

SECTION 09900 - PAINTING

1. SCOPE:

A. This Section includes all labor, material, equipment and related items necessary to complete the installation of the painting of all scheduled surfaces as specified herein and as shown on the drawings.

2. REFERENCED STANDARDS:

A. Comply with standards and procedures and all applicable requirements of Painting and Decorating Contractors of America Manual, Type 1 unless otherwise particularly specified herein.

3. QUALITY ASSURANCE:

A. Qualifications of Manufacturer: Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items with a history of successful production acceptable to the Architect.

B. Qualifications of Applicator: Provide at least one person present at all times during execution of the work who is thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who directs all work performed under this Section.

(1) Staffing: Provide adequate numbers of workmen skilled in the necessary crafts and informed in the methods and materials to be used. In acceptance or rejection of the work, the Architect will make no allowance for inability on the part of the workmen.

4. SUBMITTALS:

A. Shop Drawings: Comply with provisions of Section 01300.

B. Material List: Contractor shall submit complete materials list of all items proposed for the work specified.

C. Manufacturers Data: Submit copies of manufacturers specifications including paint label analysis and application instructions for each material specified. Indicate by transmittal that a copy of each has been distributed directly to the applicator.

D. Samples: Provide two samples of each color and each gloss for each material on which the finish is specified to be applied.

5. PRODUCT HANDLING AND STORAGE:

A. Deliver all materials to job site in original, new and unopened containers bearing manufacturer's name and label showing the following information.

- (1) Manufacturer's stock number and name.
- (2) Material name or title.
- (3) Contents by volume of major constituents.
- (4) Thinning and application instructions.

B. Provide safe and adequate storage to prevent damage to and deterioration of paint materials.

C. Use all means necessary to protect the materials before, during and after application and to protect the work and materials of all other trades.

D. In the event of damage, immediately make all replacements necessary to the approval of the Architect and at no additional cost to the Owner.

6. SURFACE PREPARATION:

A. General: Prepare and clean surfaces as per paint manufacturers recommendations and as approved by the Architect.

(1) Remove all removable items in place and not scheduled to receive paint, or provide surface-applied protection prior to painting. On completion of painting in each space or area, reinstall removed items with workmen skilled in the necessary trades.

(2) Clean each surface to be painted prior to applying paint or surface treatment. Remove oil and grease with clean cloths and cleaning solvents of low toxicity and a flashpoint not in excess of 100 degrees F, prior to mechanical cleaning. Schedule cleaning and painting so dust and other contaminants from cleaning process will not fall onto wet newly painted surfaces.

B. Metal Surfaces: Thoroughly clean all metal surfaces until completely free of dirt, oil and grease. On galvanized surfaces, use solvents for initial cleaning and then treat surface thoroughly with a phosphoric acid etch. Remove all etching solution before proceeding. Allow the surface to dry before painting.

7. PAINT APPLICATION:

A. General: Slightly vary color of succeeding coats. Do not apply additional coats until previous coat has been inspected and approved. Only inspected and approved paint coats will be considered in determining number of coats applied. Sand and remove dust between enamel coats to remove all defects visible to the unaided eye from a distance of 5 feet. Paint back sides of all removable and hinged panels to match exposed sides.

B. Drying: Allow sufficient drying time between coats. Modify the period as recommended by manufacturer to suit adverse weather conditions. Oil-based and oleo-resinous solvent-type paints shall be considered dry for recoating when paint feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another paint coat does not cause lifting or adhesion loss of undercoat.

C. Brush Application: Brush out and work all coats onto surfaces in an even film. Cloudiness, spotting, holidays, laps, brushmarks, runs, sags, ropiness and any other surface imperfections will not be acceptable.

D. Completed Work: Shall match the approved samples for color, texture and coverage. Remove, refinish or repaint all work not in compliance with the specified requirements.

8. EXTRA STOCK:

A. Amount: On completion of the work, deliver to Architect extra stock amounting to 10% of each color, type and gloss of paint used in the work.

B. Packaging: Tightly seal each container and label with contents and location where applied in the work.

9. COMPLETION AND CLEANING:

A. Upon completion of the Work, carefully clean all glass, hardware, unpainted surfaces, etc. and remove all misplaced paint or spills and leave the Work in condition acceptable to the Architect.

10. CLEAN-UP:

A. Upon completion of all painting, all excess paint materials shall be turned over to the Owner and all other materials, tools, rags, containers, etc. shall be removed completely from the job site.

11. PAINTING AND FINISHING SCHEDULE:

A. General: All paint coats scheduled herein are in addition to any prime coat which may already be on the surface. Paint types, thickness and number of coats are listed below.

B. Design: Design is based on the products manufactured by the following suppliers and the materials are named and numbered in the following Paint Schedule. Any equal products of other manufacturers approved in advance by Architect may be used as per the approval by the Architect. Paint based on Sherwin-Williams.

C. Exterior Painted Surfaces:

Ferrous Metal: Gloss Finish/Alkyd Base

1st coat: Kem Kromik Primer, B50N2/B50W1 (8.0 mils wet, 3.0 mils dry).
2nd coat: Industrial Enamel, B54 Series (5.0 mils wet, 2.0 mils dry).
3rd coat: Industrial Enamel, B54 Series (5.0 mils wet, 2.0 mils dry).

Wood: Gloss Finish/Alkyd Base

1st coat: A-100 Alkyd Exterior Wood Primer, Y24W20 (4.0 mils wet, 2.2 mils dry)
2nd coat: SWP Gloss House & Trim, A2 Series (4.0 mils wet, 2.0 mils dry).
3rd coat: SWP Gloss House & Trim, A2 Series (4.0 mils wet, 2.0 mils dry).

D. Interior Painted Surfaces:

Ferrous Metal: Gloss Finish/Latex Base

1st coat: Kem Kromik Metal Primer, B50N2, (8.0 mils wet, 3.0 mils dry).
2nd coat: ProMar 200 Latex Gloss Enamel, B21W201 Series (4.0 mils wet, 2.0 mils dry).
3rd coat: ProMar 200 Latex Gloss Enamel, B21W201 Series (4.0 mils wet, 2.0 mils dry).

Gypsum Wallboard: Semi-Gloss Finish/Latex Base

- 1st coat: ProMar 200 Latex Wall Primer, B28W200 (4.0 mils wet, 1.1 mils dry).
- 2nd coat: ProMar 200 Latex Semi-Gloss Enamel, B31W200 Series (4.0 mils wet, 1.3 mils dry).
- 3rd coat: ProMar 200 Latex Semi-Gloss Enamel, B31W200 Series (4.0 mils wet, 1.3 mils dry).

Plaster: Semi-Gloss Finish/Latex Base

- 1st coat: Wall and Wood Primer, B49W2 (4.0 mils wet, 1.5 mils dry).
- 2nd coat: ProMar 200 Latex Semi-Gloss Enamel, B31W200 Series (4.0 mils wet, 1.3 mils dry).
- 3rd coat: ProMar 200 Latex Semi-Gloss Enamel, B31W200 Series (4.0 mils wet, 1.3 mils dry).

NOTE: On exterior plaster use alkyd system.

Concrete Masonry Units: Semi-Gloss Finish/Latex Base

- 1st coat: ProMar Block Filler, B25W1 (75 sq. ft. per gal) maximum.
- 2nd coat: ProMar 200 Latex Semi-Gloss Enamel, B31W200 Series (4.0 mils wet, 1.3 mils dry).
- 3rd coat: ProMar 200 Latex Semi-Gloss Enamel, B31W200 Series (4.0 mils wet, 1.3 mils dry).

Painted Wood: Eg-Shell Finish/Latex Base

- 1st coat: ProMar 200 Alkyd Enamel Undercoater, B49W200 (4.0 mils wet, 2.0 mils dry).
- 2nd coat: ProMar 200 Latex Eg-Shell, B20W200 Series (4.0 mils wet, 1.5 mils dry).
- 3rd coat: ProMar 200 Latex Eg-Shell, B20W200 Series, 4.0 mils wet, 1.5 mils dry).

Painted Wood: Gloss Finish/Latex Base.

- 1st coat: ProMar 200 Alkyd Enamel Undercoater, B49W200 (4.0 mils wet, 2.0 mils dry).
- 2nd coat: ProMar 200 Latex Gloss, B21W201 Series (4.0 mils wet, 2.0 mils dry).
- 3rd coat: ProMar 200 Latex Gloss, B21W201 Series (4.0 mils wet, 2.0 mils dry).

Stained and Varnished Wood: Clear Finish

- 1st coat: Interior Wood Stain, A48.
- 2nd coat: Sherwood 100 Fast Dri Semi-Paste Filler D70T1.
- 3rd coat: Oil Base Gloss Varnish, A66V91.
- 4th coat: Oil Base Gloss Varnish, A66V91 or Oil Base Satin Varnish, A66F90.

SECTION 10160 - METAL TOILET COMPARTMENTS

1. SCOPE:

A. This Section includes all labor, materials, equipment and tools necessary to complete the installation of the metal toilet compartments and urinal screens, if shown on the drawings, as shown on the drawings and specified herein.

2. QUALITY ASSURANCE:

A. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a successful history of production acceptable to the Architect.

B. Qualifications of Installer: Use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are competely familiar with the specified requirements and methods needed for proper performance of the work.

3. SUBMITTALS:

A. Shop Drawings: Shall comply with provisions of Section 01300.

B. Product Data: Submit complete material list of all items furnished and installed under this Section. Furnish all written literature showing compliance with the specified requirements of this Section.

