



Rimiller Architects llc.

1630 W. McCarty St.
Jefferson City, Missouri 65109
(t) 573.761.5600 (f) 573.761.5605

November 9, 2009

Clayton Hanks
Senior GS Specialists
P.O. Box 270
Jefferson City, MO. 65102

Fwd To: Plans and Specifications Holders List for:
9091116:Central Office, Warehouse Renovation Phase I
Jefferson City, Missouri

RE: ADDENDUM #1

Missouri Department of Transportation: Warehouse Renovation Phase I

1. Item #1.

The following specifications sections have been added to the project manual:

- 15100 Plumbing
- 15200 Fire Protection
- 15300 Heating, Ventilating and Air Conditioning
- 16100 Electrical

2. Item #2.

The following specification portions of section 01500 have been omitted from the project manual:

- 1.2 Temporary Electricity
- 1.3 Telephone Service
- 1.4 Facsimile Service
- 1.14 Field Offices and Sheds

3. Item #3.

Sheet A1.2 / Detail 5 – Provide 2x2 APC (revision #1 dated 11-09-2009).

4. Item #4

Sheet D1.1 / Detail 1 - Completely remove (4) pipe bollards (revision #1 dated 11-09-2009) and patch slab per Sheet S101 / Detail 2 (revision #1 dated 11-09-2009).

5. Item #5

See modified section 05500, Metal Fabrications, of the project manual as it pertains to metal bollards for concrete footings.



6. Item #6

Sheet D1.1 / Detail 2 – Cut additional concrete slab to eliminate embedded rail from new office and bathroom areas (revision #1 dated 11-09-2009).

7. Item #7

Sheet A1.1 / Detail 1 and Sheet A5.1 / Detail 2 – Contractor shall provide a temporary weather tight opening enclosure instead of metal wall panel (revision #1 dated 11-09-2009).

8. Item #8

Sheet A6.1 / Wall Types – Add Vinyl cove base to wall (revision #1 dated 11-09-2009).

9. Item #9

Coordinate comments with Malicoat-Winslow Engineers, P.C. "Addenda #1" dated 11-09-2009, and Shafer, Kline and Warren Inc, "Addendum #1" dated 11-09-2009.





November 9, 2009

Clayton Hanks
Senior GS Specialists
P.O. Box 270
Jefferson City, MO. 65102

RE: ADDENDUM #1

Missouri Department of Transportation: Warehouse Renovation Phase I

1. Item #1

Sheet S101 / Detail 1 – Reduce the dimensions of the concrete approach at the west overhead garage door (revision #1 dated 11-09-2009).

2. Item #2

Sheet S101 / Detail 2 – Patch slab where pipe bollards were demolished (revision #1 dated 11-09-2009).

3. Item #3

Sheet S101 / Detail 1- Install new metal bollards (revision #1 dated 11-09-2009) as indicated to match Sheet A1.1 / Detail 4. Detail 6 on Sheet S101 has been added to detail concrete footings for these bollards.

4. Item #4

Sheet S101 / Detail 1 - patch additional concrete as a result of demolished rail. Also grout remaining rail as indicated.



MALICOAT-WINSLOW ENGINEERS, P.C.
MECHANICAL AND ELECTRICAL ENGINEERS

5649 NORTH CLEARVIEW ROAD
COLUMBIA, MISSOURI 65202-9687

FREDDIE L. MALICOAT, P.E
email: fredm@mwengrs.com

Phone: 573-875-1300
Fax: 573-875-1305

November 9, 2009

MODOT Phase I
MWE#2009138

Addenda #1

Item #1 - Emergency eyewash shall have $\frac{3}{4}$ inch cold water line.

Item #2 - Route A/C condensate to north outside wall and turn down outside.

Item #3 - At removed interior partition – remove 3 phase wiring circuits back to panel. Remove conduit to first joint. Leave remainder of conduit to panel.

Item #4 – At north wall of new office location – relocate switch and thermostat, that serves existing unit heater, to new office wall.



11-9-09

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel framing and supports for overhead doors.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Steel weld plates and angles for casting into concrete not specified in other Sections.
 - 4. Structural-steel door frames.
 - 5. Miscellaneous steel trim including steel edgings and loading-dock edge angles.
 - 6. Metal bollards.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
 - 2. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Mill Certificates: Signed by manufacturers certifying that products furnished comply with requirements.
- D. Welding certificates.
- E. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- C. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- H. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- I. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- J. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9 painting Sections.

- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Available Products:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts if units are installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.

- E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.8 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm), unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.9 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.10 STRUCTURAL-STEEL DOOR FRAMES

- A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch (16-by-38-mm) steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches (250 mm) o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.
 - 1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.
- B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.
- C. Galvanize exterior steel frames and interior steel frames, where indicated.
- D. Prime exterior steel frames and interior steel frames, where indicated with zinc-rich primer.

2.11 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim and interior miscellaneous steel trim, where indicated.
- D. Prime exterior miscellaneous steel trim and interior miscellaneous steel trim, where indicated with zinc-rich primer.

2.12 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab, unless otherwise indicated. Drill baseplates at all 4 corners for 3/4-inch (19-mm) anchor bolts.
 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.15 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Satin Finish: No. 4.
- D. Dull Satin Finish: No. 6.
- E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.16 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC's "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary" and with requirements applicable to listing and labeling for fire-resistance rating indicated.

3.4 INSTALLING METAL BOLLARDS

A. Anchor bollards to existing construction with expansion anchors or concrete footings. Provide four 3/4-inch (19-mm) bolts at each bollard, unless otherwise indicated.

1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

C. Where Indicated on Drawings, anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

DIVISION 15000
SECTION 15100
PLUMBING

PART I - GENERAL

1.01 Related Documents

- A. Provisions of the General Requirements, Division 1, are a part of this section.

1.02 Work Included

- A. Piping
 - 1. Sanitary waste and vent
 - 2. Hot and cold water
- B. Plumbing fixtures and trim.
- C. Drawings of Record.
- D. Prior to bidding, all Contractors shall visit the site and become familiar with all existing conditions, which will affect construction procedures and scope of work required as part of this Section.

1.03 Related Work

- A. Painting by Painting Contractor
- B. Cutting and patching
- C. Excavation and backfill

1.04 Codes and Standards

- A. International Plumbing Code.
- B. National Fire Protection Association.
- C. American Society of Mechanical Engineers.
- D. International Approval Service.

- E. American Society for Testing and Materials.
- F. American Society of Heating, Refrigerating, and Air Conditioning Engineers.
- G. Building Officials and Code Administrators International, Inc.

1.05 Shop Drawings

- A. Shop drawings shall be submitted to the Architect for approval. The Contractor shall be responsible for quantities and dimensions. The Contractor shall check all shop drawings prior to submission to the Architect.

