance with Texas Department of Transportation Standards Item 300, Asphaltic, Oils and Emulsions.

A.PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify base conditions prior to commencing Work.

B. Verify that compacted sub-grade is dry and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

3.02 PREPARATION – PRIMER

A. Apply primer in accordance with Texas Department of Transportation Standards.

B. Apply primer evenly and smoothly on base or sub-base over sub-grade surface at uniform rate not to exceed 0.20 gallons/square yard of surface or as approved by Civil Engineer.

C. Use clean sand to blot excess primer.

3.03 PREPARATION - TACK COAT

A. Apply tack coat in accordance with Texas Department of Transportation Standards. Apply at a rate of 0.11 gallons/square yard or surface or as approved by Civil Engineer.

B. Apply tack coat to contact surfaces of existing asphalt surfaces where the new entrance drives transition to the existing street.

3.04 PLACING ASPHALT PAVEMENT

A. Install Work in accordance with Texas Department of Transportation Standards.

B. Place asphalt within twenty four (24) hours of applying primer or tack coat.

C. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.05 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with ten (10) foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within ½ inch.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00 ‘Quality Requirements’.

B. Take samples and perform tests in accordance with Texas Department of Transportation Standards.

3.07 PROTECTION

A. After placement, protect pavement from mechanical injury.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General, Supplementary Conditions, Special Conditions and Division-1 Specification Sections, apply to work of this section.

1.02 SECTION INCLUDES

A. Rigid pavement and approaches.

B. Aggregate base course.

1.03 RELATED SECTIONS

A. Section 31 00 00 - Earthwork.

B. Section 31 23 23.13 – Backfill

C. Section 32 13 20 - Curbs and sidewalks.

D. Section 07 92 00 - Joint Sealants.

E. Section 03 30 00 – Cast–in Place Concrete.

1.04 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

C. ACI 330 – Guide for Design and Construction of Concrete Parking Lots.

D. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

E. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

F. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

G. ASTM C33 - Concrete Aggregates.

H. ASTM C94 - Ready Mix Concrete.

I. ASTM C150 - Portland Cement.

J. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

K. Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges of the Texas Department of Transportation, 2014 edition.

1.05 PERFORMANCE REQUIREMENTS

A. Concrete pavements and approaches: Designed for vehicular traffic.

1.06 SUBMITTALS

A. Samples: Submit for approval samples, manufacturer's product data, test reports and material certifications as required in referenced Sections for concrete Work.

B. Certificates: Manufacturer's certification that sealer meets Specification requirements.

C. Shop Drawings: submit for approval copies of dimensioned layout of the Work, showing pattern, jointing and reinforcing.

D. Product Data: Provide data on joint filler, dowel assemblies (load transfer devices), concrete mix design, and curing compound.

1.07 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301 requirements of Section 03 30 00 ‘Cast-In Place Concrete’.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable TxDot standards for concrete paving work.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: Conform to ACI 301 As specified in Section 03 30 00 'Cast-In Place Concrete'.

2.02 REINFORCEMENT

A. Reinforcing Steel and Wire Fabric: Type specified in Section 03 20 00 'Concrete Reinforcement'.

B. Dowels: ASTM A615; 60 ksi yield grade, painted plain steel. One half greased, or sleeved to prevent bond.

2.03 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 30 00 'Cast-In Place Concrete'.

B. Cement: ASTM C150 Normal - Type I Grey color.

C. Fine and Coarse Mix Aggregates: ASTM C33.

D. Air Entrainment: ASTM C260.

E. Chemical Admixture: ASTM C494, Type A - Water Reducing

2.04 ACCESSORIES

A. Curing Compound: FS TT-C-800, Type 1, 30 percent solids ASTM C309, Type 1.

B. Liquid Surface Sealer.

C. Tie Brick or approved equal rebar supports.

D. Dowel Baskets (Load Transfer Devices).

2.05 CONCRETE MIX - BY PERFORMANCE CRITERIA

A. Mix and deliver concrete in accordance with Section 03 30 00 'Cast-In Place Concrete'.

B. Select proportions for normal weight concrete in accordance with Section 03 30 00 'Cast-In Place Concrete'.

C. Provide concrete to the following criteria:
   1. See Paragraph 3.11, this Section.

D. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.

E. Use calcium chloride only when approved by Engineer.

F. Use set retarding admixtures during hot weather only when approved by Engineer.

2.06 SOURCE QUALITY CONTROL

A. Test samples in accordance with ACI 301.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify compacted sub-grade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. Prepare sub-base in accordance with Section 31 00 00 'Earthwork'.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Notify Civil Engineer minimum twenty four (24) hours for observation prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, and profile.

B. Assemble form work to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to form work during concrete placement.

D. Positioning and supporting devices for steel reinforcement bars shall be Tie Brick or approved equal and of sufficient number to maintain the position of the bars within the allowable tolerances, but in no case will the chairs be less than five (5) feet on center.

3.05 REINFORCEMENT

A. Place reinforcement as indicated.

B. Interrupt reinforcement at expansion joints.

C. Place dowels to achieve alignment as detailed using dowel baskets.

3.06 PLACING CONCRETE

A. Place concrete in accordance with Item 360-Concrete Pavement of the Texas Department of Transportation Specification.

B. Ensure reinforcement, inserts, embedded parts, formed joints and dowel assemblies are not disturbed during concrete placement.

C. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

D. Place concrete to pattern indicated.

3.07 JOINTS

A. Place expansion joints at maximum of 60 feet intervals.

B. Place isolation joints as required to isolate pavement from structure, joint filler between paving components and building or other appurtenances.

C. Provide saw cut control joints at 15 feet intervals, longitudinal and 15 feet transverse. Provide at closer spacing where indicated in drawings for visual effect.

3.08 FINISHING

A. Paving: Light broom-finish and trowel joint edges.

B. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00 Quality Requirements. During the placing of concrete, the testing laboratory representative must be present during the entire pour.

B. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

C. One (1) additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.

D. One (1) slump test will be taken for each set of test cylinders taken.

E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.10 PROTECTION

3.11

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

3.12 SCHEDULES

A. Concrete approaches: 4000 psi 28 day Portland cement concrete, seven (7) inches thick with #4 steel reinforcing bars at twelve (12) inches on center both ways, medium broom finish, and troweled edges. Slump = 3.0” ± 1.0”.

B. Concrete pavement: 4000 psi 28 day Portland cement concrete, six (6) inches thick with #4 steel reinforcing bars at twelve (12) inches on center both ways with medium broom finish. Slump = 3.0” ± 1.0”.

END OF SECTION

SECTION 32 13 20
CURBS AND SIDEWALKS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide concrete curbs and sidewalks as shown and specified.

B. The types of Work covered by these Specifications are conventionally formed or machine formed curbs and conventionally - formed sidewalks.

C. The thickness and extent of curbs and sidewalks are shown on the Drawings.

D. Perform work on this Section in accordance with phasing requirements.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 20 00 – Earthwork

B. Section 03 30 00 – Cast-In-Place Concrete

1.04 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ASTM D 1190, Concrete Joint Sealer, Hot Poured Elastic type, or as otherwise shown on drawings.

B. Applicator Qualifications: Demonstrate previous experience in installing concrete curbs and sidewalks.

1.05 SUBMITTALS

A. Samples: Submit for approval samples, manufacturer's product data, test reports and material certifications as required in referenced Sections for concrete Work.

B. Certificates: Manufacturer's certification that sealer meets Specification requirements.

C. Shop Drawings: submit for approval copies of dimensioned layout of the Work, showing pattern, expansion joints and reinforcing.

D. LEED Submittal Requirements:

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars: Deformed steel bars and shall comply with requirements of Section 03 20 00, Reinforcement.

B. Concrete Materials: Comply with requirements of Section 03 10 00 for formwork, concrete materials, admixtures, bonding materials, curing materials and others as required.

C. Expansion Joint Material: Comply with requirements of Section 07 92 00 for expansion joint fillers.

2.02 CONCRETE MIX, DESIGN AND TESTING

A. Comply with requirement of applicable provisions of Section 03 30 00, Cast-In-Place Concrete, for concrete mix design, sampling and testing, and quality control.

B. Design the mix to produce concrete having a minimum compressive strength, of 3,000 psi with a 5" slump range and air content as specified in Section 03 30 00.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

A. Preparation of the sub-grade including compaction shall be completed for the full width of the Work.
   1. Where the sub-grade is constructed by excavation of existing grade, the top six (6) inches of the sub-grade shall be compacted to at least 95 percent of maximum density at optimum moisture content.
   2. Where the sub-grade shall be made smooth and compacted per these Specifications or as shown on the Drawings.
   3. The existing grade shall be brought to the final lines and grades utilizing select backfill as specified in Section 31 00 00 - Earthwork. The compaction requirements of Section 31 23 33 apply to this Section.

B. Base: Base shall be provided as shown on the Contract Drawings. The material shall be select backfill as specified in Section 31 00 00 - Earthwork, and compacted as specified.

3.02 FORM CONSTRUCTION

A. Set forms to line and grade. Install forms over full length of curbs and sidewalks.

3.03 REINFORCEMENT

A. Locate, place, and support reinforcement as specified in Section 03 30 00, unless otherwise shown. Size of reinforcement shall be as shown on Drawings.

3.04 CONCRETE PLACEMENT

A. General: Comply with the requirements of Section 03 30 00 for mixing and placing concrete, and as specified.

B. For concrete curbs and sidewalks, place concrete in one course, monolithic construction, for the full width and depth of curbs and sidewalks.

3.05 JOINTS

A. General: Construct expansion, contraction, and construction joints with faces perpendicular to surface of the concrete curb and sidewalk. Construct transverse joints at right angles to the Work centerline and as shown on Drawings.

B. Scored Contraction Joints: Provide these joints at ten (10) feet on centers for concrete curbs and five (5) feet on centers for sidewalks. Provide at closer spacing where indicated in Drawings for visual effect.

C. Construction Joints: Place joints at locations where placement operations are stopped for a period of more than ½ hour, except where such pours terminate at expansion joints.

D. Expansion Joints: Provide ½” inch expansion joint filler and pourable sealant where Work abuts structures; at returns; and at 30 foot spacing for straight runs. If curbs and sidewalks are not poured monolithically, provide doweled expansion joints where each abuts the other.

E. Place top of expansion joint material not less than ½” inch or more than 1 inch below concrete surface. Apply joint sealer on top of expansion joint material, flush with concrete surface, and in accordance with manufacturer's instructions.

3.06 CONCRETE FINISHING

A. All sidewalk surfaces to receive light broom finish. All curbs to be smooth finish. Smooth surfaces to receive smooth finish by screeding and floating.

B. Work edges of curb and sidewalk, and transverse joints; and round to 1/4 inch radius.

C. Complete surface finishing by drawing a fine-hair broom across surface, perpendicular to line of traffic.

3.07 CURING

A. Protect and cure finished concrete curbs and sidewalks, complying with applicable requirements of Section 03 30 00.

3.08 REPAIR AND CLEANING

A. Repair or replace broken or defective curbs and sidewalks as directed by the Architect.

B. Sweep Work and wash free of stains, discolorations, dirt or other foreign material.

3.09 REPAIR OF EXISTING CONCRETE CURB AND SIDEWALK AREAS

A. Repair and/or patch any and all damage to existing concrete curbs and sidewalk surfaces resulting from construction operations with materials to match existing.

3.10 SCHEDULE

A. Concrete Sidewalks: 3,000 psi twenty eight (28) day concrete five (5) inches thick with #3 steel reinforcing bars at 12" on center both ways Portland Cement with medium, broom finish.