C. Shop Drawings: Submit complete dimensioned drawings showing all compartment size as well as all door, stall dimensions, pilaster placement and bracing as called for in the specifications. Drawings shall also show all required concealed placement of blocking required for attachment of partitions.

D. Submit manufacturers recommended installation procedures for review.

4. PRODUCT HANDLING:

A. Protection: Use all necessary means to protect materials of this Section before, during and after installation to protect work and materials from damage of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and correct all damage to the approval of the Architect and at no additional cost to the Owner.

5. MATERIALS:

A. Furnish metal toilet compartments and urinal screens as shown on the drawings from one of the following manufacturers or from equal manufacturers.

- (1) Accurate Partitions Corp., Lyons, IL.
- (2) All American Metal Corp., Freeport, NY.
- (3) American Sanitary Partition Corp., Ocoee, FL.
- (4) Ampco Products, Inc., Opa Locka, FL.
- (5) Bobrick Washroom Equip., Los Angeles, CA.
- (6) Capitol Partitions, Inc., Columbia, MD.

- (7) Comtec Industries, Moosic, PA.
- (8) Flush-Metal Partitions, Maspeth, NY.
- (9) General Partitions Mfg. Corp., Erie, PA.
- (10) Global Steel Products, Deer Park, NY.
- (11) Knickerbocker Partition Corp., Freeport, NY.
- (12) Metpar Corp., Westbury, NY.
- (13) Mills Co., Cleveland, OH.
- (14) Sanymetal, Somerset, NY.

B. Design: Academy toilet compartments shall be Acrylic Coated Academy type as manufactured by Sanymetal. Academy urinal screens, where shown on plans, shall be Acrylic Coated Type A, wall hung as manufactured by Sanymetal.

C. Color: Color shall be as selected by the Architect from manufacturers standard color chart.

D. Metal Toilet Compartments:

(1) Doors: Shall be 1" thick with two sheets of #22 galvanized-bonderized steel enclosing sound-deading bridgecore. All formed edges shall be welded every 18" and sealed with a surrounding oval-crown locking strip, mitered and finished at the corners.

(2) Panels: Shall be 1" thick with two sheets of #22 galvanized-bonderized steel enclosing sound-deading bridgecore. All formed edges shall be welded every 18" and sealed with a surrounding oval-crown locking strip, mitered, welded and finished at the corners.

(3) Pilasters: Shall be 1-1/4" thick with two sheets of acrylic coated #20 gauge galvanized-bonderized steel welded and finished as specified for doors. Pilaster bases shall be attached with floor stirrups and leveling bolts to secure for anchorage. Pilaster tops shall be overhead braced with full perimeter of the installation with 1" x 1-1/2" anodized aluminum anti-grip headrail bracing.

(4) Hardware: Furnish #8809 Knob, #8818 Escutcheon, #7810 Coat Hook/Bumper, #8801 Door Keeper, #7780 Top Hinge Bracket, #7961 Bottom Hinge Bracket and #4224 Panel Brackets. All connections shall use #304 stainless steel screws.

(5) Finish: Shall consist of base metal coating and a finish color coat of thermo-setting acrylic enamel applied electrostatically in a pressurized, dust free atmosphere, baked on to produce a uniform, smooth lustrous protective finish.

E. Urinal Screens:

(1) Panels: Shall be 1" thick made of two sheets of #20 gauge galvanized bonderized stretcher leveled steel over sound-deading bridgecore insulation. The two face plates of the panel shall have formed edges sealed with a continuous oval-crown locking strip, metered, welded and finished at corners.

(2) Hardware: Shall have continuous wall strip.

(3) Finish: Per above.

6. PREPARATION FOR INSTALLATION:

- A. Coordination: Properly coordinate with all other trades as required to ensure adequate provisions for anchorage of the work of this section and for proper interface with the work of all other trades.
- B. Inspection: Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the proper and timely completion of the work.

7. INSTALLATION:

- A. Install all metal toilet compartments and urinal screens as per manufacturers instructions and approved shop drawings.
- B. All work shall be plumb, level, true, straight and anchored as per specifications and shop drawings.
- C. Perform all drilling and cutting for installation of anchors only at locations which will be concealed in the finished work.
- D. Provide uniform vertical edge clearance for doors of approximately 3/16", resting open at approximately 30 degrees when the latch is not engaged.

8. CLEAN UP:

- A. Upon completion of the work of this section, remove all unused tools, materials and equipment. Leave the area clean and ready for final cleaning.
- B. Protect all installed work from future damage.

SECTION 10522 - FIRE EXTINGUISHER CABINETS AND ACCESSORIES

1. SCOPE:

A. This Section includes all labor, materials, equipment and tools necessary to complete the installation of the fire extinguishers, cabinets and accessories as shown on the drawings and specified herein.

2. SUBMITTALS:

A. Shop drawings shall comply with provisions of Section 01300.

3. GENERAL REQUIREMENTS:

A. The extent, location and placement of fire extinguisher cabinets and fire extinguishers shall be indicated on the drawings as noted:

- (1) Type 1: FEC
- (2) Type 2: FX

B. Each fire extinguisher cabinet shall be furnished installed and complete with an ABC multi-purpose dry chemical extinguisher.

C. Furnish only UL Approved extinguishers.

D. Furnish cabinets and extinguisher from a single manufacturer.

4. MATERIALS:

A. Furnish fire extinguisher cabinets and fire extinguishers from one of the following manufacturers or equal manufacturers.

- (1) J.L. Industries
- (2) Larson's Manufacturing Co.
- (3) Profile International, Inc.

B. Type 1: FEC Fire Extinguisher Cabinet to be equal to J.L. Industries, Panorama #1037 with 2-1/2" return stainless steel trim, and P40 door. Extinguisher Cosmic 10E, multi-purpose ABC type shall be in each cabinet.

C. Type 2: FX Fire Extinguisher to be equal to J.L. Industries, Cosmic 10E, multi-purpose ABC type with MB 846 hanger.

5. INSTALLTION OF CABINETS:

A. Install cabinets in recesses as called for on the approved shop drawings. Cabinets shall be semi-recessed as specified with 2-1/2" return.

B. If cabinets are in masonry walls, provide wood frames for blockouts. Do not install cabinets as part of the masonry work.

C. Fasten cabinet in opening per manufacturers recommendations and consistent with wall construction.

D. Mounting Height: Mount top of cabinet no higher than 60" AFF.

6. CLEAN UP:

A. Clean all cabinets, polish if soiled or stained, and make final adjustments before substantial completion.

B. Touch up all walls, etc. if scratched or damaged.

C. Remove all tools, and unused materials upon completion of cabinet and extinguisher installation.

SECTION 10810 - TOILET ACCESSORIES

1. SCOPE:

A. This Section includes all labor, material, equipment and tools necessary to complete the installation of the toilet accessories as scheduled on the drawings and specified herein.

2. QUALITY ASSURANCE:

A. Qualifications fo Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacturer of similar items and with a minimum of 5 years of successful production of these products.

3. SUBMITTALS:

A. Shop drawings shall comply with provisions of Section 01300.

B. Manufacturers Data:

- (1) Complete materials list showing all items proposed to be furnished and installed.
- (2) Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.
- (3) Manufacturer's recommended methods of installation.
- (4) Complete descriptive data on fasteners proposed for each type of wall construction, recommended mounting locations, and mounting instructions.

4. MATERIALS:

A. Furnish toilet accessories as indicated on the Toilet Accessories Schedule on the drawings, from one of the following manufacturers or from equal manufacturers.

- (1) ASI
- (2) Bobrick
- (3) Bradley
- (4) McKinney
- (5) General

B. Handicap Compliance: All accessories shall meet the requirements of the 1994 Kentucky Building Code as well as the ANSI A117.1 and the American Disabilities Act (ADA).

C. Anchors and Fasteners: Provide anchors and fasteners capable of developing a retaining force commensurate with the strength of the accessory to be mounted, and suited for use with the supporting construction. Where exposed fasteners are specified, provide oval head type with finish to match the accessory.

D. Finish: Accessories shall be stainless steel with satin finish. Grab bars shall have safety-grip finish.

E. Design and Catalogue Numbers: Toilet Accessory Schedule are based on Bradley products, unless noted otherwise. Equal manufacturers will be accepted.

5. INSTALLATION OF TOILET ACCESSORIES:

- A. Blocking: Install wood blocking, or as appropriate for construction type, in all walls to receive toilet accessories. Follow approved shop drawings for mounting heights.
- B. Install toilet accessories in strict accordance with the manufacturer's recommendations. Install plumb, level, square and firmly into position on walls.
- C. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.

6. CLEAN UP:

- A. Clean and polish all exposed surfaces after removing protective coatings and films.
- B. Upon completion of toilet accessory installation remove all tools, unused materials and leave area clean and neat.
- C. All walls damaged, scarred, etc. from the installation of toilet accessories shall be touched-up, repainted or repaired.

DIVISION 15 - MECHANICAL WORK
Section 15010 - General Provisions

1. GENERAL

1.01 SECTION INCLUDES

A. Base Bid, Mechanical Contractor provide:

Section 15050 - Basic Materials and Methods.

Section 15250 - Insulation.

Section 15400 - Plumbing Systems.

Section 15800 - Air Distribution.

Section 15950 - Piping Systems Testing, Adjusting and Balancing.

Section 15955 - Air Systems Testing, Adjusting and Balancing.