PART II - PRODUCTS

2.01 Piping Materials

- A. All sanitary waste piping and vent piping shall be Schedule 40 PVC plastic pipe and fittings, except waste piping outside building shall be SDR-35.
- B. All hot and cold water piping above grade shall be Type L, hard copper. Below grade shall be type K copper, ASTM B 88, wrought copper fittings, bridgit, lead-free solder.

2.02 Hangers

- A. All hangers 1/2" through 6", Elcen Figure 89 or 389, galvanized steel or copper plated steel, all thread rod with concrete insert, lag screw, or other approved anchorage means.

2.03 Valves

- A. Ball valves (all valves unless noted on Drawings) shall be Watts 6000 Series ball valves, 2 piece bronze, or equal by Nibco or Crane.
- B. All bathroom groups shall have isolation valves on both the cold and hot water supplies. Locate valves as required. If valves are installed within a wall, provide an access door as required. (See Section 15100-3.07)

2.04 Pipe Insulation

- A. Shall be 1/2" thick Imcolock. Insulate all above grade hot water and cold water piping.

2.05 Plumbing Fixtures

- A. All fixtures shall be of one manufacturer unless specified. See drawings.
- B. Vitreous china fixtures shall be twice fired, all exposed surfaces covered with opaque glaze. Cast iron fixtures shall be finished inside with acid resisting porcelain enamel. All exposed trim shall be heavy polished chrome plated brass. Determine quantity of fixtures and equipment from drawings.

2.06 Cleanouts

- A. Approved equal by Zurn or Wade. Install maximum of 50 feet on centers, at base of all stacks, and at all 90E bends in waste piping. Cover for cleanouts shall be coordinated with wall and floor finish.

2.07 ADA Compliant Lavatory Insulation

- A. All exposed piping under handicap or wheelchair accessible lavatories shall be insulated/isolated with molded, recessed tamper proof security set screws, antimicrobial UV inhibited, universal fit, Handy-Shield Safety Covers Pro-2000 series brand by Plumberex Specialty Products, Inc. or other approved as equal.

2.08 Other Equipment

- A. All other equipment (Water Heaters, etc.) shall be as scheduled on drawings.

2.09 Substitutions

- A. All substitutions must be pre-approved by the architect prior to bidding. See Division 1 for substitution process.

PART III - EXECUTION

3.01 Installation Instructions.

- A. All material and equipment shall be installed as recommended by manufacturer. These specifications shall not be construed to vary from manufacturer's written installation instructions without written approval from manufacturer.
- B. It shall be the responsibility of this Contractor to visit the site & coordinate with the other trades for clearance, elevations, etc., before installation of any material. Where conflicts exist the Architect shall be notified before installing material.

Changes required in work specified in this Section caused by neglect to do so shall be made at no cost to the Owner.

- C. Arrange with Contractors of other trades for installation of built-in items, blocking, and additional necessary supports.

3.02 Pipe Routing

- A. All piping shall be concealed except where approved by Architect.
- B. All piping shall be run parallel and/or perpendicular to building lines and shall be neatly grouped. Piping shall be on warm side of insulation.
- C. See Drawings for general routing of pipes and see details of drawings for specific pipe routing.
- D. Join all copper piping with Bridgit Lead-Free solder and non-corrosive flux Nodorode, or equal clean surfaces to be solder bright.
- E. Provide a union or flange connection at each piece of equipment such as water heaters, accessible fixtures etc. so the equipment can be removed or serviced without disturbing remainder of system, draining system or cutting piping.
- F. Make all connections between copper and ferrous pipe in domestic water and other open type systems with dielectric unions.

3.03 Plumbing Fixture Installation

- A. Provide all fixtures and equipment with compression stops in addition to the faucets.
- B. Provide all grounds and supports for the fixtures and other equipment. Arrange with contractors of other trades for installation of built-in items, blocking, and additional necessary supports.
- C. Grout behind all wall hung plumbing fixtures with hard white durable plaster materials to eliminate all voids and cracks and provide sufficient plane bearing surface for mounting.
- D. Caulk behind all standard wall hung fixtures with G.E. "Silicone Sanitary Sealant" or other approved mildew resistant, paintable, non-hardening sealant.

3.04 Pipe Support Installation

- A. Vertical pipe of the following materials shall be supported at intervals not more than the distance prescribed in the following:
1. Copper Tube: At each story, but not more than ten (10) foot intervals.
 2. Plastic Pipe: At each story, and at midpoint between floors.
 3. Threaded Pipe: At each story, but not more than (10) foot intervals.
 4. Cast Iron: At each story, but not more than (15) foot intervals.
- B. Horizontal pipe of the following materials shall be supported at intervals not more than the distances prescribed in the following:
1. Copper Tube (1¼ inch or less): At six (6) foot intervals.
 2. Copper Tube (1½ inch and over): At ten (10) foot intervals.
 3. Plastic Pipe (3 inch or less): At four (4) foot intervals.
 4. Plastic Pipe (4 inches and over): At five (5) foot intervals.
 5. Threaded Pipe: At twelve (12) foot intervals.
 6. Cast Iron: At five (5) foot intervals.
- C. Piping shall be so anchored as to take the load off the stack at the base.
- D. Hangers and strapping material shall be of similar materials as the piping to avoid galvanic action.
- E. Provide additional hangers at each turn and where concentrated loads such as valves, risers, etc. occur.
- F. Trapeze Hangers shall not be permitted.
- G. Provide pipe covering protection saddles.
- H. Construct rigid structural steel anchors to secure piping to building construction where required to stabilize piping.
- I. Furnish and install all supplementary steel angles, channels, beams, etc.; where hanger location falls between joists, purlins or beams; for hanging loads exceeding capacity of a single joist, etc. Safety factor of all such assemblies shall be 5 to 1 minimum.
- J. Support all piping and equipment from building construction with adequate hangers, claps, rods inserts.

- K. All supporting methods and devices must be approved by the Architect prior to installation. No overloading of any beam, joist, slab, device, etc. will be allowed. Welding to and drilling of structural members must be approved by the Architect. Coordinate support locations with other Contractors.

3.05 Water Heater Installation

- A. Furnish and install ASME rated temperature-pressure relief valve with temperature sensing element directly inserted into tank. Pipe relief full size to drain using copper piping.
- B. Furnish and install cutoff valves and dielectric unions in hot and cold connections to water heater.
- C. Furnish and install safe pans under water heater. Drain safe pan to a conspicuous location.

3.06 Floor Drain Installation

- A. This contractor shall be responsible for proper setting and elevation of all floor drains to provide proper slopes and avoid water puddling on floors.

3.07 Access Doors

- A. Furnish and install access doors over all concealed valves, and other concealed components requiring service and not accessible from utility spaces. All access doors shall be as manufactured by Inland Steel Products Co. "Milcor" styles as required to match construction and as approved by Architect.