B. Concrete Curbs: 3,000 psi twenty eight (28) day concrete, Portland Cement medium, broom finish.

C. Concrete Ramps: 3,000 psi 28 day concrete, cast in place, Portland Cement, medium broom finish.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 This Specification describes the minimum optical and physical properties required for a thermoplastic road marking compound that is to be applied in a molten state, onto a pavement surface, to provide traffic stripes and/or markings.

1.02 The appearance of the finished markings shall have a uniform surface, crisp edges with a minimum over-spray, clean cut-off, meet straightness requirements and conform to the design Drawings and/or Engineer instructions.

1.03 Parking Area and Asphalt Playground Area pavement marking paint: Chlorinated rubber-alkyd type, ready-mixed, complying with Federal Spec TTP115E, Type III. Reference drawings for location and color.

1.04 Drive Area pavement marking paint: Thermoplastic paint complying with TxDOT standard specifications. Reference drawings for location and color.

PART 2 - PRODUCTS

2.01 Thermoplastic pavement marking material shall be a product especially compounded for traffic markings for use on either asphaltic or Portland cement concrete surfaces.

A. The following composition requirements shall be met:

	White	Yellow
Binder	18% Min.	18% Min.
Ti02 (Type 2 Rutile)	12% Min.	N/A
Glass Spheres *	48% Min.	48% Min.
Yellow Pigment	N/A	10% Min.

NOT USED ON THIS PROJECT.

2.02 BINDERS

A. The alkyd binder shall consist of maleic modified rosin ester and other plasticizers.

2.03 PIGMENT

A. The white pigment must be a rutile titanium dioxide meeting the standards of ASTM D 476, Type V.

B. The yellow pigment must be heat-resistant and weather-stable. The yellow pigment may be either a double-encapsulated medium chrome yellow or a lead-free, organic yellow pigment (C.I. Pigment Yellow 83, opaque version). Do not mix pigment types within a batch.

2.04 PHYSICAL REQUIREMENTS

A. The Meltdown Procedure for Thermoplastic, available from the Engineer, shall be used when conducting laboratory tests to verify the following property requirements.

2.05 COLOR

A. The white thermoplastic shall be pure white and free from any tint. Using a Colorimeter, such as a Gardner color Difference Meter, the materials shall not show deviations from a magnesium oxide color standard that are greater than the following:

Scale Definition	Magnesium Oxide Standard	Sample
RD	100	75%
Reflectance		
a Red-Green	0	-5 to +5
b Yellow-Blue	0	-10 to +10

PART 3 - APPLICATION - SURFACE PREPARATION

3.01 MOISTURE

A. All surfaces shall be inspected for moisture content prior to application of thermoplastic. Approximately two square feet of a clear plastic or tar paper shall be laid on the road surface and held in place for 15 to 20 minutes. The underside of the plastic or tar paper shall then be inspected for a build up of condensed moisture from the road surface. If the amount of condensed moisture is of a sufficient amount to result in water dripping from the plastic or tar paper when held in a vertical position, thermoplastic shall not be applied. This moisture test shall be repeated until the moisture in the pavement surface has been allowed to evaporate to a level whereby there is not excessive build up of condensed moisture on the underside of the plastic or tar paper.

3.02 CLEANING

A. All surfaces shall be clean and dry before thermoplastic can be applied. Loose dirt and debris shall be removed by blowing compressed air over the area to be striped. If the thermoplastic is to be applied over existing paint lines, the paint line shall be swept with a mechanical sweeper or wire brush to remove poorly adhered paint and dirt that would interfere with the proper bonding or the thermoplastic. Latence and curing compound shall be removed from all new Portland cement concrete surfaces by loose grain abrasive pressure blasting or wire brushing.

3.03 LAYOUT

A. The pavement markings shall be placed in proper alignment with guidelines established on the pavement. Deviation from the alignment established shall not exceed 2-inches and, in addition, the deviation in alignment of the marking being placed shall not exceed 1-inch per 200 feet or pavement nor shall any deviation be abrupt.

1. Longitudinal markings shall be offset at least 2-inches from construction joints of Portland cement concrete surfaces and joints and shoulder breaks of asphalt surfaces.

3.04 PRIMER AND SEALER

A. Primer sealer shall be used on all Portland cement concrete surfaces. A primer sealer shall be used on asphalt surfaces that are over two years old and/or on asphalt surfaces that are worn or oxidized to a condition where 50 percent or more of the wearing surface is exposed aggregate.

3.05 PRIMER SEALER APPLICATION

A. When required as described, the primer-sealer shall be applied to the pavement surface in a continuous film at a minimum thickness of 3 to 5 mils. Before the thermoplastic is applied, the primer-sealer shall be allowed to dry to a tacky state. The thermoplastic shall be applied within 4 hours after the primer application.

3.06 TEMPERATURE REQUIREMENTS: AMBIENT CONDITIONS

A. The ambient air and road surface shall be 55°F and rising before application of thermoplastic can begin.

3.07 MATERIAL REQUIREMENTS

A. The thermoplastic compound shall be heated from 400°F to 450°F and shall be a minimum of 400°F as it makes contact with pavement surface during application. An infrared temperature gun shall be used to determine the temperature of the thermoplastic as it is being applied to the pavement surface.

3.08 PACKAGING: CONTAINERS

A. The thermoplastic material shall be delivered in 50 pound cardboard containers or 50 pound bags of sufficient strength to permit normal handling during shipment and handling on the job without loss of material.

3.09 LABELING

A. Each container shall be clearly marked to indicate the color of the material, the process batch number and/or manufacturer's formulation number, the manufacturer's name and address and the date of manufacture.

3.10 MANUFACTURER'S RESPONSIBILITY: SAMPLING AND TESTING

A. The manufacturer shall submit test results from an approved independent laboratory. All material samples shall be obtained twenty (20) days in advance of the pavement marking operations. The cost of testing shall be included in the price of thermoplastic material. The approved independent laboratory's test results shall be submitted to the Engineer in the form of a certified test report.

3.11 BILL OF LADING

A. manufacturer shall furnish the Material and Tests Laboratory with copies of Bills of Lading for all materials inspected. Bill of lading shall indicate the consignee and the destination, date of shipment, lot numbers, quantity, type of material, and location of source.

