

SECTION 22 01 00
BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Mechanical Work include the following Divisions and Sections of the Project Manual. Mechanical Work shall be taken to mean Plumbing Work.
1. The Contractor is requested to read carefully the Project Manual and drawings for all parts of work so as to become familiar not only with the work covered by his Contract, but also that of other Contractors.
 2. Should any changes in the specifications and drawings be necessary to conform to the demands of any established local labor practices, or errors and omissions noted, the Contractor shall so notify the Owner at the time of submitting his bid so that suitable adjustments may be made.
 - a. Failure on the part of the Contractor to fulfill the above requirements will not relieve him of his responsibility of executing all work necessary for a complete and approved installation without extra expense to the Owner.
- B. Include all materials, labor, equipment and incidentals, shown, specified or otherwise necessary to provide a complete system.

1.2 REQUIREMENT OF REGULATION AGENCIES

- A. Permits, Inspections and Notices
1. Secure and pay for all permits and inspections required for execution of the mechanical work. Comply with State of Ohio Basic Building Code, Ohio Plumbing Code, all other State, County and Local Laws or Ordinances, local Fire Prevention Bureau, which affect this.
 2. Requirements of the Ohio Department of Health, County and City Health Agencies shall also be complied with.
 3. Give the proper authorities notice as required by law.
 4. Arrange for all tests on any or all parts of the work required by authorities that have jurisdiction and pay all charges for same.
 5. In no case shall the standard of work be inferior to the standard called for in the Code, but where the class of work called for by these specifications is superior to the Code requirements, the specifications shall govern the work and the work must conform to these requirements.
 6. No extra compensation will be allowed for changes necessary for Code compliance regardless of the method of installation shown on the drawings or specified herein.
 7. Certificates of inspection shall be delivered, without charge, to the Architect by this Contractor before final payment showing that all work and materials under this Contract fully meet the requirements and approval of the City, County, and State Inspection Departments.
- B. Utility Company Charges and Requirements
1. Materials, equipment and installation shall conform in all respects with the service rules, regulations and construction standards of the utility companies.
 2. All charges by the Columbus Water Department for meters, etc., shall be included in the Plumbing Contractor's Base Bid Proposal.
 3. All charges by the Columbia Gas Company for meters, etc., shall be included in the Plumbing Contractor's Base Bid Proposal.
 4. Temporary services and charges for services consumed during construction, refer to Division 1, Section 01 50 00, Temporary Services.

- C. Codes and Standards
1. Install all work strictly according to all local, State and Federal Codes.
 2. Comply with latest edition of the following as interpreted by local board having jurisdiction as well as any further modifications or regulations of local or state authorities.
 - a. Ohio Basic Building Code.
 - b. National Fire Protection Association.
 - c. Pressure Piping and Mechanical Refrigeration Systems and Equipment.
 - d. American Society of Testing Materials.
 - e. American Welding Society.
 - f. National Pressure Vessel Code.
 - g. National Electric Code.
 - h. NFPA Life Safety Code.

1.4 SUBMITTALS

- A. Refer to DIVISION I, Section 01 33 00.
- B. Submit shop drawings, catalog sheets and wiring diagrams in six (6) copies.
 1. Shop drawings required for all custom built and/or special equipment.
 2. Standard catalog equipment.
- C. Manufacturers catalog cuts shall be securely fastened in folders with proper identification on the front cover.
- D. Furnish sets of approved shop drawings to all trades whose work pertains to this work and/or is affected thereby.
- E. The bid shall contemplate the furnishing and installing of material and equipment, exactly as specified or shown as similar by the contract documents. Manufacturers of similar equipment must be submitted for approval and the contractor submitting on similar equipment will be responsible for all costs associated with changes in architectural, structural, mechanical and/or electrical trades due to the similar equipment characteristics submitted. If manufacturers are listed, no other manufacturers except those listed within the sections of this Division, that are in turn able to comply with the contract document requirements and minimum standards of these specifications, will be acceptable.
- F. Mechanical Contractor to provide with bid documents pre-submittal on the proposed air handling units dimensional drawings to ensure proper sizing due to limited space. (Refer to Mechanical Drawings for maximum sizes on units.)