1.02 RELATED WORK

A. Wiring.

1. Electrical Contractor will provide complete power wiring of mechanical equipment, not including temperature control system, but including disconnect switches and final power connections.
2. Items of equipment normally furnished with cords and plugs such as electric water coolers shall be furnished with these items.
3. Items of equipment normally furnished with terminal boxes, such as water heaters, shall be furnished with these items.
4. Items of equipment such as exhaust fans shall be furnished with twist-lock plug or disconnect switch at motor.
5. All HVAC equipment shall be furnished with factory installed starters, internal wiring and controls.
6. If equipment furnished by Mechanical Subcontractor requires larger feeders, disconnect switches, starter, than equipment specified, Contractor shall pay additional cost encountered to wire equipment furnished and shall coordinate all changes with Electrical Subcontractor.

1.03 QUALITY ASSURANCE

A. Qualifications of Welders.

1. At the request of the Architect/Engineer, Contractor employing welding operators shall be prepared to furnish proof of the competency of each operator.

B. Regulatory Requirements.

1. State Plumbing Code.

SECTION 15010-2

2. National Electrical Code (NEC).
3. National Fire Protection Association Codes.
4. State Mechanical Code.
5. State Fire Code.
6. State Building Code.
7. National Fire Protection Association (NFPA).
8. Underwriter's Laboratories, Inc. (UL).
9. American Society of Mechanical Engineers (ASME).
10. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
11. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
12. American Water Work Association (AWWA).

C. Permits and Fees.

1. Each Contractor shall secure and pay for all permits and inspections required by local codes or ordinances.

1.04 SUBMITTALS

- A. Shop drawings: See respective specification sections.
- B. Maintenance data and operating instructions: See respective specification sections.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to fixtures, equipment and materials.
- B. Store materials on the site so as to prevent damage.
- C. Keep fixtures, equipment and materials clean, dry and free from deleterious conditions

2. PRODUCTS

NONE

3. EXECUTION

3.01 INSTALLATION

A. Space Preference.

1. All Contractors shall carefully check and coordinate the location and level of all lines. Each Contractor shall run preliminary levels and check with all other Contractors so that conflicts may be avoided.
2. Where conflicts occur, the following preference schedule shall be followed:
 - a. Low pressure ductwork.
 - b. Plumbing lines.
 - c. Electrical conduit.

SECTION 15010-3

3. No other work shall have preference over wiring and/or conduits above or below electric switchgear and panels.
4. No piping conveying fluids shall be installed directly over electrical equipment.

B. Coordination.

1. Before any work is installed and before any equipment is purchased, this Contractor shall carefully check specifications and drawings for trade and job conditions and any lack of coordination between work, drawings, specifications or job conditions shall be immediately reported in writing to Architect/Engineer. Architect/Engineer will work out conflicts. Changes in equipment shall be incorporated in shop drawings and called to the attention of Architect/Engineer in submittal of same.

C. Cutting and Patching.

1. General Contractor will provide chases, openings, recesses, etc., where so indicated for each Contractor. Each Subcontractor shall furnish information to General Contractor as to size, location, etc..
2. If Contractor fails to give required data to General Contractor in time for openings to be left, each Subcontractor shall be required to do necessary cutting and patching. Openings shall be accurately located, neatly cut and no larger than necessary.
3. Each Contractor shall use skilled craftsmen to do rebuilding, patching, refinishing, and painting required to restore construction to original condition before cutting as approved by Architect/Engineer.

D. Miscellaneous Blocking: Each Contractor shall furnish all miscellaneous blocking and other materials and labor required for the proper installation of their work.

E. Flashing: Each Contractor shall furnish and install flashing on all his work installed through roof.

F. Verification of Existing Underground Utilities and Services.

1. It shall be each Contractor's responsibility to verify location, type and size of existing underground piping of service of his trade in any area where below grade work must be performed. Where necessary, hand tools shall be used to excavate for installation of new work.
2. All work around existing underground services shall be coordinated with and approved by the appropriate utility company and Architect/Engineer.
3. Each Subcontractor shall be responsible for all costs incurred if any existing underground service is disrupted due to damage during installation of new work under the Contract.

G. Visit to Site: Each Contractor must visit site before submitting his bid and thoroughly inspect same to familiarize himself with all conditions which may affect new installation of work under this Contract. Claim for extra compensation due to existing conditions will not be considered.

H. Installation of Equipment.

1. Provide all necessary supports for the equipment and accessories.
2. Provide all shims, edges, etc., to align equipment.

3.02 FIELD QUALITY CONTROL

- A. Plumbing contractor shall test the domestic hot and cold water system and the sanitary waste and vent system.

SECTION 15010-4

All piping and connections installed under this Contract shall be tested prior to installation of non-conducting covering, or concealment within building construction or backfilling. Each test shall be performed as hereinafter specified and shall be continued or repeated until lines under test are proven tight to satisfaction of Architect/Engineer, and in accordance with Section 15950.

After the air distribution systems are operable, perform the following tests and balancing the systems in accordance with Section 15955.

END

15010-4

SECTION 15050
BASIC MATERIALS AND METHODS

PART 1: GENERAL

1.01 SECTION INCLUDES

- A. Base Bid: Mechanical Contractor Provide:
 - 1. Interior waste, vent, soil and water systems.
 - 2. All pipe hangers, sleeves, valves, and piping specifications.
 - 3. Rough-in final connections for residential equipment.
- B. Trenching and backfill required in conjunction with plumbing service is specified in applicable Division - 2 and shall be included as work of this Contract.
- C. Electrical Contractor: Equipment wiring.

1.02 RELATED SECTIONS

- A. Section 15010 - General Provisions.
- B. Section 15250 - Insulation.
- C. Section 15400 - Plumbing Systems

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
 - 1. State Plumbing Code.
 - 2. State Mechanical Code.
 - 3. Underwriter's Laboratories, Inc. (UL).
 - 4. American National Standards Institute (ANSI).
 - 5. American Society of Mechanical Engineers (ASME).

1.04 SUBMITTALS

- A. Provide product Data on valves and cocks under provisions of Section 01340.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Pipe and pipe fittings.
 - 1. Underground or underfloor sewers of all types: drains, branches, soil, waste and drain and vent stacks, unless otherwise called for, shall be Schedule 40 PVC-DWV or ABS-DWV plastic pipe and solvent welded drainage fittings.
 - 2. Above ground or above floor soil, drain and waste stacks: Schedule 40 PVC-DWV or ABS-DWV plastic pipe and solvent welded drainage fittings.
 - 3. Domestic hot and cold water piping within building and above the concrete floor shall be Revere, Chase or Anaconda, Type L hard drawn copper with wrought type sweat fittings. Pipe under floor slabs shall be Type L soft copper.

SECTION 15050-2

4. Domestic cold water piping to the building shall be Type K soft copper with wrought type sweat fittings.
5. Refrigeration condensate drain lines shall be Schedule 40 PVC-DWV or ABS-DWV plastic pipe and solvent welded drainage fittings.
6. Reduce fittings.
 - a. Reduce fittings shall be provided at reductions in sizes of supply and return lines. No bushings will be permitted.
 - b. Reducing fittings shall be "Eccentric" type turned so that the flow line of the two (2) different size pipes will be level.
 - c. Reducing fittings in lines 1-1/2" in size and smaller shall be screwed type. All reducing fittings shall be suitable for working pressure in conformity with the specification requirements for "Screwed fittings".
 - d. The Contractor shall place a union near each screwed type valve on each pipe connecting to apparatus or equipment such as tanks, traps, pumps, etc., excepting where the connection to such apparatus is flanged.
7. Unions: All unions in copper pipe lines shall be dielectric type as manufactured by Epco, Capital or approved equal.

B. Supports, Anchors and Seals.

Item	Fee & Mason	Grinnell	Elcen
Clevis hanger (copper pipe)	364	CT-65	312
U-clamps (copper pipe)	180	262	43

C. Valves and Cocks (manual).

Item	Jenkins	Nibco	Stockham
Gate valves (sweat ends)	1240	S-113	B112
Globe valves (sweat ends)	1200	S-211-Y	B-14-T
Check valves (sweat ends)	92A	T-413-B	B-319

- D. Wall and Floor Plates: Wall and floor plates shall be Crane, Frost Beaton & Corbin or Valley Steel, nickel plated cast iron, split plates with set screws.
- E. Substitutions shall be in accordance with Section 01640.

PART 3: EXECUTION

3.01 INSTALLATION

- A. All pipe delivered to the job site shall be placed on skids or otherwise fully protected from contact with the ground. Piping systems shall be laid out in a direct manner so as to obtain an installation in conformity with intent and purpose of drawings and specifications.

SECTION 15050-3

- B. Each section of pipe, special fittings, trap, valve, etc., shall be carefully inspected and thoroughly cleaned inside before installing. Pipe shall be in accordance with sizes shown on drawings and shall proceed up grade.
- C. All special lengths of pipe shall be cut accurately to measurements established at site and shall be worked into place without springing or forcing. Cut sections of pipe shall be reamed to remove all burrs. Allowance shall be made to cover contingencies as to lengths or runs as may occur.
- D. All piping shall be concealed unless otherwise shown.
- E. Exposed pipe, where shown, shall be run parallel to or at right angles with lines of building, or with other exposed pipes, care being taken to avoid all windows, doors or other outlets; and not to weaken any structural portions of building. Maximum headroom under exposed piping shall be maintained.
- F. Where exposed groups of pipe runs are shown, various runs shall be spaced approximately 6" on center and run at same general level and pitch wherever possible.
- G. Each length of pipe and fitting furnished under this Contract shall bear manufacturer's characteristic identifying mark or marks.
- H. All changes in direction shall be made with fittings.
- I. Unions shall be installed on discharge side of each valve and for all final connections to fixtures or equipment, the trimmings of which do not permit their convenient removal.
- J. The location of all unions, cleanouts and valves, etc., shall be conveniently accessible with reference to finished building. During entire time of building construction, each open end of pipe, fittings, trap, valves, etc., shall be protected with a water tight plug or cap.
- K. Waste and Vent Piping.
 - 1. Each soil, waste and drain stack shall have an accessible cleanout at its base.
 - 2. The top of each vent stack shall be vented through the roof by means of an increaser with outlet diameter at least 1" larger than diameter of vent stack. Vents 4" and larger will not be required to have an increaser.
 - 3. Where possible, interior sewers and branches shall pitch down 1/2" per foot, but not less than 1/8" per foot.
 - 4. Underground or underfloor piping shall be on compacted bank of sand. All backfilling for 6" on side and to underside of floor slab shall be compacted, bank of sand conforming to Division 2.
 - 5. Connections to soil, waste and drain stacks be at 45 degrees; those to vent stacks may be at 45 degrees or 90 degrees.
 - 6. All plumbing fixtures shall be vented to prevent siphoning of traps. Venting down on drawing is minimum required.
- L. Water Piping (hot and cold):
 - 1. A complete system of water piping shall be furnished and installed to all appurtenances requiring water.
 - 2. Nipples and couplings used with pipe shall be of same type materials as pipe. Nipples used for final connections to fixtures shall be chrome-plated brass when in exposed locations.