3.12 MATERIAL ACCEPTANCE

A. Final acceptance of a particular lot of thermoplastic will be based on the following:
   1. Compliance with the Specifications for material composition requirements verified by approved independent laboratory with tests results.
   2. Compliance with the specification for the physical properties required and verified by an approved independent laboratory with test results.
   3. Manufacturer's test results for each lot thermoplastic have been received.
   4. Identification requirements are satisfactory.

3.13 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall notify the Construction Inspector 72 hours prior to the placement of the thermoplastic markings enable the inspector to be present during the application operation. At the time of notification, the Contractor shall indicate the manufacturer and the lot numbers of the thermoplastic that he intends to use. A check should be made by the Contractor to insure that the approved lot numbers appear on the material package. Failure to do so is cause for rejection.

B. If the normal trade practice for manufacturers is to furnish warranties or guarantees for the materials and equipment specified herein, the Contractor shall turn the guarantees and warranties over to the School Project Manager for potential dealing with the Manufacturers. The extent of such warranties or guarantees will not be a factor in selecting the successful bidder.

END OF SECTION

SECTION 32 31 13
CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. Fence is to be complete with all fittings, straps, etc. required to provide a first class installation in keeping with the highest standards for security chain link fencing. Fencing fabric shall have knurled top and barbed bottom. Gate fabric shall have knurled top and knurled bottom.

1.03 RELATED SECTIONS

A. Section 03 30 00 - Cast-In-Place Concrete.

1.04 APPLICABLE CODES AND REGULATIONS

A. Comply with all applicable City of San Antonio codes and regulations.

B. All posts and rails shall conform to requirements of ASTM-A120-73 if pipe, or ASTM-A123-73 if “C’ section.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, and installation instructions for fencing and gates.

PART 2 - PRODUCTS

2.01 All components shall be galvanized steel. Aluminum is not allowed.

2.02 Fence shall have a top rail. All tube ends shall be capped or plugged.

2.03 Fence shall have a 11-gauge bottom tension wire tied to fabric at 24” OC max.

2.04 All ties shall be #11 smooth galvanized steel wire at 24” on center on top rail, post, and bottom tension wire. Aluminum ties are not acceptable.

2.05 All gates shall generally lie in the fence line when closed and have LOCK OPEN POST to provide for locking the gate open 180° swing.

2.06 Erection shall be by mechanics experienced in fence erection with work plumb, square, straight and in line with accurately fitted tight joints, and securely anchored.

2.07 Fence fabric shall be maximum 1.5” off grade and cut into grade locally as required to maintain smooth top line. Where perimeter fence backs to an existing fence, a 3” off grade will be required for general maintenance and to maintain brush.

2.08 Concrete footing top finish shall be round, diameter to match footing, edges to be flush with grade, with a smooth one-inch crown.

2.09 Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Allied Tube and Conduit Corp.
2. Anchor Fence, Inc.
3. Colorguard Corp.
4. Davis Walker Corp.
5. Dominion Fence and Wire Prod.
6. United States Steel.

2.10 STEEL FENCING

A. Four Foot Chain Link Fence:

1. Line Posts:
   Material – 2” by 2.72 lbs. linear feet (std. St.) galvanized steel pipe or C-section roll formed from steel conforming to ASTM A570-72, Grade E, 1.875” x 1.625” with minimum bending strength of 245 lbs. under a 6’ cantilever load.
   Spacing – 10’ maximum
2. Installation – set in concrete minimum of 10” diameter and minimum of 30” deep.
3. Corner or Terminal Posts:
   Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
   Installation - set in concrete minimum of 12" in diameter and minimum depth 36".
   Bracing - horizontal brace back to first line post with 2" std. wt.
   Galvanized pipe - diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8" steel rod with tightening device.
4. Gate Hinge Post:
   a) 10' and wider gate.
      Material - 6-5/8" by 18.97 lbs./linear ft. (std. wt.) galvanized steel pipe.
      Installation - set in concrete, minimum 18" diameter by minimum depth of 60".
   b) 5' to 9' wide gate.
      Material - 4" by 9.10 lbs./linear ft. (std. wt.) galvanized steel pipe.
      Installation - set in concrete, minimum 18" diameter by minimum depth of 48".
   c) 3' to 4' wide gate.
      Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with a minimum bending strength of 453 lbs. on a 6' cantilever load.
      Installation - set in concrete, minimum of 12" diameter by minimum depth of 36".
5. Gate - Latch Open Post:
   Material - 3" by 5.79 lbs./linear ft. or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
   Installation - set in concrete minimum diameter 10" by minimum of 30" deep.
6. Fabric: 9 gauge, 2" x 48” galvanized chain link.
7. Fence Top Rail:
   Material - 1-5/8" diameter by 2.27 lbs./linear ft. (std. wt.) galvanized steel tube or shall be a roll formed section of 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
8. Bottom Tension Wire:
   Material - 11 gauge galvanized steel wire.
9. Gate Construction: 6' and wider gates.
   Frame - 2" by 2.72 lbs./linear ft. (std. wt.) galvanized steel pipe. Frame to include vertical members as required to divide gate into bays not to exceed one and one half times the gate height in length. All bays shall be of equal length. Each bay shall have one diagonal member with the top end of the diagonal towards the hinge end of the gate. All corners and trussing to be welded, or bolted, using heavy duty cast malleable iron fittings.
   Filler - same as fence fabric.
   Security - gate latches shall be suitable for locking.
   3' to 5' wide gates same as 6' and wider except delete internal frame bracing.

B. Five and Six Foot Chain Link Fence:
   1. Line Posts:
      Material - 2-3/8" by 3.65 lbs./linear ft. (std. wt.) galvanized steel pipe or C - section roll formed from steel conforming to ASTM A570-72, Grade E, 1.875" x 1.625" with minimum bending strength of 245 lbs. under a 6' cantilever load.
      Spacing - 10' maximum.
      Installation - set in concrete minimum of 12'' diameter and minimum of 30" deep.
   2. Corner or Terminal Posts:

Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
Installation - set in concrete minimum of 12" in diameter and minimum depth 40".
Bracing - horizontal brace back to first line post with 2" std. wt.
Galvanized pipe - diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8" steel rod with tightening device.