1.5 MAINTENANCE MANUALS

- A. Prepare three (3) complete operating and maintenance manuals in hardback binders describing operation of the systems and recommended maintenance schedule. The manual shall contain building floor plans reduced in scale to fit a 15 x 11 sheet showing the location of all equipment and with a short description of the function and maintenance requirements of each piece of equipment. Turn all equipment warranties over to Owner.
- B. Manual shall include:
 1. Identifications, name, mark, number, etc., as indicated on drawings.
 2. Step-by-step procedures for start-up and shut-down of each system and piece of equipment.
 3. Normal equipment operating characteristics.
 4. Performance data, curves, ratings.
 5. Wiring diagrams.
 6. Manufacturer's descriptive literature.

7. Automatic controls with diagrams and written description of operation.
8. Manufacturer's maintenance and service manuals.
9. Plumbing fixtures.
10. Spare parts and replacement parts list for each piece of equipment.
11. Name of service agency and installer.
12. Final approved shop drawings.

C. Provide operating instructions for principal plant mechanical components, for use by operating personnel, laminated between thermoplastic sheets and affixed where directed. Instructions shall describe function of equipment, most economical operating, start-up and shut-down procedures to follow in event of failure, normal maintenance practices, controls, caution and warning notices.

1.6 RECORD DRAWINGS

- A. Refer to DIVISION I, Section 01 78 23.
- B. Assemble and submit to the architect for subsequent submission to the Owner; one (1) complete "as-built" drawing of the plumbing (sanitary and storm lines), domestic water (hot, cold & recirculating), gas distribution, heating hot water and chilled water piping layout, etc., one hard copy of mark-ups and one AutoCAD file (R-14 or 2000) for use in preparation of record drawings.

1.7 LOCAL CONDITIONS

- A. Visit site, become familiar with conditions affecting this work. No additional payment will be made on claims that arise from lack of knowledge of the existing conditions.
- B. This contractor shall visit the site before submitting bid and make all necessary observations, measurements, and not conditions under which his work is to be performed. No extra compensation will be allowed for failure to do so. This contract involves remodeling of and a new addition onto the existing building and therefore contractor shall field locate existing ductwork, piping and sewers before starting work.
- C. Exercise extra care when working in areas where existing services may exist. Any costs for repair of damage to such services become the responsibility of Contractor causing the damage.

1.8 PROTECTION

- A. When setting up pipe shop, cutting, threading machines, protect area against staining, abrasion. Cost of correction of any such condition will be charged against the respective Contractor.
- B. Protect finish floors from chips and cutting oil by the use of chip receiving pan and oil proof cover.
- C. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
- D. Protect finished floor and finished surfaces from paint drippings, insulation adhesive, etc., by the use of drop cloths.

1.9 PRODUCT HANDLING

- A. Pay all costs for transportation of materials, equipment to job site.

- B. Provide all scaffolding, tackle, hoists, rigging necessary for placing mechanical material and equipment in their proper places. Scaffolding, hoisting equipment: comply with applicable Federal, State, and Local regulations. Remove temporary work when no longer required.
- C. Arrange for packaging of equipment which must be hoisted so that there will be no damage or distortion caused by hoisting operation. Protect all coils, bearing, fan shafts and housing from any damage during hoisting operation.
- D. Store fans, pumps, control assemblies, motors, starters, controls, air handling and conditioning equipment, plumbing fixtures, etc., in dry location until building is ready to receive them. Protect all openings, bearings, motor controls, etc., from dirt and moisture.
- E. Make arrangements and work out all charges with the General Contractor for access and providing openings in walls or floors as necessary for hoisting equipment in place.

1.10 WARRANTY

- A. All work shall be free from defect in material and workmanship for a period of one year following the date of final acceptance of the work, unless a longer period is stipulated under specific headings. The Contractor shall guarantee that apparatus will develop capacities and characteristics required. The Contractor shall repair or replace at no additional cost to the Owner, any material or equipment developing defects and shall make good any damage caused by such defects or the correction of defects.
- B. Each Contractor shall submit his own and each equipment manufacturer's written certificates, warranting that each item of equipment furnished complies with all requirements of the drawings and specifications.