3.08 Excavation and Backfill

- A. Contractor shall perform all excavation and backfill required for all plumbing work. Cutting of any concrete required by the excavation shall be done by the General Contractor. Any rock shall be excavated 3" below the laying depth, and the trench shall be filled in 6" layers and mechanically compacted. Flooding or puddling not permitted. All piping which will be under concrete or roads, shall be backfilled in accordance with Architects specifications.

3.09 Waterproofing

- A. Plumbing work piercing weatherproof construction shall be made weatherproof by use of Architect approved materials and methods.

3.10 Tests and Adjustments

- A. Fixtures and equipment shall not be concealed or covered until they have been inspected and approved by the Architect, who shall be notified when the work is ready for inspection. All work shall be completed installed, tested as required by this Section, and leak-tight before inspection if requested. All tests shall be repeated to the satisfaction of those making the inspection.
 - 1. All waste and vent piping shall be filled with water to the highest point in each system with all air removed. The lines shall be flushed by removing the test plug. Piping concealed shall be subjected to not less than 10' head. Stand piping installed for head test shall be min. 2" diameter.
 - 2. Sewer piping and storm water piping shall be filled with water to its highest point.
 - 3. Water and gas piping shall be flushed out, tested at 100# PSI for 24 hours, then left under pressure of supply main for the balance of construction period.
 - 4. Plumbing fixtures shall be filled with water and checked for leaks or retarded flow.
 - 5. All flush valves, key stops, valves and similar equipment shall be adjusted and balanced to provide for the proper operation of the various systems.
 - 6. Each piece of plumbing equipment and the entire plumbing system shall be adjusted and readjusted as required to insure proper functioning and shall be left in 1st-class operating condition.

3.11 Expansion

- A. Contractor shall provide for min. 1-1/2" expansion per 100 linear ft. of piping by installing swing joints and/or expansion compensators.

3.12 Sterilization of Water Distribution System

- A. When the new water distribution system has been flushed thoroughly, it shall be sterilized in accordance with the requirements of the Health Department having jurisdiction or, in the absence of such, by the following:
 - 1. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling the lines slowly and applying the sterilizing agent at a rate of 50 parts per million of chlorine as determined by residual chlorine tests at the ends of the lines. Open and close all valves and hydrants while the system is being chlorinated.
 - 2. After the sterilizing agent has been applied for 24 hours, test for residual chlorine that is indicated, repeat the sterilization process.

3.13 Cutting, Patching And Piercing

- A. Obtain written permission of the Architect before cutting or piercing structural members. If, in the process of the mechanical work, ducts, piping or equipment need to be installed in an area after it has been completed, the area shall be left in the same condition it was originally. Patching and/or refinishing will be determined by the Architect.

3.14 Access

- A. Equipment, valves and devices shall be mounted in a manner which provides adequate maintenance, inspection access and work space. Where access is required for adjustment, cleanout, inspection of maintenance and such access is not otherwise available, access panels shall be furnished and installed. Panels shall be selected by the Architect.

3.15 Building Openings for Admission or Installation of Equipment

- A. The Contractor shall ascertain from his examination of the Architectural and Structural Drawings whether any special temporary or permanent openings in the building for the admission or installation of apparatus furnished under this Contract will be necessary and he shall notify the General Contractor accordingly. He shall pay all cost of making such openings in case of failure to give this notification in time for the General Contractor to arrange for same during construction.

3.16 Cutting, Sleeves, Inserts, Anchor Bolts and Escutcheons

- A. In placing sleeves, inserts, anchor bolts and any other material to be embedded in masonry and concrete or built into the structure, the Contractor shall cooperate with all other trades and shall consult with the Architect in regard to their exact location whenever there is any interference with structural members.
- B. The Contractor will be held responsible for locating and maintaining in proper position, sleeves, inserts and anchor bolts supplied and/or set in place by him. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.
- C. All pipe passing through floors, walls or partitions shall be provided with sleeves having an internal diameter 1" larger (unless specifically indicated otherwise) than the outside diameter of the pipe.

- D. Sleeves through outside walls shall be Schedule 40 black steel pipe. Sleeves shall extend 1/2" beyond each side of the wall. The space between the sleeve and the pipe shall be packed and made watertight with a waterproof compound.
- E. Sleeves through interior partitions shall be 22 gauge galvanized sheet steel set flush with finished surface of partitions.
- F. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4" in diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods to be passed through the insert body and shall be similar to Fee and Mason Fig. 188 or equal for equipment suspension and Fig. 9000 or equal for pipe suspension.
- G. Where sleeves or inserts are placed in interior walls or partitions, the openings shall be completely sealed with Fiberglass to prevent sound transmission. Where sleeves are placed in fire rated walls and floors, they shall be packed with high temperature mineral wool and non-flammable sealant.
- H. Furnish and install escutcheons where uninsulated pipes pass through finished walls, floors or ceilings. Escutcheons shall be chrome plated brass, firmly secured to the pipes and of sufficient outside diameter to amply cover the sleeved openings for the pipes. Escutcheon plates shall be as manufactured by Crane Company or equal.

3.17 Sound and Vibration

- A. All pumps, motors etc. shall be mounted so as to be isolated from the building by approved sound insulation means. All noises and hums of motors, fan etc. shall be so absorbed that the operation will not be heard except in the immediate vicinity of the equipment.

3.18 Cleaning of Equipment and Removal of Rubbish

- A. All equipment furnished or installed by this Division shall be thoroughly cleaned. At the completion of the work, the Contractor shall remove from the buildings and the premises all rubbish and debris resulting from his operations and shall leave all material and equipment furnished by him and the space occupied by them absolutely ready for use.
- B. Under no circumstances shall rubbish be allowed to accumulate in the building or on the premises. All dirt and rubbish resulting from this Division's work shall be

removed by this Division from time to time and as often as directed by the Architect and Owner's representativ

3.19 Record Documents

- A. Blueline or blackline copy of Drawings shall be kept by this Contractor at the job site at all times for the sole purpose of recording horizontal and vertical location of all concealed and underground plumbing, referenced to permanent visible structures. At completion of job, neatly record all dimensions on a reproducible drawing and submit for approval of Architect.