3. Gate Hinge Post:
   a) 10' and wider gate.
      Material - 6-5/8" by 18.97 lbs./linear ft. (std. wt.) galvanized steel pipe.
      Installation - set in concrete, minimum 18" diameter by minimum depth of 60".
   b) 5' to 9' wide gate.
      Material - 4" by 9.10 lbs./linear ft. (std. wt.) galvanized steel pipe.
      Installation - set in concrete, minimum 18" diameter by minimum depth of 48".
   c) 3' to 4' wide gate.
      Material - 3" by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with a minimum bending strength of 453 lbs. on a 6' cantilever load.
      Installation - set in concrete, minimum of 12" diameter by minimum depth of 40".
4. Gate - Latch Open Post:
   Material - 3" by 5.79 lbs./linear ft. or shall be a roll formed section 3.5" x 3.5" with minimum bending strength of 453 lbs. on 6' cantilever load.
   Installation - set in concrete minimum diameter 10" by minimum of 30" deep.
5. Fabric: 9 gauge, 2" x 60" for 5' fence and 72" for 6' fence.
6. Fence Top Rail:
   Material - 1-5/8" diameter by 2.27 lbs./linear ft. (std. wt.) galvanized steel tube or shall be a roll formed section of 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
7. Bottom Tension Wire:
   Material - 9 gauge galvanized steel wire.
8. Gate Construction: 6' and wider gates.
   Frame - 2" by 2.72 lbs./linear ft. (std. wt.) galvanized steel pipe. Frame to include vertical members as required to divide gate into bays not to exceed one and one half times the gate height in length. All bays shall be of equal length. Each bay shall have one diagonal member with the top end of the diagonal towards the hinge end of the gate. All corners and trussing to be welded, or bolted, using heavy duty cast malleable iron fittings.
   Filler - same as fence fabric.
   Security - gate latches shall be suitable for locking.
   3' to 5' wide gates same as 6' and wider except delete internal frame bracing.

C. Eight Foot High Chain Link Fence
1. Line Posts:
   Material – 2-3/8” by 3.65 lbs./linear ft. (std. wt.) galvanized steel pipe or C-section roll formed from steel conforming to ASTM-A570-72, Grade E, 2.25” x 1.70” with minimum bending strength of 316 lbs. under a 6’ cantilever load.
   Spacing – 10’ maximum.
   Installation – set in concrete minimum of 12’’ in diameter and minimum of 36” deep.
2. Corner or Terminal Posts:
   Material – 3” by 5.79 lbs./linear ft. (std. wt.) galvanized steel pipe or shall be a roll formed section 3.5” x 3.5” with minimum bending strength of 453 lbs. on 6’ cantilever load.
   Installation – set in concrete minimum of 12” in diameter and minimum of 40” deep.
   Bracing – horizontal brace back to first line post with 2” std. wt.
   Galvanized pipe – diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8” steel rod with tightening device.
3. Gate Hinge Post:

8' to 16' wide gates
Material – 6-5/8'' by 18.97 – lbs./linear ft. galvanized steel pipe.
Installation – set in concrete minimum of 18" diameter by minimum depth 72".
3' to 7' Wide Gates:
Material – 4" by 9.10 lbs./linear ft. galvanized steel pipe.
Installation – set in concrete minimum of 12" diameter by minimum depth 48".

4. Gate – Latch Open Post
   Material – 3" by 5.79 lbs./linear ft. galvanized steel pipe or shall be a roll formed section 3.5" x 3.5" with a minimum bending strength of 453 lbs. on a 6' cantilever load.
   Installation – set in concrete minimum of 12" diameter by minimum depth 30".
5. Fabric shall be 9 gauge, 2" x 96" galvanized chain link, having barbed finished both edges.
6. Fence Top Rail:
   Material – 1-5/8" by 2.27 lbs./linear feet. Galvanized steel tube or shall be a roll formed section 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
7. Bottom Tension Wire:
   Material shall be 9 gauge galvanized steel wire.
8. Gate Construction:
   6' and wider:
   Frame – 2" by 2.72 lbs./linear ft. (std. wt.) galvanized steel pipe. Frame to include vertical members as required to divide gate into bays not to exceed one and one half times the gate height in length. All bays shall be of equal length. Each bay shall have one diagonal member with the top end of the diagonal towards the hinge end of the gate. All corners and trussing to be welded, or bolted, using heavy-duty cast malleable iron fittings.
   Filler shall be same as fence fabric.
   Security – gate latches shall be suitable for locking.
   3' to 6' wide gates same as 6' and wider except delete internal frame bracing.

D. Play Court Fencing (10 foot high chain link fence)
1. Line posts shall be 3" by 5.79 lbs./linear feet (std. wt.) galvanized steel pipe.
   Spacing – 10' maximum.
   Installation – set in concrete minimum of 12" in diameter and minimum of 40" deep.
2. Corner or Terminal Posts:
   Material – 4" by 9.10 lbs./linear ft. (std. wt.) galvanized steel pipe.
   Installation – set in concrete minimum of 18" in diameter and minimum of 48" deep.
   Bracing – horizontal brace back to first line post with 2" std. wt.
   Galvanized pipe – diagonal brace top of first line post to bottom of corner or terminal post with a galvanized 3/8" steel rod with tightening device.
3. Fabric – 9 gauge, 1-3/4" x 120" galvanized chain link, having knurled edges top and bottom.
4. Fence Top Rail:
   Material – 1-5/8" by 2.27 lbs./linear ft. galvanized steel tube or shall be a roll formed section 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 lbs. on 10' span.
5. Bottom Tension Wire:
   Material – 9 gauge galvanized steel wire.
6. Gate Construction
   Same as for 8' high chain link fence.

