

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 REFERENCES

- A. All Provisions of this Section 220500 shall apply to all Sections of Division 22.
- B. The work of Division 22 includes providing all labor, material and equipment required to produce the various systems complete and operating.
- C. All work under this Division shall be subject to all applicable requirements of the Project Manual.
- D. The commissioning responsibilities found elsewhere in this project manual are applicable to this section.

1.2 CONTRACTOR'S INSTALLATION DRAWINGS

- A. Only drawings bearing Architect's stamp shall be used for construction. Keep drawings on job at all times.

1.3 MATERIAL AND EQUIPMENT REQUIREMENTS

- A. ALL products used on the project must be Asbestos FREE. Note, imports from Canada can contain asbestos and may state it is asbestos free but if the ingredients are checked it may contain chrysolite or Canadian fibers which is not considered asbestos in Canada but is considered asbestos here in the United States. This can be found in mastics, flooring products, and sheetrock. The Contractor shall be required to be aware of the products their company, and their subcontractors supply for the project. Contractor's shall be required to prudently check material MSDS sheets. Key words to look for include: asbestos, Canadian fibers, and Chrysolite mineral fibers.
- B. No materials or equipment shall be used in the work until reviewed and accepted for such work by the Engineer. Prior to submission of shop drawings, and within the time specified in Section 013300, the Contractor shall submit to the Engineer, a complete list of materials and equipment which he intends to furnish, giving manufacturer and catalog numbers. Shop drawings will not be considered for review until the complete list of the manufacturers of all materials and equipment has been accepted.
- C. All materials and equipment shall be new and the best of their respective kinds, suitable for the conditions and duties imposed on them after installation. All applicable materials and equipment shall be such as found in the approved list of the National Board of Fire Underwriters. Where applicable, all materials and equipment used shall bear the label of the Underwriter's Laboratories, Inc. securely attached.
- D. All equipment shall be supplied to the job in sections which can readily pass through the openings provided. If necessary, sections shall be assembled and connected at the site, within the space which they occupy.
- E. Only those materials and equipment named in the specifications by giving the name of the manufacturer, or by brand or trade name or catalog reference, shall be used as a basis for the

preparation of the base proposal, and only those materials shall be furnished under the Contract.

- F. Should the bidder desire to use any materials or products other than those specified by name, he shall submit the proposed substitution to the Engineer for review ten (10) days prior to the date of the proposal.
- G. Where substitutions are allowed herein, any equipment so accepted shall meet all specified requirements in all aspects of design, space requirements, electrical characteristics, power consumed, and suitability to system design. Any changes in wiring, controls, etc., from that shown on the contract drawings necessary to accommodate the equipment substituted shall be made by the Contractor at his expense. Where substitutions require change in the work under other sections, the Contractor shall make all such changes at his expense. Acceptance of the shop drawings of the substitution does not relieve the Contractor of this responsibility.
- H. Material list shall be submitted within thirty (30) days after award of contract.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with Section 013300.
- B. The Contractor shall submit shop drawings to the Engineer for review before fabrication of any equipment.
- C. Shop drawings, cuts, sheets, and other data shall bear the Contractor's stamp of approval as an indication that he has examined them and found thereon complete information as to the space requirements, electrical characteristics, power consumption, suitability to system design, and considers the material or equipment to fully meet the specifications.
- D. Review of shop drawings will be general and will not relieve the Contractor from the responsibility for quantities, for proper fitting and construction of the work, or from furnishing materials and work required by the contract which may not be indicated on the shop drawings when accepted.
- E. All materials and equipment shall be new, of best quality and grade, all subject to Engineer's review. None shall be used until they have been reviewed. Use product of one manufacturer where two or more items of same kind of equipment are required. Reuse existing equipment only where specifically indicated.
- F. Submit under provisions of Section 013300 a list of proposed manufacturer's and suppliers of all items of mechanical equipment for the Engineer's review. Submittals will not be processed until this list has been reviewed.