END OF SECTION

DIVISION 15000
SECTION 15200
FIRE PROTECTION

PART I - GENERAL

- 1.01 Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 Specification Sections apply to this section.
- 1.02 Work Included
- A. Automatic Sprinkler System
 - B. This specification for the fire protection work is intended to be a performance type specification for the furnishing and complete installation of a fire protection automatic dry pipe sprinkler system for complete coverage of the entire building, and to conform to the requirements of NFPA Bulletin 13, 20, International Building Code and ISO. The work shall include the connection to water service piping, and all equipment and materials and the complete installation and testing of the automatic sprinkler system to conform with NFPA 13, ISO, International Building Code (Seismic design) and as herein specified. Sprinkler system shall be designed for LIGHT HAZARD OCCUPANCY.
- 1.03 Related Work
- A. Painting by Painting Contractor
 - B. Cutting & Patching by General Contractor.
 - C. Fire Extinguishers - See Architectural Plans
- 1.04 Codes & Standards
- A. International Building Code
 - B. NFPA 13
 - C. ISO
- 1.05 Shop Drawings
- A. The Contractor shall prepare and submit shop drawings with hydraulic calculations to the Engineer for approval, showing each fire protection system complete, including but not limited to, test and drain valves and connections,

sprinkler heads all piping with sizes and drains. Submittals shall also include manufacturer's data sheets on all equipment and materials included in system. Shop drawings shall be sealed by an Engineer registered in Missouri.

- B. Items of work not specifically mentioned in this specification shall be furnished and performed in accordance with applicable requirements of NFPA #13 and ISO.
- 1.06 The contract drawings for fire protection work are in part schematic, intended to convey the scope of work and indicate the general layout, design and arrangement. The Contractor shall follow these drawings in the layout of his work and shall consult general construction drawings, mechanical/electrical drawings and all other drawings for this project to determine all conditions affecting the fire protection work. The contract drawings are not to be scaled and the Contractor shall verify spaces in which the fire protection work is to be installed. An Autocad drawing with walls, reflected ceiling, grilles, and registers will be provided at the request of the successful bidder.
- 1.07 Where specific details and dimensions for fire protection work are not shown on the drawings, the Contractor shall take measurements and make layouts as required for the proper installation of the work and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and the Contractor shall perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect, and no additional costs shall be allowed by the contract price.
- 1.08 Quality Assurance
- A. ISO Listing: Provide component materials which have been evaluated and approved by ISO.
 - 1. Plans shall be submitted to ISO for approval.
- 1.09 Design
- A. The system shall be hydraulically designed. Verify pressures with the water utility company prior to performing hydraulic calculations. Hydraulic calculations shall be sealed by an Engineer registered in Missouri.

PART II - PRODUCTS

2.01 Piping Materials

- A. Piping inside building shall be plastic approved for sprinkler piping.

- B. Piping shall be sized, in accordance with NFPA 13 and ISO. All pipe sizes shall be shown on shop drawing submittals, and all calculations and information required for the sizing in accordance with NFPA 13 and ISO shall be submitted with the shop drawings.

2.02 Sprinkler Heads

- A. Sprinkler heads shall be Central or equal by Viking or Reliable.
- B. Installation shall comply with the requirements of NFPA 13 and ISO.
- C. Provide spare sprinkler heads, of the types installed and wrench in a suitable steel cabinet with hinged door and latch. Number of spare sprinkler heads, of each type installed, shall comply with NFPA 13 and ISO.
- D. If additional sprinkler heads are required, (due to obstructions) to provide the coverage as required by NFPA Standards and as hereinbefore specified, then the additional heads shall be furnished and installed, and piping size increased as necessary to comply with the NFPA Standards at no additional cost to the Owner.
- E. Provide chrome plated brass 2-piece escutcheon plate which allows escutcheon installation after ceiling tile is in place.

2.03 Alarm

- A. Provide approved water flow switch and bell which sounds upon water flow in system. Water flow switch shall also initiate alarm through fire alarm system to notify emergency personnel. Provide valve tamper switches to initiate alarm through Fire Alarm System.

2.04 Escutcheon Plates

- A. Provide escutcheon plates around exposed pipes (pipes not concealed by construction) where they pass thru ceilings, walls or partitions. Plates shall be chromium plated, cast or heavy stamped brass. Secure plates so that they will not pull away from construction when pipe expands and contracts.

2.05 Color Banding and Identification of Piping

- A. The Contractor shall provide color banding with legend identification of piping as herein specified. Band colors and identification legends shall be as selected by Owner.

- B. All exposed pipes and all pipes located above accessible ceilings shall have color bands with legends at intervals not to exceed 20 feet apart. Where pipes are located in accessible concealed locations such as shafts, pipe spaces, chases, etc., or wherever access panels are installed at the nearest point of access to the space and in the most conspicuous location. Color bands with legends shall also be located on pipes adjacent to all cut-off valves and adjacent to each pipe of equipment.
- C. Identification legends shall be made of pressure-sensitive vinyl type with background color as scheduled and with plain block or Roman letters in a contrasting color and letters of height as follows: 1/2" high for 1/2" through 1-1/2" pipe size; 3/4" for 1-1/2 and 2" pipe; and 1-1/4" for 2-1/2" through 6' pipe; 2-1/2" for 8" and 10" pipe; and 3-1/2" for over 10" pipe size. If the identification legend tape does not extend completely around pipe and with at least 1/4" overlap, furnish and install a band of matching color, pressure sensitive vinyl tape around pipe at each end of the identification legend tape. These bands shall be installed around the complete circumference of the pipe and shall overlap not less than 1/2" and shall overlap the ends of the identifications legend by 1/2" to 1". Adjacent to each identification legend, furnish and install a pressure-sensitive vinyl arrow marker tape showing the direction of flow.
- D. Where possible, the identification legends shall be installed where they can be easily read from standing on the floor.
- E. Color banding with legend identification shall not be installed until piping has been insulated and painted, for pipes that are to be insulated and painted. Surface of insulation or pipe on which the color banding is to be installed shall be thoroughly clean before installation of banding is made.
- F. Identification legends may be abbreviated from or full lettering, conforming with ANSI Standards A13.1, but identification description shall not be less than shown in schedule. Markers shall be as manufactured by Seton Name Platre Corporation or Brady, or approved equal.
- G. The Contractor shall furnish a framed copy of the pipe identification legends mounted under plexiglass and shall install in location as directed.

2.06 Labels and Valve Tagging

- A. All main manual valves and all control valves throughout the building shall be identified with a stamped brass or plastic tag attached to the valve with a brass "S" diameter and with 1/2" depressed black letters. A list of all valves shall be mounted in a frame with plexiglass cover and shall be permanently fastened to wall in location as directed. Valve lists shall include the following:

1. Valve identification number.
 2. System designation (PLBG.CW";"CH.WTR.SUP.";etc.)
 3. Type valve (gate; ball; auto. control; etc.).
 4. Manufacturer and manufacturer's catalog number.
 5. Location of valve.
- B. All mechanical equipment shall be identified with engraved phenolic nameplates. All starters, disconnect switches, controls and control panels furnished under Division 15 shall also be identified with engraved nameplates, showing the name of equipment controlled. Plates shall be black with white core and shall be securely attached to equipment with screws. List of plates with proposed working shall be submitted to the Architect for approval prior to manufacturing of plates and installation. Dymo type labels not accepted.