SECTION 15050-4

3. Copper fittings shall be wrought type with 95/5 solder joints.
 4. Bushings will not be permitted in fittings in any part of water supply piping.
 5. Provide approved dielectric unions at all locations where pipe materials change from ferrous to non-ferrous.
 6. The arrangement of pipes installed above the concrete floor, shall be as shown on drawings and so installed that entire system may be drained dry. Provide manual air vents as required for filling or draining system.
 7. Each supply branch to group of fixtures shall be provided with valves as shown on drawings.
 8. Each cold water and hot water supply riser and fixture supply shall have a separate air chamber not less than 15" long and the same size as supply to fixtures, but shall not be less than 1/2".
- M. Wall and Floor Plates: Furnish and install ceiling, floor and wall plates for all exposed pipes passing through walls and ceilings.
- N. Hangers, Supports, Inserts, Anchors and Seals.
1. Installing Contractor shall be responsible for providing all necessary hangers, bracing, supports, inserts, beams, anchors, guides, sleeves and/or miscellaneous steel, etc., for proper support, alignment, expansion and contraction of piping, ductwork, equipment, etc.
 2. Piping and equipment shall be adequately supported, either by suspension from the construction above or by means of struts or brackets to the construction below or to the side.
 3. Where possible, hangers, piping guides, anchors and other pipe supporting devices shall be of same manufacturer.
 4. Provide all supplemental angles, channels, plates and other items of adequate sizes and design where bracing and supports are required for piping and ductwork between building structural members. Sizing shall provide for weight of duct or pipe, pipe contents, fittings and other items plus a 200 pound load. Attachment to structural members in a manner to weaken the member shall not be allowed. Drilling or welding will not be permitted without Architect/Engineer's approval.
 5. Attachment shall be by clamping, expansion shield anchors, concrete inserts and other items. The forged steel clamps shall include retaining strap for a permanent installation. Where construction permits, power driven fasteners shall be limited to a single pipe less than 2-1/2" in size. Attachment standards set forth in UL 203 will be acceptable where compatible to the above specifications. No lead shield anchors shall be permitted.
 6. Provide hangers, threaded rods, turnbuckles, deflection guides, deflection provisions, anchors, guides and all specialties for the attachment of hangers and supports to the structure and for the maintaining of required elevations.
 7. Pipes shall be supported in a manner to minimize undesirable stress on bodies of valves and other fittings.
 8. All horizontal piping 2-1/2" and larger shall be supported every ten (10) feet and pipes 2" or smaller every eight (8) feet. All pipes shall be supported at each change in direction unless otherwise specified. All hangers (except soil pipe) shall be Fee and Mason, Grinnell or Elcen, clevis type with rods and lockouts, attached to beam clamps where run through joists. Hangers on copper pipe must be copper or copper plated steel.

SECTION 15050-5

9. Horizontal runs of above floor plastic DWV pipe shall be supported at least every five (5) feet and at each change in direction.
10. Provide suitable supports between joists for fastening hangers when piping runs parallel to joists. Supports shall be bolted to joists.
11. Perforated bar and strap hangers will not be allowed.
12. Hanger rods shall be sized as follows.

Size of Pipe

Rod Sizes

3/4" to 2" inclusive
2-1/2" to 3" inclusive
4" and larger

3/8"
1/2"
5/8"

3.02 TEST AND CLEANING

- A. Make in accordance with Section 15010.

END OF SECTION 15050

DIVISION 15 - MECHANICAL WORK
Section 15250 - Insulation

1. GENERAL

1.01 SECTION INCLUDES

A. Base Bid, Mechanical Contractor provide:

1. Insulating plastic pipe in plenums.
2. Insulate water lines.
3. Insulate water and waste below accessible lavatories.
4. All above ground water and city water exterior, exposed piping shall be electric heat traced and insulated.
5. Insulate ductwork.
6. All water piping.
7. Insulating plastic pipe in plenums.
8. condensation drain lines.

1.02 RELATED SECTIONS

- A. Section 15010 - General Provisions.
- B. Section 15050 - Basic Materials and Methods.
- C. Section 15312 - Sprinkler Piping and Accessories.
- D. Section 15400 - Plumbing Systems.
- E. Section 15800 - Air Distribution.

1.03 SYSTEM DESCRIPTION

- A. Piping: Includes mains, risers, branches, runouts, final connections, valves, fittings, unions and specialties.
- B. Concealed: Refers only to furred spaces, pipe shafts and duct shafts. All other spaces are to be considered "exposed" areas.

1.04 QUALITY ASSURANCE

A. Qualifications.

1. Contractor shall employ only skilled pipe covering mechanics regularly engaged and employed in the application of insulation.

B. Regulatory Requirements.

1. NFPA 90A.
2. NFPA 255.
3. American Society for Testing and Materials (ASTM).
4. National Fire Protection Association (NFPA).

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1.05 REFERENCES

- A. Standards: Commercial and Industrial Standards, Midwest Insulation Contractor's Associations.

1.06 SUBMITTALS

- A. Provide manufacturer's brochures and performance data for pipe and ductwork insulation under provisions of Section 01340.

2. PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manville.
- B. Certain Teed.
- C. Armstrong.
- D. Substitutions shall be in accordance with Section 01640.

2.02 MATERIALS

- A. Ductwork: Apply one (1) inch thick flexible fiberglass duct insulation with reinforced foil kraft vapor barrier on all supply air, return air, fresh air and exhaust air ductwork.

<u>Line</u>	<u>Thickness and Type</u>	<u>Finish of Covering</u>
All domestic hot and cold water lines and condensate drain lines	Fiberglass - 1"	All-service jacket
All heating hot and Chilled water lines	Fiberglass - 1"	All-service jacket

3. EXECUTION

3.01 PERFORMANCE

- A. Tolerances: The insulation of the piping systems shall be installed in accordance with the Commercial and Industrial Insulation Standards, published by the Midwest Insulation Contractor's Association, First Edition.

3.02 INSPECTION

- A. No insulation shall be installed until piping systems have been tested and any leaks repaired.

3.03 INSTALLATION

- A. Anti-sweat insulation shall pass unbroken through wall and floor sleeves.
- B. Valves and unions shall not be covered and insulation shall be tapered back, neatly cemented and covered with fittings to permit access to joint or valve without disturbing covering. Cement, bands, wires, etc., shall be supplied by manufacturer furnishing insulation.

3.04 ADJUST AND CLEAN

- A. Clean premises of all unused insulation materials and debris after completing work.

END

15250-2

DIVISION 15 - MECHANICAL WORK
Section 15350 - Natural Gas Piping Systems

1. GENERAL

1.01 SECTION INCLUDES

- A. Contractor provide:
1. Complete gas service.
 2. Complete interior gas piping system.
 3. Valves, cocks, pipe hangers, tees, unions, etc.
 4. Connection of system to equipment.
 5. System testing and Owner instruction.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 2 - Specifications Section - apply to this Section.

1.03 DESCRIPTION OF WORK

- A. Extent of natural gas piping system work is indicated on drawings and schedules, and by requirements of this Section.
- B. Trenching and backfill required in conjunction with gas service piping is specified in applicable Division - 2 and 15 Sections - and is included as work of this Section.

1.04 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacturer of natural gas piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installer: A firm with at least three (3) years of successful installation experience on projects with natural gas piping system work similar to that required for project.
- C. ANSI Code Compliance: Comply with applicable provisions of ANSI B31.2 "Fuel Gas Piping".
- D. National Fuel Gas Code Compliance: Comply with applicable provisions of NFPA 54 (ANSI 2223.1) "National Fuel Gas Code", and ANSI 2223.1a "Supplement to National Fuel Gas Code".
- E. Local Utility Compliance: Comply with requirements of local gas utility company.

1.05 SUBMITTALS

- A. Provide manufacturer's data for fuel gas piping systems materials and products under provisions of Section 01340.

2. PRODUCTS

2.01 GENERAL

SECTION 15350-2

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by installer to comply with installation requirements. Provide materials and products complying with ANSI B31.2 where applicable, base pressure rating on natural gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in natural gas piping systems. Where more than one (1) type of material or product is indicated, selection is installer's option.