NOTE: The guarantee shall run from date of final acceptance of the work, not from date of installation of a device or piece of equipment. Deviations from this may occur on larger items of equipment used during beneficial occupancy before the total system is accepted and shall be made a matter of written record by the Architect.

1.11 QUALITY ASSURANCE

- A. Any manufacturer other than basis of design shall be responsible for any additional requirements for electrical service, physical space limitations, and capacities at no additional cost to the project.
- B. Materials and installation shall comply with requirements of governing regulations and controlling agencies.
- C. All materials used shall be first grade of their kind and shall be new and in first-class condition when installed.
- D. Work done by the Contractor shall include the services of an experienced superintendent.
- E. Identification requirement shall meet ASME A13.1.

1.12 DELIVERY, STORAGE AND HANDLING

- A. Piping and tubing shall include factory-applied end caps.
- B. All piping and tubing shall be elevated from grade for onsite storage.

- C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.13 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in the building structure during progress of construction.
- C. Coordinate installation sleeves and supporting devices with concrete and structural components.
- D. Coordinate connection of plumbing, fire protection, mechanical systems with underground and overhead utilities and services.
- E. Coordinate requirements for access panels and doors.
- F. Coordinate installation of identifying devices.

1.14 PROJECT CONDITIONS

- A. Plumbing support shall only be permitted at steel joist panel points.
- B. Any supplemental steel required for support between building structural members shall be the responsibility of the Plumbing Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials used shall be new, free from defects, clean and shall be protected from dirt and damages before and after installation, shall be as specified under the base bid for each item.
- B. See all other Sections relating to work, either affected or affected by.

2.2 PIPE AND PIPE FITTINGS

- A. Pipe threads shall meet ASME B1.20.1 for factory-threaded pipe and pipe fittings.
- B. Pipe-flange gasket materials shall meet ASME B16.21, nonmetallic, flat, and asbestos-free.
- C. Pipe Flanges
 - 1. Full face shall be Class 125, cast iron and cast-bronze material.
 - 2. Narrow face shall be Class 250, cast-iron and cast steel material.
- D. Flange bolts and nuts shall meet ASME B18.2.1.
- E. Solder filler materials shall be ASTM B32.
 - 1. Alloy Sn95 and Sn94 shall be used.
- F. Brazing filler materials shall meet AWS A5.8.

G. Welding filler metals shall comply with AWS D10.12.

2.3 IDENTIFICATION COMPONENTS

- A. Equipment Nameplates: Aluminum, permanently fastened to equipment, engraved or stamped.
- B. Stencils: Standard stencils shall be black enamel on a white background or white enamel on a dark background.
- C. Snap-on Plastic Pipe Markers: Preprinted, semi-rigid type, color-coded.
- D. Pressure-Sensitive Pipe Markers: Preprinted, color-coded, vinyl type with permanent adhesive.
- E. Pipe Markers: Full band type.
- F. Plastic Duct Markers: Laminated plastic, color coded, and engraved with the service.
- G. Plastic Tape: Color-coded, pressure-sensitive, self-adhesive vinyl.
- H. Valve Tags: Polished tags with numbers and letters.
- I. Access Panel Markers: Engraved plastic laminate.
- J. Engraved Plastic-Laminate Signs: Sizes required to contain message.
- K. Plastic Equipment Markers: Standard color-coded, laminated plastic.
- L. Plasticize Tags: Preprinted, accident prevention.
- M. Valve Location Tags: 3/4-inch diameter colored, pressure-sensitive adhesive paper circles.

2.4 VALVE CHARTS

- A. Valve charts shall be furnished by each respective Contractor and shall include the following items:
 - 1. Valve identification
 - 2. Location
 - 3. Purpose
- B. Valve charts shall be included in the Maintenance and Operating Manuals.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. The Architectural and Structural drawings with field observations and measurements shall be used for all building dimensions, structural materials, etc. and for all pertinent details. Should discrepancies exist or where any question arises in regard to the meaning of the drawings, the Architect shall be consulted and his interpretation shall be followed.
- B. Piping and ductwork shown on the plans is diagrammatic and must be modified with prior approval of the Architect as required to meet the conditions on the job. It is desired that the indicated positions be followed as closely as possible. Where additional offsets in pipes or ducts are required to obtain

maximum head room or avoid conflict with other work, they shall be installed without extra charge.