2.11 INSPECTION

A. All postholes shall be inspected and approved prior to the setting of any post in concrete. Any post set without hole inspection and approval shall be removed and reset at Contractor's expense.

2.12 CONCRETE

A. Provide concrete consisting of portland cement, ASTM C 150 aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

B. Excavation: Drill holes for posts of diameters and spacing as shown on plans in firm, undisturbed or compacted soil.

C. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.

D. Setting Posts: Center and align posts in holes 3" above bottom of excavation. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Finish top of concrete footing in cone shape for drainage away from post.

E. Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.

F. Center Rails: Provide center rails where shown. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

G. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

H. Tension Wire: Install tension wires before stretching fabric and tie to each post with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.

I. Fabric: Leave approximately 2" between finish grade and bottom salvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

J. Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c.

K. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

L. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend wire to minimize hazard to persons or clothing.

M. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION

SECTION 33 00 00
UTILITIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. Reference Division 22 for building plumbing requirements.

1.02 SUMMARY

A. This Section includes all underground utility systems five (5) feet outside the proposed buildings. Systems include the following:
   1. Sanitary Sewerage.
   2. Water and Fire Lines.
   3. Gas Main.

B. Related Sections: The following Sections contain requirements that relate to this Section.
   1. Division 03 Section 30 00 ‘Cast-in-Place Concrete’ for cast-in-place concrete structures.

1.03 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non-pressure-Piping Pressure Ratings:
   1. At least equal to system test pressure.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
   1. Product data for the following:

B. Shop drawings for pre-cast concrete manholes and other structures. Include frames and covers.

C. Shop drawings for cast-in-place concrete or field-erected manholes and other structures. Include frames and covers.

D. Reports and calculations for design mixes for each class of cast-in-place concrete.

E. Shop drawings for cleanouts.

F. Coordination drawings showing manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures, invert elevations and pipe sizes at manholes, and rim elevations of structures.

G. Inspection and test reports specified in the "Field Quality Control" Article.

1.05 QUALITY ASSURANCE

A. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewerage potable water and gas piping systems.

B. Utility Compliance: Comply with regulations pertaining to sanitary sewerage systems. Include standards of water, gas and other utilities where appropriate.

C. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components and are based on specific Manufacturer types indicated. Other Manufacturers' products with equal performance characteristics may be considered. Refer to Section 01 60 00.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures in direct sunlight.

B. Do not store plastic pipe or fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle pre-cast concrete manholes and other structures according to Manufacturer's rigging instructions.

1.07 PROJECT CONDITIONS

A. Site Information: Verify that survey benchmark and intended elevations for the Work are as shown on the Drawings, research public utility records, and verify existing utility locations. All bidders will be required to visit the site prior to bidding to verify the actual job site conditions. Any conflicts with construction documents must be brought to the attention of the Project Engineer for instructions to bidders. Adjustments or removal of existing utilities such as vaults, meters, valves, telephone poles, power poles, overhead lines, hydrants, etc. that are necessary for the construction of this project will be considered as part of the Contract Bid and will not justify a change in Contract Price or additional cost to the Owner after the project is awarded.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate water and fire system connections with the local water purveyor.

B. Coordinate with other utility and earthwork.

C. Coordinate installation with all utility building Plumber Contractors.

PART 2 - PRODUCTS

2.01 PIPES AND FITTINGS

A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, service and extra-heavy classes, gray cast iron, for gasketed joints.
   1. Gaskets: ASTM C 564, rubber, compression type, thickness to match class of pipe.

B. Ductile-Iron Pipe for Water and Fire Mains: AWWA C151, Class 150 minimum, for push-on joints.
   1. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
   2. Pipe and Fitting Interior Coating: AWWA C104, asphaltic-material seal coat, minimum 1-mil (0.025-mm) thickness.
   3. Gaskets: AWWA C111, rubber.

C. Polyvinyl Chloride (PVC) Sanitary Sewer Pipe and Fittings: ASTM D 3034, SDR 26 (as noted on drawings), for solvent-cemented or gasketed joints.
   1. Primer: ASTM F 656.
   2. Solvent Cement: ASTM D 2564.
   3. Gaskets: ASTM F 477, elastomeric seal.

D. Polyvinyl Chloride (PVC) Pressure Pipe and Fittings: CLASS 150 pipe, AWWA C 900, for integral bell and spigot joints. Blue Brute or equal for underground water lines. Class 200 pipe, AWWA C900 for fire line, schedule 80 PVC for pipe sizes less than 4 inches.

E. Polyethylene Pipe (PE) Gas Distribution and Fittings: ASTM D 2513 -"Standard Specification for Thermoplastic Gas Pressure Pipe, tubing and Fittings." Manufactured by Phillips Disco Pipe, Inc., required equivalent.

2.02 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Ductile-Iron, Flexible Expansion Joints: Compound fitting with a combination of flanged and mechanical-joint ends conforming to AWWA C110 or AWWA C153. Include 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections, rated for 250-psig minimum working pressure and FDA-approved epoxy interior coating for offset and expansion indicated. Include polyethylene (PE) film encasement.

2.03 PIPE ENCASEMENT

A. Include AWWA C105, polyethylene film tube and sheet, 8-mil (0.2-mm) thickness for the following:

1. Cast-iron soil pipe and fittings.
2. Ductile-iron piping.
3. Pressure-type pipe couplings.
4. Ductile-iron, special pipe fittings.