2.02 BASIC IDENTIFICATION

- A. Provide identification complying with Division 15 - Basic Materials and Methods Section - "Mechanical Identification", in accordance with the following listing.
 - 1. Building distribution piping: Plastic pipe markers.
 - 2. Gas service: Underground-type plastic line markers.
 - 3. Gas valves: Plastic valve tags.
- B. Basic pipe, tube and fittings: Provide pipe, tube and fittings complying with Division 15 - Basic Materials and Methods Section - "Pipe, Tube, and Fittings", in accordance with the following listing.
 - 1. Gas service piping: all pipe sizes are black steel pipe.
 - a. Pipe weight: Schedule 40.
 - b. Fittings: Wrought-steel butt welding.
 - c. Wrapping: Machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Hand wrap fittings using 100% overlap wrap extending six (6) inches beyond fitting onto wrapped pipe. Comply with tape manufacturer's installation instructions.
 - 2. Building distribution piping: pipe size 2" and smaller are black steel pipe.
 - a. Pipe weight: Schedule 40.
 - b. Fittings: Malleable iron threaded.
 - 3. Building distribution piping: pipe size 2-1/2" and larger are black steel pipe.
 - a. Pipe weight: Schedule 40.
 - b. Fittings: Wrought-steel butt welding.
- C. Basic piping specialties: Provide piping specialties complying with Division 15 - Basic Materials and Methods Section - "Piping Specialties", in accordance with the following listing.
 - 1. Pipe escutcheons.
 - 2. Pipe sleeves.
 - 3. Sleeve seals.
- D. Basic supports, anchors and seals.
 - 1. Provide supports, anchors and seals complying with Division 15 - Basic Materials and Methods Section - "Supports, Anchors and Seals" in accordance with the following listing.
 - a. Adjustable swivel pipe rings for horizontal piping hangers and supports.
- E. Special valves required for natural gas piping systems include the following types.
 - 1. Gas cocks 2" and smaller: 150 psi, non-shock WOG, bronze straightway cock, flat or square head, threaded ends.

SECTION 15350-3

2. Gas cocks 2-1/2" and larger: 125 psi non-shock WOG, iron body bronze mounted, straightway cock, square head, flanged ends.
3. Available manufacturers: Subject to compliance with requirements, manufacturers offering gas cocks which may be incorporated in the work include, but are not limited to, the following.
 - a. Jenkins Brothers.
 - b. Lunkenheimer Co., Division of Conval Corp.
 - c. NIBCO, Inc.
 - d. Rockwell Manufacturing Co.
 - e. Substitutions in accordance with Section 01640.

3. EXECUTION

3.01 GENERAL INSTALLATION

- A. Install mechanical identification in accordance with Division 15 - Basic Materials and Methods Section - "Mechanical Identification".

3.02 INSTALLATION OF NATURAL GAS PIPING

- A. Install natural gas distribution piping in accordance with Division 15 - Basic Materials and Methods Section - "Pipe, Tube and Fittings", and in accordance with applicable codes and local utility company requirements.
- B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.
- C. Remove cutting and threading burrs before assembling piping.
- D. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.
- E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.
- F. Ground gas piping electrically and continuously within project and bond tightly to grounding connection.
- G. Install drip-legs in gas piping where indicated and where required by code or regulations.
- H. Install "tee" fitting with bottom outlet plugged or capped at bottom of pipe riser.
- I. Use dielectric unions where dissimilar metals are joined together.
- J. Install piping with one (1) inch drop in sixty (60) foot pipe run (0.14%) in direction of flow.
- K. Install piping parallel to other piping, but maintain minimum of twelve (12) inch clearance between gas piping and steam or hot water piping above 200 degrees F. (93 degree C.).
- L. Insulate gas piping exposed to freezing temperatures.
- M. For piping buried in building substrate or below floor slabs, install in welded conduit, ventilated to outdoors on both ends and tested to same requirements as gas piping.
- N. Arrange with utility company to provide gas service to indicated location with shutoff as terminus. Consult with utility as to extent of its work, costs, fees, and permits involved. Pay such costs and fees and obtain permits.
- O. Extend service pipe from utility's terminus to inside building wall, under utility's directions.

SECTION 15350-4

- P. Install piping specialties in accordance with Division 15 - Basic Materials and Methods Section - "Piping Specialties".
- Q. Install supports, anchors and seals in accordance with Division 15 - Basic Materials and Methods Section - "Supports, Anchors and Seals".
- R. Provide gas cocks at connection to gas train for each gas-fired equipment item and on risers and branches where indicated.
- S. Locate gas cocks where easily accessible and where they will be protected from possible injury.
- T. Install control valves as indicated. Refer to Division 16 for wiring (not work of this Section).
- U. Install pressure regulating valves as indicated; comply with utility requirements. Pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoff valve upstream of each pressure regulating valve.
- V. Connect gas piping to each gas-fired equipment item with drip-leg and shutoff gas cock. Comply with equipment manufacturer's directions.
- W. Test natural gas piping in accordance with ANSI B31.2 and local utility requirements.

END

15350-4

DIVISION 15 - MECHANICAL WORK
Section 15400 - Plumbing Systems

1. GENERAL

1.01 SECTION INCLUDES

- A. Mechanical Contractor provide:
 - 1. Interior soil, waste and vent piping.
 - 2. Hot and cold water piping.
 - 3. New plumbing fixtures and trim.
 - 4. Pipe insulation.
 - 5. Testing and cleaning.
 - 6. Instructions to User's personnel.

1.02 RELATED SECTIONS

- A. Section 15010 - General Provisions.
- B. Section 15050 - Basic Materials and Methods.
- C. Section 15250 - Insulation.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
 - 1. State Plumbing Code.
 - 2. National Electrical Code (NEC).
 - 3. Underwriter's Laboratories, Inc. (UL).
 - 4. National Fire Prevention Association (NFPA).

1.04 REFERENCES

- A. Plumbing Code.
- B. American National Standards Institute, Inc., A117.1.

1.05 SUBMITTALS

- A. Provide manufacturer's data for plumbing fixture products under provisions of Section 01340.

2. PRODUCTS

2.01 MATERIALS

- A. Refer to Plans for Plumbing Fixture Schedule.

3. EXECUTION

3.01 INSTALLATION

SECTION 15400-2

- A. This Contractor shall provide fixtures, complete with supplies, stops, p-traps and trim conforming to those listed in schedule. All vitreous china fixtures shall be white acid-resisting. All piping, fittings, supplies, stops and trim shall be brass with all exposed portions chrome-plated.
- B. Water services shall be as shown on the drawings.

3.02 CLEAN AND ADJUST

- A. After completion of installation, Contractor shall remove all paint, grease, oil, dirt, labels and stickers from all fixtures and equipment, including the exterior of piping.
- B. All pipe space must be cleaned out at completion of project.

3.03 TESTS

- A. Make in accordance with Section 15010.

END

15400-2

DIVISION 15 - MECHANICAL
Section 15800 - Air Distribution

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Mechanical Contractor provide:
 - 1. Registers, grilles and diffusers.
 - 2. Automatic Temperature Controls.
 - 3. Duct work system.
 - 4. Testing and balancing of air distribution system.
 - 5. Instructions to Owner.

1.02 RELATED SECTIONS

- A. Section 15010 - General Provisions.
- B. Section 15050 - Basic Materials and Methods.
- C. Section 15250 - Insulation.

1.03 RELATED WORK

- A. Electrical Contractor: Power wiring to equipment.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements.
 - 1. NFPA No. 90A.
 - 2. NFPA No. 90B.
 - 3. NFPA No. 255.
 - 4. NFPA No. 211.
 - 5. Underwriter's Laboratories, Inc. (UL).

1.05 REFERENCES

- A. Duct Construction Standards (SMACNA).

1.06 SUBMITTALS

- A. Provide product data on HVAC equipment, registers, grilles and diffusers under provisions of Section 01340.
- B. Test Reports: Testing and balancing air distribution systems.

2. PRODUCTS

SECTION 15800-2

2.01 MATERIALS

A. Air Handling Units, Condensing Units, Accessories.

1. Refer to drawing schedules and notes.

B. Registers, Grilles, Ceiling Diffusers.

1. Each air opening shall be equipped with a register, grille or ceiling diffuser as called for on the Drawings. First dimension is horizontal. Dimensions are inside of frames.
2. Anemostat, Barber-Coleman, Carnes, Titus or Tuttle & Bailey are acceptable manufacturers. Substitutions shall be in accordance with Section 01640.
3. Each register, grille and ceiling diffuser shall have:
 - a. All aluminum construction.
 - b. Aluminum margin overlapping frame.
 - c. Air tight gasket to prevent streaking.
 - d. Frame to serve as screen or ground.
 - e. Machine bolts.
 - f. Finish to match surrounding finishes.
4. Registers and grilles must have horizontal front bars and be sight tight from 5'-0" above floor.
5. Dampers on registers and ceiling diffusers must be of opposed blade, key-operated type.
6. See drawings for size required.

C. Sheet Metal Ductwork.

1. Furnish and install all ductwork in accordance with arrangement and size indicated on Drawings in connection with supply and exhaust systems, consisting of all horizontal and vertical ducts, which shall have all necessary elbows, easy turns and to be erected in a thorough and substantial manner, all to be true to size and section, perfectly smooth, straight, tight and properly supported to satisfaction of Architect/Engineer.
2. All sheet metal ductwork shall be fabricated as called for in the latest edition of the Low Velocity Duct Manual for Ventilating and Air Conditioning Systems prepared by SMACNA.
3. The following gauges of iron shall be used for ducts unless otherwise specified:

Rectangular Ducts

- 4" to 12" wide - No. 26.
- 13" to 30" wide - No. 24.
- 31" to 40" wide - No. 22.