1.5 REGULATIONS AND PERMITS

- A. Perform all work in accordance with the applicable regulations of N.F.P.A., all State and Municipal building ordinances, codes and regulations and any insuring agency having jurisdiction.
- B. Furnish required certificates of approval. Obtain and pay for all required fees, permits and inspections.
- C. Within 30 days after award of Contract, make application for inspection service, simultaneously filing a copy of the application with the Architect as proof of having requested this service.

1.6 GUARANTEES

- A. Guarantee complete mechanical installation free of all defects of material, equipment and workmanship for one year beginning from date of final acceptance of work. During this year be responsible for proper adjustment of all systems, equipment and devices installed by Contractor and correct all defects or maladjustments promptly without additional expense to Owner. This shall not include normal maintenance, care and operation of the systems.
- B. Contractor's attention is directed to guarantee periods greater than one year on certain items of equipment. These requirements are spelled out in detail in the Articles covering the specific equipment.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Furnish manual containing a brief description of each system. Include explicit instructions for operating the systems. Provide under provisions of Section 017823.
- B. In addition, furnish the following information in the manual:
 - 1. Manufacturer's printed operating and maintenance instructions, parts lists, illustrations and diagrams for each piece of equipment.
 - 2. A complete schedule of periodic servicing and lubrication requirements for all equipment.
 - 3. One copy of each shop drawing and Contractor's record drawings, and record control diagrams.
- C. Place these instructions in Architect's hands at least 30 days prior to date system will be turned over to Owner.
- D. After review by Architect, revise as required, and supply copy to Owner and Architect.

PART 2 PRODUCTS

2.1 ELECTRICALLY OPERATED EQUIPMENT AND CONTROLS

- A. Unless otherwise indicated:
 - 1. All starters, all disconnect switches and all work pertaining to equipment power connections are specified under Division 26, Electrical Work.
 - 2. All control circuit wiring, including all electrical interlocking, relay wiring, remote controls and temperature controls shall be provided under Division 23, and shall be in conformance with the requirements of Division 26.
 - 3. Provide all control devices suitable for operation on a maximum of 120 volt service.
 - 4. Where applicable, all equipment used shall bear the label of the Underwriter's Laboratories, Inc. securely attached.

2.2 MOTOR

- A. Motors for all equipment specified under this Section of the Specification shall be provided with the equipment.

- B. Unless specifically noted otherwise, all motors 1/2 HP and over shall be suitable for 480 volts, 3 phase, 60 hertz current, and those under 1/2 HP for 120 volts, single phase, 60 hertz current. All motors shall be equipped with grease-packed ball bearings.
- C. Fractional horsepower motors, 1/12 horsepower and larger, shall be permanently split capacitor or split phase. Shaded pole motors will only be acceptable for motors smaller than 1/12 horsepower.
- D. Where a motor supplied differs from the motor indicated for a certain piece of equipment, and the difference requires a change in starter, feeder, branch circuit or other electrical items, include the cost of such electrical changes under the Section of the Specifications wherein the particular piece of equipment is specified.
- E. Design motors in accordance with NEMA standards and affix to each a nameplate accurately listing all pertinent data. Each motor shall have sufficient capacity to start and operate the machine it drives without exceeding the motor nameplate rating at the speed specified or at any speed or load which may be obtained by the drive actually furnished. Except as noted, rate all motors for continuous duty at 100% of rated capacity. The NEMA standard service factor may be applied only to motors having water or refrigerant cooling. The indicated motor horsepowers are those estimated to be required by the driven equipment when operating at specified duties and efficiencies and are to be used to determine electrical feeder sizes. If the actual horsepower required for the equipment proposed to be furnished is greater than the indicated horsepower, it shall be provided at no additional expense to the Owner; and equally, if it is less, no credit shall accrue to the Owner.
- F. Unless otherwise indicated, polyphase motors shall be NEMA Design B, general purpose, squirrel cage, single speed, open drip proof, induction type, with Class B Insulation, stamped with NEMA Design B letter designation. Motors 20 horsepower and above shall be high efficiency type, 92% efficiency minimum. Motors connected to variable frequency drives shall be inverter duty rated.
- G. Single phase motors, open, capacitor start type.
- H. Provide motors with adjustable V-belt drives with a cast iron or steel base, slide rail and adjustable screw device.
- I. V-Belt Drives: Sheave diameters shall not be less than the drive manufacturer's minimum recommended diameter for various belt cross-sections. Belt velocity must lie within the 2500 fpm to 4000 fpm range. The NEMA minimum sheave diameter is not acceptable.
- J. Alignment of motors and drives and placing motors and equipment on foundations ready for operation shall be included in the work of the Section wherein the particular equipment is specified.