2.07 Substitutions

- A. All substitutions must be pre-approved by the architect prior to bidding. See Division 1 for substitution process.

PART III - EXECUTION

3.01 Installation

- A. The mechanics for this work shall cooperate with the mechanics for all other work in the building. The installation of piping and sprinkler heads shall be coordinated with existing conditions and all other construction, including but not limited to, the ductwork, piping, conduits, lighting fixtures, acoustical ceilings, and building structures. Any conflicts that occur with the work of other trades as a result of the lack of coordination by the installers of the fire protection work shall be adjusted at the expense of the fire protection subcontractor and as required and approved by the Architect.
- B. Arrange with Contractors of other trades for installation of built-in items, blocking, and additional necessary supports.

3.02 Sleeves

- A. Sleeves shall be furnished and installed wherever pipe passes through walls, partitions or floors, and the space between the pipe and sleeve shall be packed. Sleeves, packing and installation shall comply with requirements as specified in Section 15100 paragraph 3.15 of the specifications.

3.03 Sprinkler

- A. Sprinkler design shall not exceed 52,000 sq.ft. per system.

3.04 Testing and Piping Systems

- A. All piping shall be tested hydrostatically with 200 psi pressure in accordance with NFPA and ISO. Test pressure shall be maintained on piping system for a period of not less than 2 hours. Test shall be made before piping is painted or concealed in any manner. If leaks occur, they shall be corrected and the system shall be retested for the 2 hour period.

3.05 Record Drawings

- A. Blueline or blackline copy of Drawings shall be kept by this Contractor at the job site at all times for the sole purpose of recording horizontal and vertical location of all concealed and underground piping, referenced to permanent visible structures. At completion of job, neatly record all dimensions on a reproducible drawing and submit for approval of Architect.

3.06 Operating Instructions and Maintenance Data.

- A. Upon completion and acceptance of the work by the Owner, the Contractor shall provide four(4) sets of 8 1/2" x 11" typed operating and maintenance instructions. Sample maintenance instructions will be provided by Engineer upon request.

END OF SECTION

DIVISION 15000
SECTION 15300
HEATING, VENTILATING, AND AIR CONDITIONING

PART I - GENERAL

1.01 Related Documents

- A. Provision of General Requirements, Division 1, are a part of this section.

1.02 Description of Work

- A. The extent of work is shown on drawings, and includes but is not necessarily limited to the following:
 - 1. Ductwork
 - 2. Grilles, Registers, Louvers
 - 3. Exhaust Fans
 - 4. Ductless Split System Heat Pump
 - 5. Refrigerant Piping
 - 6. condensate Piping and Insulation
- B. Prior to bidding, all Contractors shall visit the site and become familiar with all existing conditions, which will affect construction procedures and scope of work required as part of this Section.

1.03 Related Work

- A. Power and control wiring
- B. Painting
- C. Cutting and patching

1.04 CODES AND STANDARDS

- A. American Society of Mechanical Engineers
- B. American Society for Testing and Materials
- C. American Society of Heating, Refrigerating and Air Conditioning Engineers.
- D. Building Officials and Code Administrators International, Inc.
- E. Sheet Metal and Air Conditioning Contractors National Association.

- F. Underwriter's Laboratories
- G. NFPA
- H. International Approval Service

1.05 Design Conditions

- A. HVAC system design assumes the following:
 - 1. Winter outdoor temperature -10E F.
 - 2. Winter indoor temperature 72E
 - 3. Summer outdoor temperature 95E F. D.B. 78E F W.B.
 - 4. Summer indoor temperature 76E F. D.B.

PART II - PRODUCTS

2.01 Exhaust Fans

- A. Shall be as scheduled or equal, with backdraft damper, bird screens, disconnect. Provide combination starter/disconnect with on all fans with motors 1 HP or larger for electrical contractor to install.

2.02 Ductwork

- A. Rectangular - shall be galvanized iron fabricated and installed to SMACNA standards. Provide turning vanes in all 90 degrees elbows. Provide all necessary manual volume dampers, turning vanes, volume extractors, etc. as required to properly balance system. Fresh air duct and all duct in unconditioned shall be insulated with 2" ductwrap, insulation, with "K" value of .24. Duct in conditioned shall have 1 1/2" ductwrap, except in plenum areas shall have no insulation. Fiberglass ductliner is not allowed.
- B. Round - Shall be galvanized iron fabricated and installed to SMACNA standards.
- C. Flexible Duct – FLEXMASTER #6M Insulated flexible duct. Mylar inner liner, 1" thick fiberglass insulation with seamless aluminized vapor barrier. Maximum length unless otherwise noted shall not exceed 10 feet, and supported maximum 3' o.c.

2.03 Grilles and Louvers

- A. Exhaust, grilles shall be fixed deflection and shall be Hart and Cooley or approved equal. All aluminum. Color as selected by Architect.

- B. Supply registers in areas with no ceiling shall be adjustable curved blade, all aluminum, and supported from structure.
- C. Louvers shall be Ruskin #ELF-375 all aluminum with bird screen. Color as selected by Architect.

2.04 Dampers

- A. Manual dampers up to 14" may be single blade. Quadrants shall be Duro-Dyne #KP-20 series, or approved equal.
- B. Motorized dampers shall be Ruskin #CD35 or approved equal with 120V. electric two-position activators with spring return, Barber Colman #MA-400 Series or approved equal.

2.05 Ductless Split System Heat Pump

- A. As shown on plans

2.06 Controls

- A. Furnish & install thermostats, transformers, relays etc. as required to provide control sequence as specified. See Division 16 for temperature control conduit & conductors by this Division.

2.07 Refrigerant Piping

- A. Refrigerant piping shall be ACR cleaned and capped hard drawn copper refrigerant pipe with wrought copper fittings and silver solder joints.
- B. System shall be insulated, evacuated, and charged per manufacturers written installation instructions.
- C. Support piping to prevent sagging.

2.08 Substitutions

- A. All substitutions must be pre-approved by the architect prior to bidding. See Division 1 for substitution process.

3.01 Manufacturer's Written Installation Instructions

- A. All materials shall be installed as recommended by manufacturer. Nothing in these specifications shall be construed to vary from manufacturer's written installed instructions without written approval from manufacturer.
- B. It shall be the responsibility of this Contractor to coordinate with the other trades for clearance, elevations, etc., before the installation of any material. Where conflicts exist the Architect shall be notified before installing material. Changes required in work specified in this Section caused by neglect to do so shall be made at no cost to the Owner.
- C. Arrange with Contractors of other trades for installation of built-in items, blocking, and additional necessary supports.

3.02 Heating/Air Conditioning

- A. Furnish and install complete and operable system, consisting of dampers, exhaust fans, air distribution ductless heat pump etc.