- C. The drawings are not to be scaled. Take all measurements and determine all elevations at the building site for the installation of the work.
- D. The Contractor shall note the type of construction which will be used in this building as he will have to conceal his piping and ductwork and make a neat job of the entire work.
- E. The Contractor shall watch the progress of the work and report to the Architect immediately any cases where ample space has not been provided to accommodate his work. He must not cut through any finished work until he has received permission from the Architect. No claims for "EXTRA WORK" shall be approved due to unfamiliarity with existing conditions or misinterpretation of contract documents.

3.2 DAMAGE TO OTHER WORK

- A. It shall be the responsibility of the Contractor to maintain his own systems in proper working order, and the Contractor will be held responsible for all damage to other work caused by his work or through the neglect of his workmen. Any damage caused by mechanical systems to any other work, such as by leaking pipes, paint overspray, etc. will be the responsibility of the Contractor that installed the system that failed.
- B. All patching and repairing of damaged work shall be done by the Contractor who installed the work or by a Contractor approved by the Architect and as directed by the Architect, but the cost for the same shall be paid for by the Contractor causing such work to be done, and at no additional cost to the Owner.

3.3 PROTECTION OF PIPING AND EQUIPMENT

- A. Equipment with factory finish shall be touched up where finish has been damaged, to match original finish, if finish cannot be "touched-up", the Contractor shall refinish the equipment to original condition. Galvanized casing, etc. to be touched up with Rust-Oleum #3216.

3.4 SUPPORTS AND FOUNDATIONS

- A. Provide necessary supports and foundations for piping, ductwork and equipment unless specifically noted as being furnished and installed on the Architectural or Structural Drawings. All concrete work to be in accord with the preceding Section on concrete. All corners of equipment bases to be chamfered. Pipe support bases to be 12" x 12" minimum.
- B. All small equipment such as pumps, water heaters, etc., shall be set up above the floor on concrete bases all by the Contractor furnishing that equipment unless noted otherwise on the drawings. Large equipment such as air handling units, water chillers, etc. shall be set up on bases as noted on the drawings.
- C. All concrete housekeeping pads shall be four (4) inches thick and shall be a minimum six (6) inches larger than the equipment outside dimensions unless otherwise noted on the drawings.

3.5 INSTALLATION OF PIPING

- A. Install piping so that it will not be strained, damaged, or ruptured by expansion or contraction. Run pipe in a direct, straight and workmanlike manner. Place valves in an accessible location. Ream pipe clean and free of burrs and ascertain that no foreign material is inside the pipe before assembling.

- B. Conceal piping in walls, above ceilings, or behind cabinets and equipment except as noted otherwise on the drawings. Test all concealed piping independently as work progresses. Provide unions for dismantling of piping and valves or servicing equipment or replacing coils. Refer to "Valves" section of specification for valving, and similarly to "Drains", "Vents" and "Access Doors" sections.
- C. Connections from steel to copper piping shall be made with dielectric type unions, Epco or other as approved by the engineer. Fittings shall be zinc plated with a thermoplastic liner, rated or 250°F maximum.
- D. Drain lines sizes 3" and smaller shall pitch 1/4" per foot, 4" and larger shall pitch 1/8" per foot, except where otherwise noted.
- E. Water mains shall be run level, or pitch up with flow 1" in 40' to vent points. All branches shall pitch up with flow to the vent points. Wherever possible branches shall be taken off the bottom of mains.
- F. Counterflashing shall be provided where piping, etc. penetrates roof or outside wall. Sheet metal counter flashing shall provide a four inch (4") overlap of counterflashing over flashing. All piping extensions through roof shall be flashed with 4 lb. sheet lead or 16 oz. copper, 24" square, with sleeves soldered on, extending to top of vent and turned down 2" inside.
- G. Disinfection of water mains shall be done in accordance with the Procedure for Disinfecting Water Mains prepared by the American Water Works Assoc., (revised edition).