2.04 MANHOLES

A. Pre-cast Concrete Manholes: ASTM C 478, pre-cast, reinforced concrete, of depth indicated, with provision for rubber gasket joints.
   1. Ballast: Increase thickness of pre-cast concrete sections or add concrete to base section, as required to prevent floatation.
   2. Base Section: Six (6) inch minimum thickness for floor slab and four (4) inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor.
   3. Riser Sections: five (5) inch minimum thickness, forty eight (48) inch diameter, and lengths to provide depth indicated.
   4. Top Section: Concentric cone or flat-slab-top type as indicated. Top of cone of size that matches grade rings.
   5. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
   6. Grade Rings: Include two (2) or three (3) reinforced-concrete rings, of 6- to 9-inch total thickness, that match a twenty four (24) inch- diameter frame and cover.
   7. Steps: Fiber glass, individual steps or ladder. Include a width that allows a worker to place both feet on one step and is designed to prevent lateral slippage off the step. Cast steps or anchor ladder into base, riser, and top section sidewalls at twelve (12) to sixteen (16) inch intervals. Steps will be included in all manholes and structures that are a minimum of five (5) feet deep, whether shown on Drawings or not.
   8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Manhole Frames and Covers: ASTM A 536, Grade 60, heavy-duty ductile iron Include 32-inch (minimum) inside diameter by 6-inch riser with 4-inch minimum width flange, and 30-inch diameter cover. Include indented top design with lettering, equivalent to the following, cast into cover:

   Sanitary Sewerage Piping Systems: SANITARY SEWER

   Storm Sewerage Piping Systems: STORM SEWER

   Provide manhole ring and cover with concrete ring encasement as per San Antonio Water System requirements.

C. Manhole Coating: All structures and non-structures shall be water tight and interior wall coated with a San Antonio Water System approved sewer structural coating.

2.05 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Structures: Portland-cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cement ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland-cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.

1. Include channels and benches in sanitary sewerage manholes.
2. Manhole Channels: Concrete invert, formed to same width as connected piping, with height of the vertical sides to 3/4 of the pipe diameter. Form curved channels with smooth, uniform radius and slope.

2.06 PROTECTIVE COATINGS

A. General: Include factory- or field-applied protective coatings to structures and appurtenances according to the following:

B. Coating: 2- coat, coal-tar epoxy, 15-mil minimum thickness, except where otherwise indicated.
   1. Manholes: On exterior surface.
   2. Trench Plates and Covers: On exterior surface.
   3. All exposed metal surfaces: On exterior surfaces.

2.07 CLEANOUTS

A. Description: ASME A112.36.2M, round, cast-iron housing with clamping device and round, secured, scoriated, cast-iron cover. Include cast-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
   1. Secure with cast iron Box with Locking Cover.
   2. Light Duty: In earth or grass, foot-traffic areas.
   3. Medium Duty: In paved, foot-traffic areas.
   4. Heavy Duty: In vehicle-traffic service areas.
   5. Extra Heavy Duty: In roads.

B. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, service class, cast-iron soil pipe and fittings.

PART 3 - EXECUTION

3.01 IDENTIFICATION

A. Arrange for installation of color coded warning tapes directly over piping and at all above ground temporary markers.
   1. Use detectable warning tape over nonferrous piping and over edges of underground structures (Reference Utility Drawings for color code sequence)

B. Refer to Part 2 of this Section for detailed Specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to the following applications.

C. Pipe Sizes 4 to 6 Inches: Hub-and-spigot, service class, cast-iron soil pipe and fittings; compression-type gaskets; and gasketed joints.

3.02 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of underground sewerage, water and gas systems piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated, to extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to Manufacturer's Recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use the manholes for changes in direction, except where fittings are indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and transition couplings, where different sizes or materials of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install gravity-flow-systems piping at constant slope between points and elevations indicated. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated.

F. Extend utility piping five (5) feet and cap five (5) feet from the new buildings of sizes and in locations indicated. Terminate piping as indicated on Drawings.

G. Install sewerage piping pitched down in direction of flow, at minimum slope of one (1) percent (1:50) and thirty six (36)-inch minimum cover, except where otherwise indicated.

3.03 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to the following:

B. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber compression gaskets according to CISPI "Cast Iron Soil Pipe and Fittings Handbook," Volume I. Use gaskets that match class of pipe and fittings.
   1. Install polyethylene film encasement over cast-iron soil pipe and fittings according to ASTM A 674 or AWWA C105.

C. Ductile-Iron Pipe with Ductile-Iron or Cast-Iron Fittings: With push-on-joint, rubber gaskets according to AWWA C600.
   1. Install polyethylene film encasement over ductile-iron pipe and ductile- and cast-iron fittings according to ASTM A 674 or AWWA C105.

D. Polyethylene (PE) Plastic Pipe and Fittings: As follows:
   1. Join pipe, tubing, and fittings with couplings for soiltight joints according to AASHTO "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4 "Joint Properties" and manufacturer's written instructions.
   2. Join pipe, tubing, and gasketed fittings with elastomeric seals for watertight joints according to ASTM D 2321 and Manufacturer's written instructions.
   3. Install according to ASTM D 2321 and manufacturer's written instructions.

E. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings: As follows:
   1. Join solvent-cement-joint pipe and fittings with solvent cement according to ASTM D 2855 and ASTM F 402.
   2. Join pipe and gasketed fittings with elastomeric seals according to ASTM D 2321.
   3. Join profile sewer pipe and ribbed drain pipe and gasketed fittings with elastomeric seals according to ASTM D 2321 and Manufacturer's written instruction.
   4. Install according to ASTM D 2321.

F. Gas Pipe and Fittings: All Gas Piping shall be accurately cut to measurement established at the job by the Contractor, and shall be worked into place without springing or forcing. Proper provisions shall be made for expansion and contraction of all pipe lines.

G. All Gas Piping shall be properly supported to prevent undue strain or sagging. All polyethylene piping above ground shall be supported by hangers. Hangers spacing shall not exceed the following maximum distance between supports: Polyethylene Pipe 4'-0"

H. Before being placed in position, all pipe, fittings and equipment shall be cleaned carefully. All materials and equipment shall be maintained in a clean condition and upon completion of final tests and acceptance shall be left in a clean condition.

I. Unions shall be installed in piping where necessary for easy dismantling of the piping and apparatus.

J. Pipe fittings shall be free of fins and burrs prior to installation. No bushings will be allowed in any piping.

K. All piping shall be made up straight and true at proper grades.

3.04 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318, ACI 350R, where indicated.