3.03 Noise and Vibration

- A. It is the specific intent of these specifications and design conditions that the system including equipment, piping and other parts, shall be noiseless and free of vibration as a result of the new installation in the building. It shall be the responsibility of this Contractor to correct these conditions at no cost to the Owner.

3.04 Wiring Diagrams

- A. Furnish complete wiring diagrams for all equipment furnished by this Contractor. Submit wiring diagrams to Architect with equipment submittals for approval.

3.05 Electrical Equipment

- A. Starters and thermal protective devices not a factory mounted integral part of equipment specified in this Section shall be furnished by this Contractor for installation by the Electrical Contractor.

3.06 Operating Instructions and Maintenance Data.

- A. Upon completion and acceptance of the work by the Owner, the Contractor shall provide an experienced Engineer to instruct the Owner's operators in operation of entire installation. Instruction period shall be for a period of one (1) eight-hour working day. Contractor shall provide four(4) sets of 8 1/2" x 11" typed operating and maintenance instructions. Sample maintenance instructions will be provided by Engineer upon request. Contractor shall also include wiring diagrams of all controls in each set of maintenance instructions.

3.07 Clean-up

- A. Upon completion of work under this Section, all unnecessary equipment, materials, rubbish, etc., shall be removed from project site and surrounding area leaving site in a safe and cleared condition.

3.08 Cutting, Patching and Piercing

- A. Obtain written permission of the Architect before cutting or piercing structural members. If, in the process of the mechanical work, ducts, piping or equipment need to be installed in an area after it has been completed, the area shall be left in the same condition it was originally. Patching and/or refinishing will be determined by the Architect.

3.09 Access

- A. Equipment, valves and devices shall be mounted in a manner which provides adequate maintenance, inspection access and work space. Where access is required for adjustment, cleanout, inspection of maintenance and such access is not otherwise available, access panels shall be furnished and installed. Panels shall be selected by the Architect.

3.10 Building Openings for Admission or Installation of Equipment

- A. The Contractor shall ascertain from his examination of the Architectural and Structural Drawing whether any special temporary or permanent openings in the building for the admission or installation of apparatus furnished under this Contract will be necessary and he shall notify the General Contractor accordingly. He shall pay all cost of making such openings in case of failure to give this notification in time for the General Contractor to arrange for same during construction.

END OF SECTION

DIVISION 16000
SECTION 16100
ELECTRICAL

PART I - GENERAL

1.01 Related Documents

- A. Provisions of General Requirements, Division 1, are a part of this section.

1.02 This work shall included, but not necessarily be limited to furnishing and installing:

- A. Wiring
- B. Conductors and Conduit
- C. Fused Disconnects.
- D. Wiring Devices, Light Fixtures, Lamps, Ballasts, Fuses.
- E. Wiring for Equipment Furnish by Others.
- F. Grounding
- G. Drawings of Record
- H. Prior to bidding, all Contractors shall visit the site and become familiar with all existing conditions, which will affect construction procedures and scope of work required as part of this Section.

1.03 Codes and Standards

- A. National Fire Protection Association - National Fire Code.
- B. National Electrical Code
- C. Building Officials and Code Administrators International, Inc.
- D. Underwriter's Laboratories
- E. National Electric Safety Code

- 1.04 Shop Drawings shall be submitted to the Architect for approval. The Contractor shall be responsible for quantities and dimensions. The Contractor shall check all shop drawings prior to submission to the Architect.
- 1.05 The Contractor shall follow the drawings in the layout of his work and shall consult general construction drawings, mechanical drawings and all other drawings for this project to determine all conditions affecting the electrical work. The drawings are not to be scaled and the Contractor shall verify spaces in which the electrical work is to be installed.
- 1.06 The Contractor shall take measurements and make layouts as required for the proper installation of the work and coordination with all other work on the project.
- 1.07 Related Work
- A. Mechanical Equipment
 - B. Painting by Painting Contractor

PART II - PRODUCTS

2.01 Wire and Cable

- A. Low voltage wire and cable
 1. All wire and cable installed under this contract shall be Southwire, Anaconda, Triangle or approved equal, complete with non-fading type color coding system as set forth by National Electric Code. General interior wiring shall have 600 volt insulation, THHN. Wiring in wet and damp locations shall be THWN.
 2. Wire shall be soft annealed copper conforming to current requirements of National Electrical Code, and shall be Brown & Sharp (B&S), or American Wire Gauge (AWG) gauges unless specifically indicated on the Drawings. NO ALUMINUM WIRE SHALL BE USED. Wire smaller than #12 gauge shall not be used.

2.02 Connectors

- A. Shall be "Scotch Lok" for up to #8 wire and Weaver, or approved equal, split bolt or set screw type connectors for #6 wire and larger.

2.03 Conduit

- A. EMT electrical metallic tubing, Republic "Electriunite", National, Triangle.

- B. Rigid galvanized conduit, Republic "Galvanite", National, Triangle, with threaded fittings.
- C. Flexible metal conduit, "Greenfield".
- D. Carlon, or approved equal, Schedule 40 non-metallic conduit and fittings.
- E. Metal Clad (Type MC) cable and fittings manufactured by AFC, or approved equal.

2.04 Outlet, Junction and Pull Boxes

- A. Outlet boxes shall be galvanized or sherardized, one-piece pressed steel of sectional type or non metallic (Carlon), of size most suitable for the outlet used. Boxes shall be equipped with plaster rings, extension rings, bar hangers and fixture studs as may be required. Junction or pull boxes, either flush or surface mounted, as indicated or required, shall be of adequate sizes to accommodate the conductors installed therein. Junction and pull boxes shall comply with the National Electrical Code as to construction.

2.05 Fuses

- A. Power panels and lighting panels are existing.
- B. Fuses shall be Bussmann as follows or as noted on Drawings. Fuses on power feeders shall be Fusetron Dual-Element fuses in the 0-60 amp sizes, "FRN" for 250 volts.

2.06 Wall Switches

- A. Shall be Leviton #1120 series, or approved equal, 20 amp, 120/277 volt, grounding clip. Single pole or 3-way as indicated in the drawings. Color as selected by Architect.

2.07 Duplex Convenience Outlets

- A. Shall be Leviton #5362, or approved equal, 20 amp grounding type. Ground fault receptacles shall be #6898 Series. Side wire only. Color as selected by Architect.

2.08 Special Outlets

- A. Shall be by Leviton as required and as shown on drawings, complete with wall plates, same color as duplex receptacles.

2.09 Switch and Receptacle Plates

- A. Shall be Leviton #80700 series to match switch, receptacle, or special outlet as required. or approved equal

2.10 Fused Disconnects

- A. Shall be Square D, general duty, single throw, externally operated safety switches, fuses and of poles, volts and ampere ratings for the load shown in NEMA-1 or NEMA-3R enclosures, as required.