3.6 INSTALLATION OF EQUIPMENT

- A. The Project Manual and drawings indicate special conditions to be adhered to in making the installation of all equipment; however, the Contractor shall also follow the specific directions and instructions furnished by the manufacturer of the equipment for the proper installation and connections of each particular piece of equipment.
- B. Equipment shall be installed with full consideration of future maintenance. Equipment which is installed such that it cannot be readily serviced shall be removed and installed correctly as the Architect or Engineer may direct. Install valves, bearings, motors, dampers, instruments, controls, etc. where easily accessible for operation, servicing, and repairing. Do not obstruct passageways, headroom and door and window operation with mechanical installation. Install controls, instruments, valve stems, shafts, etc. so as to be accessible where required, and all equipment shall have hinged and sealed access doors and panels for servicing and inspection of internal parts. All belt drive motors shall have variable pitch sheaves.
- C. Motor driven, reciprocating, rotating and/or vibrating equipment and piping connected thereto shall be installed with vibration isolators, in full accord with the directions of the isolator manufacturer for the weight and frequency of the particular equipment (as specified under "Vibration Isolators").
- D. Flexible connections shall be made in all piping to equipment mounted with vibration isolators, except where piping is installed with length equivalent to 15 diameters in each of three directions between equipment and first hanger point.
- E. Equipment shall be installed by skilled mechanics and workmanship shall be first-class in every respect. Each Contractor shall have a full time competent superintendent, experienced in the work to be done, in charge of work at all times during installation, including work performed by Subcontractors.

3.7 SLEEVES AND OPENINGS

- A. Provide sleeves for work wherever pipe lines pass through masonry or concrete. Cut sleeves from steel

pipe large enough to pass insulated line and at least two sizes larger than line size. Caulk gaps around pipe with approved materials. Extend sleeves completely through walls and floors. Steel pipe shall meet requirements of ASTM A53, Type E, Grade A, Schedule 40. Sleeves for copper piping shall be of compatible material to prevent interaction of piping materials.

- B. Sheet metal sleeves shall be provided for duct openings and wherever pipe lines pass through plaster. Fabricate sleeves from 18 gauge galvanized sheet steel with flange on one end, and large enough to pass insulated pipe. Caulk gaps between pipe and sleeves with approved materials.
- C. Install escutcheon plates at all points where pipes enter finished rooms; and within cabinets with sinks, lavatory, etc.; chrome plated cast brass with set-screw. Escutcheons shall be manufactured wall, ceiling and floor plates, split-type and of heavy chrome-plated construction.
- D. Each Contractor shall furnish to the General Contractors details and location of all sleeves and chases required in poured concrete walls or floors and concrete block walls in sufficient time that chases can be provided before scheduled portions or erection. Refer to "Cutting and Patching" for openings NOT installed new as walls and floors are constructed.
- E. All services passing through the exterior walls below grade with special waterproofing membrane shall be installed in a cast iron wall sleeve with an intermediate wall collar. The service line passing through the wall sleeve shall be lead and oakum caulked on both the exterior and interior surfaces. The wall sleeves shall be James Clow & Sons No. F-1430 cast iron sleeve or equal with length of sleeve equal to actual wall thickness.
- F. All pipe and duct penetrations of fire rated walls or floors shall be sealed with 3M "Fire Barrier," Dow Chemical "Fire Stop," STI "Specseal" or Metraflex "Metraseal".