PART 3 EXECUTION

3.1 WORKMANSHIP

- A. Install all materials and equipment in a neat and workmanlike manner. When directed, remove, replace, at Contractor's expense, all work not presenting an orderly, reasonable neat or workmanlike appearance or work failing to meet performance requirements.
- B. Coordinate all work and cooperate with other trades in building to facilitate proper and intelligent execution of work.

3.2 MANNER OF INSTALLATION

- A. Install all piping and equipment to permit easy access to all valves, dampers, traps and other equipment requiring periodic servicing. Provide extension devices and remote operators as necessary for all valves and lubrication points which require frequent service, adjustment or control and which cannot be located in a readily accessible and safe place.
- B. Unless otherwise directed, or in mechanical rooms, conceal all piping. In all cases, install piping to follow lines of building and to allow maximum headroom consistent with proper pitch.

3.3 PROTECTION OF THE WORK:

- A. Cover openings in piping and temporarily seal to protect from contamination.
- B. Protect materials and equipment from damage due to environmental conditions. Use protective cover, and protect from surface water using raised platforms.
- C. Protect unfinished work at the end of each work day from damage contamination and moisture, by the use of plugs, caps, or covers.
- D. Protect piping from freezing conditions during the various stages of construction.
- E. Protect piping and valves from damage pending performance of systems tests.
- F. Protect installed thermometers and gauges from accidental damage by construction activity.

3.4 LOCATION OF EQUIPMENT:

- A. The mechanical sheets of the Contract Drawings are diagrammatical and not intended for use in determining the exact locations of the components of mechanical and electric systems.
- B. Equipment final locations will be determined by the equipment finally approved for installation. Final location of equipment will be determined by tube removal spaces, access and clearances required. Final layout shall be submitted for approval.
- C. Do all cutting and patching required for the installation of plumbing piping and equipment. Refer to Section 024119 for specific requirements.

3.5 CLEANING OF SYSTEMS

- A. After satisfactory completion of pressure tests and before permanently connecting fixtures, equipment, traps, strainers and other accessory items, thoroughly clean all systems. Remove all burrs, cuttings and waste. Blow and flush piping until interiors are free of foreign matter. Remove mill oil from steel piping by flushing with a mixture of detergent and non-foaming agent.
- B. Clean all strainers and dirt pockets prior to test, after tests and as often thereafter as necessary to guarantee no system stoppage, either whole or partial, by end of guarantee period.
- C. Should any system be stopped with refuse, which entered the system during construction is discovered after acceptance, pay for all labor and materials required to locate and remove the obstruction and replace and repair all work in any way disturbed.
- D. Remove all rust and thoroughly clean all surfaces to be insulated or painted.

- E. Leave all systems in clean, perfect condition and in complete running order.

3.6 FIELD INSTRUCTION

- A. Upon completion of work, furnish services of a competent representative to instruct Owner's representative in the proper operation and maintenance of all elements of the plumbing systems. Instructor must be approved by Architect.
- B. Spend not less than one four-hour day in such formal instruction and if necessary, to fully prepare the owner to operate and maintain the systems, such additional time as may be directed by the Architect.
- C. The specified day of instruction shall occur after thirty days operation by the Owner's representative.