2.11 Light Fixtures

- A. All light fixtures shall be as scheduled on drawings or approved equal. To be considered as equal, fixtures must have equal features, components, quality of construction, and photometrics.

2.12 Substitutions

- A. All substitutions must be pre-approved by the architect prior to bidding. See Division 1 for substitution process.

PART III - EXECUTION

3.01 Manufacturer's Written Installation Instructions

- A. All materials shall be installed as recommended by manufacturer. Nothing in these specifications shall be construed to vary from manufacturer's written installed instructions without written approval from manufacturer.
- B. It shall be the responsibility of this Contractor to coordinate with the other trades for clearance, elevations, etc., before installation of any material. Where conflicts exist the Architect shall be notified before installing material. Changes required in work specified in this section caused by neglect to do so shall be made at no cost to the Owner or Architect.
- C. The Contractor shall verify the voltage phase full-load current and exact location of all electrical equipment before rough-in.

- D. Arrange with Contractors of other trades for installation of built-in items, blocking, and additional necessary supports.

3.02 Wire and Cable Installation

- A. Unless specifically indicated on Drawings, all wire and cable installed in ordinarily dry locations above base slab shall be Type THHN. Unless specifically indicated on Drawings, all wire installed below grade in slab or grade or in areas subjected to possible condensation, moisture, or weather shall be Type THWN.
- B. All wiring shall be in conduit, or shall be type MC cable. See "Conduit" below.
- C. All wiring shall be continuous between boxes with out any splices in conduit or frame spaces.
- D. All 120 volt 20 amp lighting and receptacle circuits requiring more than 100' of conductor (one way) shall be #10 conductors.

3.03 Conduit Installation

- A. Conduit for general use concealed inside building as shown on Drawings shall be EMT or type MC cable. All conduit shall be concealed except where approved by Architect.
- B. All conduit for installation exposed or exterior to structure, or within concrete construction or as shown on Drawings, shall be rigid galvanized or Schedule 40 PVC as approved by Architect.
- C. Conduit smaller than 1/2" shall not be used. Flexible conduit (Greenfield) may be used in short lengths (maximum 6') for fixture connections, motor connections and other special connections as approved by Architect.
- D. Conduit shall be concealed in finished spaces, except where noted otherwise on Drawings. All exposed conduit shall be as approved by Architect and shall be installed in a neat and workmanlike manner with conduit runs parallel to building lines.
- E. Conduit shall run continuous between outlets, boxes and cabinet, and each conduit run shall have not more than three 90 degree bends between termination points. Conduit shall bend without crimping or flattening to provide a smooth and even turn with bend radius as great as possible, never shorter than that used in corresponding trade elbow. Conduit bends in which interior enamel has flaked will not be permitted.

- F. Conduit shall be supported individually by use of bolted metal clamp type hangers at intervals not exceeding 8'-0' with each hanger rigidly attached to building construction. Vertical conduit supports, where required, shall be clamps attached to structure in an approved manner.
- G. Conduit ends shall be reamed and all burrs removed prior to installation, and all conduit shall be kept clean and dry during construction by use of caps and plug. Junction or pull boxes shall be installed as required to facilitate ease of wire pulling. Insulating bushings shall be provided on all conduits at points where entering metal enclosures to prevent abrasion and damage to insulation of wire and cable.
- H. Type MC cable installed in ceiling plenums shall be supported to prevent contact with T-bar ceilings.
- I. All wiring shall be installed in conduit or mc cable.

3.04 Outlet, Junction and Pull Box Installation

- A. The size of each box shall be determined by the number of wires and conduits, or size of conduit entering the box, but shall be not less than 3 1/4" octagon or 4" square with ring.
- B. All single to four-gang outlet boxes required in unplastered masonry walls shall be 3 1/2" deep solid type with square corners. All plaster and masonry rings or boxes shall be flush or not more than 1/4" behind the finished surfaces.
- C. All boxes shall be securely anchored to masonry or frame construction.

3.05 Locations of Outlets and Equipment

- A. The Contractor shall coordinate his work with that of other trades in order to provide a proper installation of electrical equipment in keeping with the intent of the Drawings and Specifications. Minor changes relative to the location of electrical equipment may be made by Owner's Representative to comply with structural and building requirements as determined in the course of construction.

3.06 Height of Outlets

- A. All heights measured from finished floor line to centerline of device.
 - 1. Receptacle (general) 18" office; 48" maintenance/warehouse area.
 - 2. Receptacle (special) as noted on Drawings
 - 3. Wall Switches 4'-0"

3.07 Panel Circuit Directory

- A. Provide a typewritten and laminated directory on inside of cabinet door on all panels designating rooms, outlets and equipment served by each branch circuit of the panel.

3.08 Grounding

- A. The complete new electrical installation, including metallic boxes and equipment shall be permanently and effectually grounded in accordance with all code requirements, whether or not such connections are specifically shown and/or specified.
- B. Every branch and feeder conduit shall contain a green insulated code sized grounding conductor. Care shall be taken to keep the system neutral conductor separate from the equipment ground except at the point of system derivation.

3.09 Cutting and Patching

- A. Contractor shall perform all cutting and patching as required for all electrical work inside and outside of building.
- B. All conduit penetrations of rated walls will be sealed.

3.10 Wiring of equipment Furnished by Others

- A. Electrical Contractor shall do all power wiring except factory prewired equipment.
- B. Furnish and install disconnects at all equipment not furnished with disconnect. Coordinate with with HVAC Contractor to ensure all equipment has a properly sized electrical disconnect at the unit.
- C. Starters and thermal protective devices not a factory mounted integral part of equipment furnished by Section 15000, shall be furnished by the HVAC Contractor but installed and wired by the Electrical Contractor.

3.11 Lighting Fixture Installation

- A. This Contractor shall furnish and install all lighting fixtures and lamps as required. Material, equipment or services necessary to complete the installation of these fixtures, but not specifically mentioned, shall be furnished as though specified. All fixtures and lamps shall be properly cleaned and adjusted after installation. All

adjustable lighting fixtures shall be carefully positioned by this Contractor in the presence of the Architect or his representative.

3.12 Drawings of Record

- A. A blueline or blackline copy of Drawing shall be kept at the job site at all times for the sole purpose of recording horizontal and vertical location of all below grade electrical wiring, referenced to permanent visible structures. At completion of job, neatly record all dimensions and submit for approval by Architect.

3.13 Clean Up

- A. Upon completion of work under this Section, all unnecessary equipment, materials, rubbish, etc., shall be removed from project site and surrounding area leaving site in a safe and cleared condition.

3.14 Equipment Label Installation

- A. Front cover of each panel, fused disconnect, and other electrical equipment shall have a mechanically attached name plate indicating name/number of panel and second nameplate on subpanels indicating "Fed from (panel #)". Panel nameplates shall have 3/4" letters and secondary nameplates shall have 1/2" letters. Seton #818-2, or approved equal, 1/2" x 4".