3.8 SCHEDULE AND COORDINATION OF WORK

- A. Each Contractor shall coordinate work with work of other trades in order to avoid delay and interferences in carrying on the construction project. Verify all dimensions and elevations. Should conflicts or interferences occur with the work of other Contractors on the job, this Contractor shall consult with them for the proper allocation of space and for arrangement of equipment and materials. In the event of disagreement, refer the matter to the Architect.
- B. Advise other Contractors as to location of equipment, piping, panels, and as to schedule of work, delivery of equipment, and when services of other Contractors will be required. Install piping, etc. in accord with construction schedule of foundations, walls, structural and finish of the building.
- C. All contractors must coordinate each piece of equipment with all other trades (general contractor, fire protection contractor, mechanical contractor, electrical contractor, etc.) affected by that piece of equipment (roof openings, weights, power requirements, voltages, etc.) prior to ordering equipment and again prior to installation. No extra compensation will be approved if coordination is not performed by each respective contractor and subcontractor.
- D. The sheet metal subcontractor shall lay out all of his work at 1/4" scale, holding all ductwork as high as possible and providing adjustments in size where required, and cutting sections through the various areas where needed to show the assigned position of the various trade elements. He shall then provide the Mechanical Piping Contractor, Plumbing Contractor, Fire Protection Piping Contractor, and Electrical Contractor with a copy of same upon which each can overlay the layout of their work prior to proceeding with the fabrication or installation of same. One copy shall also be submitted to the Architect for review. All Contractors must sign off on coordination drawings.
- E. It is the responsibility of the Mechanical Contractor to coordinate between his equipment suppliers and his temperature control subcontractor and other subcontractors as to which control devices are supplied

with equipment, required wiring and voltages, and other related coordination times, so as to ensure a complete, proper, and operable installation.

3.9 CUTTING AND PATCHING

- A. Sleeves and thimbles in the slabs, walls, beams, etc. shall be installed as the item is constructed. Where cutting cannot be avoided, it shall be done carefully so as not to injure any part of the structure and as little material as possible shall be removed. Structural steel shall not be cut without the specific permission of the Architect.
- B. If the Contractor fails to instruct the other Contractors as to the size and position of all chases, openings, releases, etc. required to install equipment and piping, or fails to set sleeves in form work on schedule, then the Contractor shall cut the openings, etc. at his own expense and in the case of careless or incompetent work, the right is reserved to have the cutting and patching done by others and the cost of same charged to the Contractor responsible for the original cutting.
- C. Each individual contractor shall be responsible for their own cutting and patching unless otherwise noted on the Drawings or Specifications.

3.10 IDENTIFICATION

- A. EQUIPMENT throughout the district shall receive a tag with a unique equipment number. The equipment tag shall have the number in both an alpha/numeric font and a bar code font. The number and font shall be obtained from CPS prior to tagging.
- B. EQUIPMENT such as water heaters, pumps, all starters, etc. shall be identified by the attachment of nameplates constructed from laminated phenolic engraved plastic 3-ply with black or red surface and white interior core at least 1/16" thick. Engraved lettering shall be at least 1/4" high. Plates shall be attached to equipment or walls by use of self-tapping screws, nuts and bolts or non-ferrous rivets or vandal proof fasteners. No tape type nameplates to be used. All nameplates are to be by the Contractor furnishing and installing the equipment.
- C. VALVES on all utilities and services shall be tagged by the Contractor installing the valves, with distinctive embossed numbers on a non-metallic plastic or brass tag. The tags shall be minimum of 2" in diameter and be attached to the valve stem with a chain or similar device. A valve index shall be prepared showing the valve number, locations, service and function of the valve. The valve index shall be in an aluminum-frame with Plexiglas and mounted as directed by the Owner. Furnish the operations and maintenance manuals with three (3) sets of the valve index. Individual valves adjacent to the equipment need not be identified.
- D. PIPING shall be identified in each room, in crawl spaces, and in plenums above ceilings accessible through "lay-in" title or access doors. Markers to be installed at 20' intervals maximum. Identify all piping near every valve, and at each access door and install direction of flow arrows at each label. Markers to be W.H. Brady Company or an approved equal, installed, directed and finished with 2 coats of clear brushing lacquer. Submit list of labels for approval before installing. Size of labels as recommended by Brady.
- E. Locate pipe markers as follows:
 - 1. Next to each valve and fitting, except on plumbing fixtures and equipment.
 - 2. At each branch or riser take-off.
 - 3. At each passage through walls, floors, and ceilings.
 - 4. At each pipe passage to underground.
- F. Identify piping contents, flow direction, supply and return.