4. Duct work Material Schedule:

- | | |
|-------------------|-------------------------|
| a. Supply Air | Galvanized sheet steel. |
| b. Return Air | Galvanized sheet steel. |
| c. Toilet Exhaust | Aluminum sheet. |
| d. Fresh Air | Galvanized sheet steel. |

D. Flexible Ductwork.

1. This Contractor shall furnish and install flexible duct for round ductwork in accordance with arrangement and sizes indicated on drawings for final connections or supply air systems to ceiling diffusers. Ductwork shall be manufactured by Johns-Manville, Owens-Corning or Gustin Bacon.

SECTION 15800-3

2. Flexible ductwork shall be constructed on an inner liner of continuous galvanized spring steel vinyl coated fiberglass mesh, wrapped with fiberglass insulation and an outer casing of reinforced, laminated neoprene. Flexible duct shall be installed per manufacturer's recommendations and according to procedures to meet the requirements of UL 181 for Class 1 air duct.
3. Flexible ductwork shall be used for run-out ductwork from branch work to diffuser and grille connections, four (4) feet maximum.

E. Duct Hanger Supports.

1. Horizontal ducts shall be supported independently of all connections and sleeves by hangers and supports as follows:

<u>Vertical Duct Dimension</u>	<u>Distance from Sleeve in Wall, End Offset of Corner to Hanger (max.)</u>	<u>Width of Steel Hanger Spacing (max.)</u>	<u>Collar at Hanger (min.)</u>
0" to 12"	2'-0"	8'-0"	6"
12-1/2" to 24"	2'-0"	10'-0"	8"
over 24"	4'-0"	12'-0"	10"

2. Hangers and supports shall be arranged to permit free, unrestrained and noiseless expansion and contraction of ducts. Vapor barrier of duct lining shall not be broken by sheet metal screws for hangers. Unless otherwise noted, hangers, supports, associated equipment, etc., shall be of all steel construction. (See SMACNA, "Low Pressure Duct construction Standards", Section V.).

3. EXECUTION

3.01 INSTALLATION

- A. Where ducts pass through finished walls, neat galvanized angle frames shall be provided by this Contractor.
- B. All seams in ductwork shall be locked and hammered flat and absolutely tight against air leakage. Joints shall be lapped with inside lap in direction of air travel.
- C. Sufficient slip joints shall be installed in ducts to take care of expansion and contraction. Ducts shall be constructed with easy turns and in no circumstances shall a curve be made having a radius less than twice the width of pipe for duct up to 12" wide and less than width of duct for larger ducts.
- D. Wherever it is necessary to change shape of duct, it shall be done gradually and full area retained.
- E. This Contractor shall carefully check arrangements of ducts and dimensions of all working spaces at building so that there will be no interference with the running of ducts. This Contractor shall carefully lay out all openings in ceilings, floors and walls.
- F. Paint inside of duct, if visible behind grilles or registers, with one (1) coat of dull black paint.

END

15800-3

DIVISION 15 - MECHANICAL WORK
Section 15950 - Piping Systems Testing, Adjusting & Balancing

1. GENERAL

1.01 SECTION INCLUDES:

- A. Base Bid, Mechanical Contractor provide:
 - 1. Testing of waste and vent system.
 - 2. Testing of domestic hot and cold water systems.

1.02 RELATED SECTIONS

- A. Section 15050 - Basic Materials and Methods.
- B. Section 15250 - Insulation.
- C. Section 15400 - Plumbing Systems.

1.03 JOB CONDITIONS

- A. Heating, ventilating, and air conditioning equipment shall be completely installed and in continuous operation as required to accomplish the testing, adjusting and balancing work specified.
- B. Perform testing, adjusting and balancing when outside conditions approximate design conditions for heating functions or when the system is operating at design capacity.
- C. The Architect/Engineer will be present during testing and balancing to verify that specified procedures were followed.

1.04 QUALITY ASSURANCE

- A. Only qualified personnel shall perform testing and balancing work.
- B. Submit evidence that the personnel who will perform the testing and balancing of the project systems are qualified personnel for review and approval by the Architect/Engineer prior to performing the work.
- C. Submit a list of completed projects successfully tested and balanced by the submitted qualified personnel for review and approval, by the Architect/Engineer, prior to performing the work.
- D. When the Contractor does not have qualified personnel on staff, he shall employ them from other firms or subcontract the work to a test and balance firm.
- E. Perform all corrective measures caused by faulty installation. Retest, readjust and rebalance system(s) until satisfactory results are achieved.

1.05 DEFINITIONS

- A. Qualified personnel are:
 - 1. Personnel who have been certified by one of the following test and balance organizations.
 - a. AABC - Associated Air Balance Council.

1.06 SUBMITTALS

- A. Submit data sheets on each item of testing equipment required, for Architect/Engineer approval. Include name of device, manufacturer's name, model number, latest date of calibration, and correction factors.

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- B. Submit a report containing all test data and other related information recorded during testing and balancing, placed on appropriate forms for Architect/Engineer review and approval. Reports shall certify that the methods used and results achieved are as specified.

2. PRODUCTS

2.01 SYSTEM PERFORMANCE MEASURING INSTRUMENTS

- A. Insertion thermometers, with graduations at 0.1 degree F and/or contact pyrometer.
- B. Sting psychrometer.
- C. Tachometer, centrifugal type.
- D. Revolution counter.
- E. Clamp-on volt ammeter.
- F. Recorders, portable type for temperature and humidity.
- G. Portable orsat flue-gas analyzer for measuring CO₂.

3. EXECUTION

3.01 BLOWING OUT AND CLEANING PIPE SYSTEMS

- A. All domestic water piping shall be filled with water and chlorine solution and flushed until chlorine residue is removed.

3.02 SUBMISSION OF REPORTS

- A. Fill in test results on approved forms.
- B. Submit three certified copies of required test reports to the Architect/Engineer for approval.
- C. Include in report a list of instruments used and last date of calibration.

END

15950-2

DIVISION 15 - MECHANICAL WORK
Section 15955 - Air Systems Testing, Adjusting & Balancing

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Mechanical Contractor provide:
 - 1. Testing, adjusting and balancing of air systems.

1.02 RELATED SECTIONS

- A. Section 15050 - Basic Materials and Methods.
- B. Section 15800 - Air Distribution.

1.03 JOB CONDITIONS

- A. Heating, ventilating, and air conditioning equipment shall be completely installed and in continuous operation to accomplish the testing, adjusting and balancing work specified. Complete air balancing prior to piping system balancing.
- B. Perform testing, adjusting and balancing when outside conditions approximate design conditions for heating and cooling functions or when the system is operating at design capacity.
- C. The Architect/Engineer will be present during testing and balancing to verify that specified procedures were followed.

1.04 QUALITY ASSURANCE

- A. Only qualified personnel shall perform testing and balancing work.
- B. Submit evidence that the personnel who will perform the testing and balancing of the project systems are qualified personnel for review and approval by the Architect/Engineer prior to performing the work.
- C. Submit a list of completed projects successfully tested and balanced by the submitted qualified personnel for review and approval, by the Architect/Engineer, prior to performing the work.
- D. When the Contractor does not have qualified personnel on staff, he shall employ them from other firms or subcontract the work to a test and balance firm.
- E. Perform all corrective measures caused by faulty installation. Retest, readjust and rebalance system(s) until satisfactory results are achieved.

1.05 DEFINITIONS

- A. Qualified personnel are:
 - 1. Personnel who have been certified by one of the following organizations:
 - a. AABC - Associated Air Balance Council.
 - b. Certified TBAB - Certified Testing, Balancing and Adjustment Bureau.
 - 2. TABIC - Test and Balancing Institute for Certification.

1.06 SUBMITTALS

SECTION 15955-2

- A. Submit data sheet on each item of testing equipment required, for Architect/Engineer approval. Include name of device, manufacturer's name, model number, latest date of calibration, and correction factors.
- B. Submit a report containing all test data and other related information recorded during testing and balancing, placed on appropriate forms for Architect/Engineer review and approval. Reports shall certify that the methods used and results achieved are as specified.

1.07 REVERIFICATION

- A. During substantial completion inspection, a percentage (not more than 5%), of the recorded data will be subject to reverification by the Architect/Engineer. Take instrument readings as directed. Test Points will be in normally accessible locations and randomly selected by the Architect/Engineer.

2. PRODUCTS

2.01 AIR BALANCE INSTRUMENTS

Ranges shown are guides, actual ranges used are subject to Architect/Engineer approval.

- A. Velometer with probes and Pitot tube.
- B. Rotating vane anemometer.
- C. ASHRAE standard Pitot tubes, stainless steel 5/16 outside diameter, lengths 18" and 36".
- D. Maghnehelic differential air pressure gages, 0 to 0.5", 0 to 1.0" water pressure ranges, each arranged as a portable unit for use with a standard Pitot tube.
- E. Combination inclined-vertical portable manometer, range 0 to 5.0" water.
- F. Portable type hook gage, range 0 to 12" water.
- G. Portable flexible U-tube manometer, magnetic mounting clips, range 0 to 18" water.
- H. Static pressure probe for induction unit.
- I. Conical or pyramidal shaped hood.

2.02 SYSTEM PERFORMANCE MEASURING INSTRUMENTS

- A. Insertion thermometers, with graduation at 0.5F.
- B. Sling psychrometer.
- C. Tachometer, centrifugal type.
- D. Revolution counter.
- E. Clamp-on volt ammeter.
- F. Recorders, portable type for temperature and humidity.

3. EXECUTION

3.01 AIR SYSTEMS

Test, adjust and balance systems in accord with the following:

- A. Preliminary:
 - 1. Identify and list size, type and manufacturer of all equipment to be tested, including air terminals. Inspect all system components for proper installation and operation.