3.15 Materials and Workmanship

- A. Only new, clean and perfect equipment, apparatus, materials and supplies of latest design and manufacture shall be incorporated in the work in order to assure an electrical system of high quality.
- B. All materials shall be new, shall bear the Underwriters Label of Approval and shall be installed according to manufacturer's specifications or as directed by the Architect. The Contractor shall assume responsibility for proper installation of materials in the space available.

3.16 Erection of Apparatus

- A. All work shall be done under the supervision of the Contractor who shall provide foremen to lay out all work. All work shall be laid out with due regard for proper working clearances about electrical equipment and the space requirements of the other Contractors. The Contractor shall immediately report to the Architect any conflict or difficulties in regard to the installation.

- B. Lighting fixtures, motor switches or controllers, switches, boxes panels, and other electrical apparatus shall be set, mounted, positioned, coupled, connected, assembled or otherwise erected or constructed as recommended by the manufacture or designer thereof, unless approved by the Architect for erection in some other manner.
- C. Where crowded locations exist and where there is a possibility of conflict between the trades, the Contractor shall coordinate the exact locations of electrical work with the other trades. After consultation and agreement between the trades, the location shall be approved by the Architect before installation of the work.
- D. Equipment of a type that requires replacement, servicing, adjusting, or maintenance shall be located to allow easy access and space for removal of internal assemblies if required.

3.17 Cutting, Patching And Piercing

- A. Obtain written permission of the Architect before cutting or piercing structural members. If, in the process of the electrical work, circuits or equipment need to be installed in an area after it has been completed, the area shall be left in the same condition it was originally. Patching and/or refinishing will be determined by the Owners Representative. Sleeves through floors and walls to be black iron pipe flush with walls, ceilings or finished floors, sized to accommodate the raceway.
- B. Use care in piercing waterproofing. After the part piercing the waterproofing has been set in place, seal opening and make completely watertight.
- C. Provide chrome-plated spring-clipped escutcheon plates where exposed pipe passes through finished walls, floors or ceilings. Cover sleeves and entire opening made for the pipe with escutcheon plates. Provide air and watertight conduit openings through floor slabs, masonry walls and continuous partitions. Tightly caulk space between conduit and building materials with non flammable sealant.

3.18 Access

- A. Equipment, valves and devices shall be mounted in a manner which provides adequate maintenance, inspection access and work space. Where access is required for adjustment, cleanout, inspection of maintenance and such access is not otherwise available, access panels shall be furnished by Division 16 for installation by the Division 5. Panels shall be selected by the Architect.

3.19 Cleaning of Equipment and Removal of Rubbish

- A. All fixtures, panelboards, motors and all other electrical equipment furnished or installed by the Contractor shall be thoroughly cleaned. At the completion of his work, the Contractor shall remove from the buildings and the premises all rubbish and debris resulting from his operations and shall leave all material and equipment furnished by him and the space occupied by them absolutely ready for use.
- B. Under no circumstances shall rubbish be allowed to accumulate in the building or on the premises. All dirt and rubbish resulting from the Contractor's work shall be removed by this Division from time to time and as often as directed by the Architect and Owner's representative.

3.20 Painting

- A. All items not provided with a corrosion-resistant finish shall be painted. All electrical control equipment, panels and supporting framework shall have a light gray enamel finish which may be the manufacturer's standard gray, if acceptable to the Architect. Where the finish becomes scratched or marred, it shall be touched up or repainted to match the original finish as directed by the Architect. Particular caution shall be exercised so as not to obscure the nameplate data.
- B. All painting other than touch-up of factory finishes shall be by Division 9.

3.21 Tests

- A. The entire system shall be tested, demonstrated and explained to such personnel as the Architect shall designate. The Contractor will be required to make the following checks and tests with his instruments as required:
 - 1. The correctness of lighting circuits to be in conformance with branch circuiting shown on the panel covers after construction.
 - 2. Motors shall be checked for proper direction of rotation and corrected if necessary.
 - 3. Grounds shall be checked and the resistance to ground shall not be more than 10 Ohms.
 - 4. This Contractor shall balance phase currents of all distribution panelboards within +/-10 percent variation between average phase currents and measured individual phase currents.

3.22 Guarantee

- A. The Contractor shall guarantee by his acceptance of this Contract that all work installed will be free from any and all defects in workmanship and/or materials and that all apparatus will develop capacities and characteristics specified. If, during a period of one year, or as otherwise specified, from date of Certificate of Completion and acceptance of work, any such defect in workmanship, material or performance appears, the Contractor will without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Architect. In default thereof, the Owner may have work performed and charge the total cost to the Contractor.

3.23 Maintenance Schedule and Operating Instructions

- A. After the project is completed, Contractor shall be required to furnish four (4) copies of instruction sheets to the Owner for the proper maintenance of electrical equipment and systems furnished and installed by him.
- B. The Contractor shall be required to instruct Owner's operating personnel in the proper operation of electrical systems.
- C. Contractor shall turn over to the Owner all spare parts furnished by manufacturer and those specifically called for in the Specifications. All spare parts shall be properly identified as to the catalog number, manufacturer and the equipment for which they are used.

3.24 Manufacturer's Guarantee and Warranty

- A. Manufacturer's equipment guarantee shall be obtained for at least one year. When manufacturer's standard guarantee is for a longer period, or if longer period is called for in the Specifications, this period shall apply and such items, if defective, shall be replaced in accordance with the terms written in the manufacturer's specifications.
- B. Manufacturer's certificates of warranty shall be provided for all major pieces of equipment and such written certificates shall be turned over to the Owner prior to the final acceptance of the Project.

3.25 Electrical Circuitry for Equipment

- A. The electrical circuits, components, and controls for all equipment are selected and sized, based on the equipment specified. If substitutions and/or equivalent equipment are furnished, it shall be the responsibility of all parties concerned,

involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the electrical characteristics and requirements of that furnished to that specified and/or shown. If greater capacity or more materials or labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then it shall be the responsibility of the parties involved in providing the substitute and/or equivalent items of equipment to provide all compensation for additional charges made for the proper rough-in, circuitry and connections for the equipment furnished. No additional charges shall be made to the Base Bid price or to the Owner.

- B. Before rough-in of circuitry or connecting to equipment, the Contractor shall verify the electrical characteristics and requirements of the equipment being furnished, and for that specified and shown on drawings.

3.26 Operating Instructions and Maintenance Data.

- A. Upon completion and acceptance of the work by the Owner, the Contractor shall provide four(4) sets of 8 1/2" x 11" typed operating and maintenance instructions. Sample maintenance instructions will be provided by Engineer upon request. Contractor shall also include wiring diagrams of all controls in each set of maintenance instructions.

END OF SECTION