- G. Install markers with tape color bands over each end of marker, extending around pipe and overlapping a minimum of 30 degrees.
- H. SERVICE ABBREVIATIONS (Add the following):
 - DCW Domestic Cold Water
 - DHW (110) Domestic Hot Water Supply (indicate temperature)
- I. Piping, except for soil waste and vent piping, shall be properly identified in accordance with OSHA-ANSI safety color coding. Contractor involved in the installation of piping and insulation shall have the surfaces prepared for finish painting by the Painting Contractor under separate contract. The Contractor installing the piping shall direct the Painting Contractor as to the color involved. Color coding shall be checked with the Architect before painting.
- J. Access panel markers shall be provided by CPS in locations designated by the Contractor.
- K. Valve locations shall be tagged with 3/4 inch diameter colored, pressure-sensitive adhesive paper circles on the ceiling grid. Coordinate with General Contractor.
- L. Note: Identification requirements to meet ASME A13.1.
- M. All piping, equipment and valve identification shall be completed by respective contractors prior to issuance of substantial completion.

3.11 CLEANING UP

- A. The Contractor shall at all times keep the premises free from accumulation of waste material or rubbish caused by his employees or work and at the completion of the work, he shall remove all his rubbish from and about the building including all his tools, scaffolding and surplus materials and shall leave all areas "broom clean" in which he has worked. He shall cooperate with the General Contractor in clean up of the premises.
- B. The Plumbing Contractor shall, when directed by the Architect, flush all sewers. The Plumbing Contractor shall remove all labels from plumbing fixtures and shall clean same when directed by the Architect.
- C. The Architect will insist on daily housekeeping to provide a clean and safe work area for all personnel. Housekeeping that is not satisfactory will necessitate charging the Contractor for the cost of the work involved to clean up debris caused by the Contractor(s) or his Subcontractors and suppliers. If determination of responsibility for debris is not possible, the cost of clean-up will be shared equally.

3.12 ELECTRICAL

- A. The Contractor that furnishes the motor or equipment shall furnish all starters, relays, control switches and remote or panel mounted switches and shall furnish full wiring diagrams to the Electrical Contractor for wiring of all equipment. The Electrical Contractor shall wire line voltage thermostats, shall mount all starters and switches, shall make all power wiring connections and shall provide wire, conduit, and disconnect switches. Low voltage control wiring, including transformers shall be by the Mechanical Contractor. Mechanical Contractor shall make connection to adjacent relay and shall coordinate with the electrical contractor for additional power requirements to the control panels.
- B. All motors 1/3 HP and smaller shall be single phase, 110 volt, with starters to be Allen Bradley Bulletin 60. Motors with automatic control shall have "hand-off-automatic" switch. Starters for motors 1/2 HP and larger, except as noted shall be Allen Bradley Bulletin 712 and shall be with "maintaining type" contacts. Provide "hand-off- automatic" selector switch where motors are automatically controlled.

Electric voltage and phase of all equipment furnished under this Section will be in accordance with the power characteristics specified in Division 26 of these specifications and shown on the Electrical Drawings.

3.13 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to facilitate service, maintenance, and repair or replacement of components.
- B. Maintain lubrication gaskets and packing during construction and assure that at time of acceptance by the Owner, equipment is in first-class operating condition.

3.14 EQUIPMENT START-UP

- A. Start-up of all plumbing equipment shall be video-taped by the plumbing contractor. Two copies shall be turned over to the Owner's maintenance staff.

3.15 TESTING AND REPAIR

- A. All piping systems shall be thoroughly cleaned and flushed prior to final testing.
- B. Pressure testing shall be completed for the following piping systems:
 - 1. Hot, cold, recirculating hot water system, gas piping, underground sanitary piping, etc.
- C. All testing must be witnessed and accurately recorded noting methods of testing, times, dates, and results.
- D. Any damage as a result of tests shall be repaired or damaged materials replaced at no cost to the Owner.

3.16 FINAL COMPLETION

- A. All work shall be cleaned prior to issuance of Substantial Completion.
- B. Retouch or repaint factory painted prime and finish coats where scratched or damaged.
- C. Deliver belts and equipment, as required by this Specification, to Owner and obtained signed receipts of delivery.
- D. Clean equipment, restore damaged materials, and leave the Work in acceptable condition.
- E. Remove all site tools, equipment, surplus materials, and rubbish continuously at no additional cost to the Owner.

END OF SECTION 22 01 00