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2. Use manufacturer's ratings for all equipment to make calculations except where field test shows ratings to be impractical.
3. Verify that all instruments are accurately calibrated and maintained.
4. Install clean filters.

B. Central systems:

1. Test, adjust and record supply fan RPM to design requirements within the limits of mechanical equipment provided.
2. Test and record motor voltage and running amperes, including motor nameplate data and starter heater ratings.
3. Make Pitot tube traverse on main supply, exhaust and return duct and record CFM at fans and adjust fans to design CFM.
4. Test and record system static pressure, suction and discharge.
5. Test and adjust system for design outside air, CFM.
6. Test and adjust system of design recirculated air, CFM/
7. Test and record heating apparatus entering air temperatures, dry bulb.
8. Test and record cooling apparatus entering air temperatures, dry and wet bulb.
9. Test and record heating apparatus leaving air temperatures, dry bulb.
10. Test and record cooling apparatus leaving air temperatures, dry and wet bulb.

C. Verification:

1. Prepare summation of readings of observed CFM for each system, compare with specified CFM and verify that duct losses are within specified allowable range.
2. Verify design CFM at fans as described in 3.01.B.3 above.

3.02 AUTOMATIC CONTROL SYSTEM

- A. Have the temperature control manufacturer's representative set and adjust automatically operated devices to achieve specified sequence of operation.
- B. Have testing organizations verify all controls for proper calibration and list those controls requiring adjustment by temperature control system.

3.03 SYSTEM PERFORMANCE REPORTS

- A. After the conclusion of balancing operations, make temporary installation of portable recorders and simultaneously record temperatures and humidity during summer and winter conditions at representative locations in each system outside of building.
- B. Architect/Engineer will direct test locations.
- C. Make recordings during summer and winter for a seven-day period, continuous over a weekend and including at least one period of operation at outside conditions with 5 F wet bulb temperature of maximum summer design conditions and within 10 F dry bulb temperature of minimum winter design condition.
- D. Report of test results shall include original recording and two reproductions.

SECTION 15955-3

2. Use manufacturer's ratings for all equipment to make calculations except where field test shows ratings to be impractical.
 3. Verify that all instruments are accurately calibrated and maintained.
 4. Install clean filters.
- B. Central systems:
1. Test, adjust and record supply fan RPM to design requirements within the limits of mechanical equipment provided.
 2. Test and record motor voltage and running amperes, including motor nameplate data and starter heater ratings.
 3. Make Pitot tube traverse on main supply, exhaust and return duct and record CFM at fans and adjust fans to design CFM.
 4. Test and record system static pressure, suction and discharge.
 5. Test and adjust system for design outside air, CFM.
 6. Test and adjust system of design recirculated air, CFM/
 7. Test and record heating apparatus entering air temperatures, dry bulb.
 8. Test and record cooling apparatus entering air temperatures, dry and wet bulb.
 9. Test and record heating apparatus leaving air temperatures, dry bulb.
 10. Test and record cooling apparatus leaving air temperatures, dry and wet bulb.
- C. Verification:
1. Prepare summation of readings of observed CFM for each system, compare with specified CFM and verify that duct losses are within specified allowable range.
 2. Verify design CFM at fans as described in 3.01.B.3 above.
- 3.02 AUTOMATIC CONTROL SYSTEM
- A. Have the temperature control manufacturer's representative set and adjust automatically operated devices to achieve specified sequence of operation.
 - B. Have testing organizations verify all controls for proper calibration and list those controls requiring adjustment by temperature control system.
- 3.03 SYSTEM PERFORMANCE REPORTS
- A. After the conclusion of balancing operations, make temporary installation of portable recorders and simultaneously record temperatures and humidity during summer and winter conditions at representative locations in each system outside of building.
 - B. Architect/Engineer will direct test locations.
 - C. Make recordings during summer and winter for a seven-day period, continuous over a weekend and including at least one period of operation at outside conditions with 5 F wet bulb temperature of maximum summer design conditions and within 10 F dry bulb temperature of minimum winter design condition.
 - D. Report of test results shall include original recording and two reproductions.

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3.04 SUBMISSION OF REPORTS

- A. Fill in test results on approved forms.
- B. Submit three certified copies of required test reports to the Architect/Engineer for approval.
- C. Include in report a list of instruments used and last date of calibration.

END

15955-4

DIVISION 16 - ELECTRICAL WORK
Section 16010 - General Provisions

1. GENERAL

1.01 SECTION INCLUDES

A. Contractor provide:

1. Furnish all labor, material, equipment and services required to execute, install and complete, ready for use, the complete electrical systems according to the drawings and specifications including, but not limited to, the following:
 - a. New electrical systems and interior distribution systems.
 - b. Branch panels, disconnect switches and fuses.
 - c. Wire, cable, conduit, boxes, fittings, hangers and conductors.
 - d. Lighting fixtures and lamps.
 - e. Wiring devices, receptacles, wall plates.
 - f. Grounding of electrical systems and equipment.
 - g. Wiring of mechanical equipment, including final connections.
 - h. Cutting and patching.
 - i. Cleaning, testing identification.
 - j. Instruction to User.

1.02 RELATED SECTIONS

- A. Section 16110 - Conduit.
- B. Section 16120 - Wire and Cable.
- C. Section 16130 - Boxes.
- D. Section 16140 - Wiring Devices.
- E. Section 16160 - Panels and Enclosures.
- F. Section 16450 - Grounding.
- G. Section 16500 - Lighting.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
 1. National Electrical Code (NEC).
 2. Underwriter's Laboratories, Inc. (UL).
 3. National Electrical Manufacturer's Association (NEMA).

SECTION 16010-2

- B. General Contractor shall secure all required permits and pay for any inspections required by local laws or ordinances for this portion of the Work.

1.04 SUBMITTALS

- A. Shop Drawings: See respective specifications sections.
- B. Maintenance Data and Operating Instructions: See respective specifications section.

2. PRODUCTS

2.01 MATERIALS

- A. See various Sections of Division 16 and Drawings for all material and equipment to be furnished and installed under the Contract.

3. EXECUTION

3.01 INSTALLATION

- A. This Contractor shall carefully check and coordinate the location and level of all lines. Each Contractor shall run preliminary levels and check with all other Contractors so that conflicts may be avoided.
- B. Where conflicts occur, the following preference schedule shall be allowed:
 - 1. Low pressure ductwork.
 - 2. Plumbing lines.
 - 3. Electrical conducts.
- C. Before any work is installed and before any equipment is purchased, this Contractor shall carefully check Specifications and Drawings for every trade and job conditions. Any lack of coordination between work, Drawings, Specifications or job conditions shall be immediately reported in writing to the Architect/Engineer, who will work out conflicts. Changes in equipment shall be incorporated in shop drawings and called to the attention of the Architect/Engineer in submittal of same.
- D. For cutting and patching, the General Contractor will provide chases, openings, recessed in new construction where so indicated by each Contractor. Each Contractor shall furnish information to General Contractor as to size and location.
- E. If this Contractor fails to give required data to General Contractor in time for openings to be left, this Contractor shall be required to do necessary cutting and patching. Openings shall be accurately located, neatly cut and no larger than necessary.

SECTION 16010-3

- F. This Contractor shall provide cutting and patching in order to install his new work in existing construction.
- G. This Contractor shall use skilled craftsmen to do rebuilding, patching, refinishing and painting required to restore construction before cutting, as approved by Architect/Engineer.
- H. This Contractor shall furnish and install flashing on all conduits installed through roof. Flashing for conduits shall be in strict accordance with roofing manufacturer's instructions. Top of flashing shall be provided with neoprene gasket and storm collar attached to conduit.
- I. It shall be this Contractor's responsibility to verify location, type and size of existing underground piping or service in any area where below grade work must be performed. Where necessary, hand tools shall be used to excavate for installation of new work.
- J. All work around existing underground services shall be coordinated with and approved by the appropriate utility company and Architect/Engineer.
- K. This Contractor shall be responsible for all costs incurred if any existing underground service is disrupted due to damage during installation of work under this Contract.
- L. Each Contractor must visit site before submitting his bid and thoroughly inspect the same to familiarize himself with all conditions which may affect new installation of work under this Contract. Claim for extra compensation due to existing conditions will not be considered.
- M. Provide bases and supports as indicated on the drawings. Contractor shall carefully examine all drawings in order that he does not duplicate or neglect these bases and/or support(s) required to make his installation(s) complete.
- N. Provide all rods, hangers, anchors, brackets, and all necessary structural members required to make a complete installation of all equipment to be installed under this Division of Work, such as conduit, raceways, lighting fixtures, panelboards. In the absence of such indications of details, the supports shall in all cases be adequate for the conditions encountered.

3.02 FIELD QUALITY CONTROL

- A. Contractor shall test entire electrical system for shorts, open and intentional or unintentional ground.
 - 1. All wiring and connections installed under this Contract shall be tested prior to installation of non-conducting covering, or concealment within building construction or backfilling. Each test shall be performed as hereinafter specified and shall be continued or repeated until lines under tests are proven tight to satisfaction of Architect/Engineer.

SECTION 16010-4

2. Allowable tolerances for testing of entire electrical system.
 - a. A voltage test shall be made on the last outlet of each circuit and the potential drop shall not exceed 3%.
 - b. Line-to-line voltage and line current measurement made at motors under full load conditions should not deviate more +/- 10% from the nameplate ratings.
3. General testing requirements.
 - a. Reading shall be taken between conductors and between conductors and ground.
 - b. Each conductor of each circuit for all electrical systems shall test free from short circuits and grounds and have an insulation value to the NEC Standards when tested with a 500 volt DC insulation resistance measuring instrument.
 - c. In the event the results obtained in these tests are not satisfactory, make such adjustments, replacements and changes as are necessary and repeat the test or tests which disclosed faulty or defective work or equipment.
 - d. Test in insulation resistances of all motor windings to ground with a Megohmmeter before applying line voltage to the motors. If these values are less than one (1) megohm the Contractor furnishing the motor shall be responsible for correcting the error.