3.05 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in a cast-in-place concrete block, 18 by 18 by 6 inches deep or as shown on Drawings. Set with tops one (1) inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete paving with tops flush with surface of paving.

3.06 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as the Work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
   1. Place plug in end of incomplete piping at end of day and whenever Work stops.
   2. Flush piping between manholes and other structures, if required by authorities having jurisdiction, to remove collected debris.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of the Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
   3. Alignment: Less than full diameter of inside of pipe is visual between structures.
   4. Deflection: Flexible piping with deflection that prevents passage of a ball or cylinder of a size not less than 92.5 percent of piping diameter.
   5. Crushed, broken, cracked, or otherwise damaged piping.
   6. Infiltration: Water leakage into piping.
   7. Exfiltration: Water leakage from or around piping.
   8. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
   9. Re-inspect and repeat procedure until results are satisfactory.

C. Test new piping systems and parts of existing systems that have been altered, extended, or repaired for leaks and defects in accordance to Section 22 05 13.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests, and their inspections by authorities having jurisdiction, with at least 24 hours' advance notice.
   4. Submit separate reports for each test.
   5. Where authorities having jurisdiction do not have published procedures, perform tests as follows:
      a) Sanitary Sewerage: Perform hydrostatic test.
      b) Close openings in system and fill with water.
      c) Purge air and refill with water.
      d) Disconnect water supply.
      e) Test and inspect joints for leaks.
      f) Leaks and loss in test pressure constitute defects that must be repaired.
      g) Replace leaking piping using new materials and repeat testing until leakage is within industry standard allowances.

END OF SECTION

SECTION 33 10 00
WATER UTILITIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Section 33 00 00 - Utility Lines

1.02 DESCRIPTION OF WORK

A. Extent of exterior water system work is shown on drawings.

B. Exterior water system work includes, but is not limited to, the following:
   1. Yard piping from public water main to within 5 feet of buildings and to private onsite fire hydrants.
   2. Control valves and fittings.
   3. Comply with requirements of applicable Division 2 sections for excavation and backfilling required in connection with exterior water system.
   4. Private fire hydrants.
   5. Excavation and backfilling for exterior fire protection system is specified in Mechanical General Provisions.
   6. Comply with requirements of applicable Division 2 sections for excavation and backfilling required in connection with exterior fire water system.
   7. Comply with requirements of applicable Division 3 sections for concrete work required in connection with exterior fire water system.

1.03 QUALITY ASSURANCE

A. Asbestos Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Architect with Certification that the material/product contains no asbestos. This certificate is mandatory before approval will be issued. Submittals furnished without the asbestos-free Certification will be returned to the Contractor with no action taken until such Certification is provided.

B. Manufacturers: Firms regularly engaged in manufacture of water system materials of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. Installer: A firm with at least 2 years of successful installation experience on exterior fire water and domestic water system projects similar to this project and registered with the State as a certified Site Utility Contractor.

PART 2- PRODUCTS

REFER TO SECTION 33 00 00 – UTILITY LINES, FOR PIPE MATERIALS

2.01 CONTROL VALVES

A. General: Provide valves and flow control devices which are approved by FM and listed by UL.

B. Minimum working pressure, 150 psi unless otherwise indicated.

C. Gate Valves: Standard shut-off valves with maximum working pressure cast into body, outside-screw-and-yoke type with non-rising stems complying with AWWA C 500 unless otherwise required by governing authorities.

2.02 ANCHORAGES

A. General: Provide anchorage's for tees, plugs, caps, bends and hydrants in accordance with NFPA No.24.

1. After installation, apply a full coat of asphalt or other acceptable corrosion-retarding material to surfaces of rods and clamps.
2. Clamps, Straps and Washers: Steel, ANSI/ASTM A 506.
3. Rods: Steel, ANSI/ASTM A 575.
4. Rod Couplings: Malleable iron, and ANSI/ASTM A 197.
5. Bolts: Steel, ANSI/ASTM A 307.
6. Cast-Iron Washers: ANSI/ASTM A 126, Class A.
7. Thrust Blocks: 3000 psi concrete.

2.03 FIRE HYDRANTS

A. General: Provide fire hydrant assemblies by manufacturers approved by AWWA. All new fire hydrants located in school property will be painted RED.

2.04 PLASTIC UNDERGROUND WARNING TAPE

A. A polyethylene plastic tape, 4 inches wide by 4 mils. thick (min.). Tape shall be “safety precaution blue” in color for all plastic water piping (domestic and fire). Tape shall be laid 1’-0” below finish grade.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Install exterior water line in compliance with applicable provisions of NFPA NO. 24, SAWS Specifications and as herein specified.

B. PVC Pipe: Install PVC pipe, ductile iron pipe, ductile iron and cast iron fittings according to AWWA C600. Bury pipe to ensure a minimum cover of 4' below finished grade.

C. Copper Tube: Install with wrought copper, solder joint pressure fittings, and Sn95 Tin-Antimony solder in accordance with CDA “Copper Tube” handbook.

D. Control Valves: Install in accordance with manufacturer’s instructions.

E. Joint Adapters: Make joints between cast-iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.

F. Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occurred.
   1. If the inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of Architect/Engineer.

G. Cleaning Conduit; Clear interior of conduit of dirt and other superfluous material as work progresses.
   1. Place plugs in end of uncompleted conduit at end of day or whenever work stops.
   2. Flush lines to remove collected debris before connecting to other fire protection systems. Flush conduit at rates of flow recommended by NFPA No. 24 unless higher rates required by local authorities.
   3. Sterilization: At completion of water service line installation, flush and sterilize in conformance with AWWA C 601, to the satisfaction of local authorities having jurisdiction.

3.02 TESTING

A. Perform hydrostatic testing of completed conduit lines in accordance with NFPA No. 24 unless more stringent test required by local authorities having jurisdiction.

B. Perform operational testing of hydrants and valves by opening and closing under water pressure to insure proper operation.

END OF SECTION