DIVISION 16 - ELECTRICAL WORK
Section 16110- Conduit

1. GENERAL

1.01 SECTION INCLUDES

- A. Contractor provide:
 - 1. Conduit, elbows, couplings, including all required accessories.

1.02 RELATED SECTIONS

- A. Section 16010 - General Provisions.
- B. Section 16120 - Wire and Cable.
- C. Section 16130 - Boxes.
- D. Section 16140 - Wiring Devices.
- E. Section 16160 - Panels and Enclosures.
- F. Section 16450 - Grounding.
- G. Section 16500 - Lighting.

1.03 SYSTEMS DESCRIPTION

- A. Thin wall conduit (EMT) shall be used unless shown or specified otherwise.
- B. Whenever flexible steel conduit is required, it shall be of watertight design.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements.
 - 1. National Electrical Code (NEC).
 - 2. Underwriter's Laboratories, Inc. (UL).

2. PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Youngstown.
- B. Republic.
- C. Triangle.
- D. Allied Tube.

SECTION 16110-2

- E. Substitutions in accordance with Section 01640.

2.02 MATERIALS

- A. Heavy wall conduit, elbows and couplings shall be mild steel, rigid or intermediate metal conduit, standard weight pipe in standard lengths, hot dipped galvanized, metalized or sherardized, manufactured by Youngstown, Republic, Triangle or Allied Tube.
- B. Thin wall conduit shall be galvanized steel (EMT) conduit manufactured by Youngstown, Republic, Triangle or Allied Tube.
- C. Each length of conduit shall be labeled with Underwriter's Laboratories label showing the manufacturer's name or trademark. The label shall also indicate the primary protective coating.
- D. All conduit fittings shall be galvanized where used with steel conduit and manufactured by Appleton Electric, Crouse-Hinds or Killark.
- E. Conduit fittings used on thin wall (EMT) conduit or flexible steel conduit shall be of the insulated throat type with a nylon insulating material of non-combustible, non-breakable type manufactured by Thomas & Betts, Appleton or Raco.
- F. Screw type or indenture type couplings and connectors shall be used.

3. EXECUTION

3.01 INSTALLATION

- A. Provide feeder conduit runs as shown. Verify for actual installation with respect to available conduit spaces provided.
- B. Install all conduit with long radius bends with not more than three (3) bends between terminals. Should a greater number of bends be necessary, install pull boxes.
- C. Install pull boxes in all conduit runs exceeding one hundred (100) feet in length. Provide accessible pull box covers.
- D. The outside diameter of any conduit run in concrete slabs shall not exceed one-third (1/3) of the thickness of the slab.
- E. All conduit crossing building expansion joints shall be provided with suitable expansion fittings where they cross these joints.
- F. Cut conduit with a power saw and ream after threading. Join lengths of conduit by approved couplings. All bending shall be done cold.
- G. Do not use running threads. Where conduit with tapered threads cannot be coupled with standard couplings, use split type couplings.

SECTION 16110-3

- H. Where conduits terminate in panel boxes, distribution panels, switchboards, pull boxes or starter boxes, provide fiber or plastic bushings and lock nuts. Conduits shall be threaded to take one (1) lock nut on inside of box and one (1) lock nut and fiber bushing on outside of box.
- I. Where conduits terminate in pull and outlet boxes, provide tinned iron bushings and secure to boxes with lock nuts and screw type bushings.
- J. All conduit shall be blown and swabbed before wires are pulled.
- K. All conduit systems shall be mechanically and electrically continuous from source of current to all outlets and grounded in accordance with the National Electrical Code.
- L. On concrete or brick construction, insert anchors shall be installed which shall be Ackerman-Johnson, Paine, or Phillips with round head machine screws. In wood construction round head screws shall be used. An electric or hand drill shall be used for drilling holes for all inserts in brick, concrete or similar construction. In brick, inserts shall be near center of brick, not near edge or in joint. Where steel members occur, same shall be drilled and tapped and round head machine screws shall be used. All screws, bolts, and washers used for supporting conduit or outlets shall be fabricated from rust-resisting metal.
- M. This Contractor shall lay out and install his work in advance of the laying of floors or walls and shall furnish and install all sleeves that may be required for openings through floors and walls. Where plans call for conduit to be run exposed, this Contractor shall furnish and install all inserts and clamps for the supporting of conduit. If this Contractor does not properly install all sleeves and inserts required, he will be required to do the necessary cutting and patching later, at his own expense, to the satisfaction of the Architect/Engineer.

DIVISION 16 - ELECTRICAL WORK
Section 16120 - Wire and Cable

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Contractor provide:
1. Wire and cable.
 2. Pulling wires and cables.
 3. Splices, connections, supports.

1.02 RELATED SECTIONS

- A. Section 16010 - General Provisions.
- B. Section 16110 - Conduit.
- C. Section 16130 - Boxes.
- D. Section 16140 - Wiring Devices.
- E. Section 16160 - Panels and Enclosures.
- F. Section 16450 - Grounding.
- G. Section 16500 - Lighting.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
1. National Electrical Code (NEC).
 2. Underwriter's Laboratories, Inc. (UL).
 3. American Society for Testing Materials (ASTM).
 4. American Standards Association (ASA).
 5. Insulated Power Cable Engineering Association (IPCEA).

2. PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Anaconda Wire and Cable Company.
- B. General Cable Corporation.

SECTION 16120-2

- C. Phelps-Dodge Corporation.
- D. Triangle Conduit and Cable Co.
- E. Carol Cable Company.
- F. General Electric.
- G. Okonite.
- H. Substitutions in accordance with Section 01640.

2.02 MATERIALS

- A. 600 Volt Insulated Wire.
 - 1. Conductors: Copper 98% conductivity, 600 volt bearing the Underwriter's Laboratories, Inc. label. All wire shall meet ASTM, IPCEA and ASA Standards.
 - 2. Except as otherwise noted or specified, wire smaller than #12 "AWG" shall not be used. All wire #8 "AWG" and larger shall be stranded.
 - 3. #12 and #10 "AWG" branch circuit wire shall be type THWN.
 - 4. Wire for feeders and all wire #8 "AWG" and larger shall be type "RHW - 75 degrees C" with braided jacket or type THW, THWN or XHHW.
 - 5. Wire for branch wiring installed in wiring spaces of fluorescent lighting fixtures shall be type "AL - 125 degrees C" rated 600 volts.
- B. Splices.
 - 1. Make all splices in #8 or smaller wire mechanically and electrically secure without solder and then soldered and bind proper thickness of vinyl plastic electrical tape.
 - 2. In lieu of soldering, Thomas & Betts, "STA-KON" Ideal "Wing nuts" or Minnesota Mining and Manufacturing Company's "Scotchlok" may be used.
- C. Cable Connectors.
 - 1. Make splices and taps in wires #6 and larger with solderless connectors.
 - 2. Connections shall be made with O.Z., Thomas & Betts or Burndy screw on, set screw, clamp on, split bolt or crimp and compression type lugs, taps and terminal fittings.

SECTION 16120-3

3. Use vinyl plastic electrician's tape to an equivalent insulation thickness of all uninsulated splices.
4. Stranded cables shall be soldered into lugs or compression type fitting used. Wrapping around binding post shall not be permitted.

3. EXECUTION

3.01 INSTALLATION APPLICATION

A. Branch Circuits.

1. Where the farthest outlet of a single 115 volt branch circuit is less than seventy-five (75) feet from the panelboard, use #12 wire between all outlets and for the home run of that circuit.
2. Where the farthest outlet of a circuit is more than seventy-five (75) feet from the panelboard, use #10 wire for the home run of that circuit and #12 wire between all other outlets on the circuit except when larger sizes are indicated.
3. In general, group branch circuits to consist of one (1) neutral for each two (2) circuits having a potential difference between them except where indicated otherwise and follow the wire color scheme in accordance with the schedule specified in this Section.

B. Wires and Cables.

1. Conductors shall be of sizes indicated. Conductors shall not be pulled through conduits until conduits are free from moisture.
 - a. Soapstone or other types of lubricants that are harmful to the conductor insulation shall not be used.
 - b. Connections shall be made to outlets, fixtures, apparatus, without straining.
2. All circuit wires shall be tagged and tested. Circuit numbers shall be stamped into the tags. Tags shall not be removed for any reasons.
3. At least six (6) inch loops or ends shall be left at each outlet for the installation of devices or fixtures in the future. All wires in outlet boxes not for the connection to fixtures at the outlet shall be rolled up, connected together and taped.
4. Group all circuits neatly in panelboards. Tie with seine twine, Thomas & Betts, AMP Products Corp. or 3M Company cable ties.

C. Schedule of Wire Coloring Coding.

SECTION 16120-4

1. All branch circuit wiring shall be done with color coded conductors, using the same code throughout.

Grounding Conductors	Green
Neutral	White
Phase A	Black
Phase B	Black
Phase C	Black
Single & 3-Way Return	Red
Start Control	Red
3-Way Traveler	Yellow
Stop Control	Red
Hold Control	Red

2. Colors as selected for the purpose of identifying circuits shall be applied to the wire. The colors must be fast, fadeless and capable of withstanding cleaning in the event that the wire becomes soiled.