3.7 EXCAVATION AND BACKFILL

- A. Do all excavating and backfilling necessary to install all underground mechanical work.
- B. Support and protect all pipes, ducts, cables or structures when such obstructions are uncovered. Repair all damage at contractor's expense.
- C. Establish all required lines and grades; be responsible for correctness thereof. Check elevation of sewers before starting.
- D. Excavate trenches to widths specified herein and to leave vertical sides. Where, under special circumstance, trenches with sloping sides are permitted, slope only to a plane one foot above top of pipe. From this plane to bottom of trench, make sides of trench vertical. Grade bottom of trenches accurately to provide uniform bearing and support on undisturbed earth along entire length of each section of pipe. Where pipe is not encased in concrete, support bottom quadrant fully and uniformly on a firm foundation; finish trench bottom by hand, shaping a groove from the barrel and scooping out hub holes. In lieu of hand shaping, or where rock excavation is required, excavate mechanically 3 to 4 inches below invert of line. Backfill overdepth with firmly compacted sand or fine gravel and then embed lower quadrant of pipe and shape hub holes as specified above. Except as specified herein, take care not to excavate below minimum required depths. Backfill unauthorized overdepths as specified for rock excavation. Where concrete encasement is specified, leave bottom of trench clean, smooth and flat. In all cases wherever wet or otherwise unstable soil, as determined by the Architect, is encountered excavate to such increased depth as may be directed. Then backfill to required level and form with firmly compacted sand or fine gravel.
- E. From a plane one foot above top of pipe to bottom of trench, make trench width at least 6 inches, but in no case more than 12 inches, wider on each side of pipe than the greatest external pipe diameter measured over the hubs. Where sheeting or shoring is used, measure minimum width between closest interior faces of sheeting or shoring as driven.
- F. Unless otherwise indicated or directed excavate trenches to depth sufficient to give 36 inch minimum cover.
- G. Make excavations for manholes, tanks and similar structures sufficiently large to leave at least 12 inches clear between their outer surfaces and the embankment or sheeting, if sheeting is used. Backfill any overdepth excavation with firmly compacted sand or fine gravel.

- H. Keep excavated areas free of water. Do such grading as may be necessary to prevent surface water from flowing into trenches or other excavations; remove all water accumulating therein by pumping, bailing or other approved method.
- I. Provide all sheeting, shoring and bracing necessary for protection of work and safety of personnel and compliance with the latest OSHA and MOSHA Regulations. Bracing shall be of approved size and quality.
- J. Remove all excavated materials not required or not suitable for backfill.
- K. Provide guard rails, lamps, flags or other safeguards as directed and adequate temporary crossovers for pedestrian and vehicular traffic. Remove when necessity for such protection ceases.
- L. Protect trees by means of boxing, guying or other methods. Sustain in place and protect from direct or indirect injury any and all property and structures. Take care to prevent debris or other materials from entering existing sewers and drains. Carry on work so as not to interfere with their function.
- M. Backfilling: As soon as pipe is laid, carefully place enough backfill on both sides of pipe to resist lateral movement. After joints have set, all required piping tests made, all water and debris removed from trenches, manually place backfill in 6" maximum depth layers up to a level of one foot over top of pipe. Exercise particular care to backfill simultaneously on both sides of pipes. Deposit all material up to a level of one foot over top of pipe with hand shovels. Compact each layer solidly before next layer is placed. Where pipe is specially coated for corrosion protection, take particular care not to damage coating. Deposit balance of backfill in one foot layers, thoroughly compacting each layer as it is placed. Backfill material shall consist of clean earth, loam, sandy clay, sand and gravel. Do not use frozen earth, large clods of earth or stone over 2-1/2" maximum dimension, organic material, debris, or cinders or other corrosive material.
- N. Where excavations are made in cinder fill, remove all excavated material and do not reuse. Make excavations wide enough and deep enough to permit placing a minimum of 10 inches of sand on all sides of pipe. Place and compact as specified above. Above the top 10 inches of sand, backfill with material and in manner specified above. No cinders may be used. At Contractor's option sand may be used for all backfill purposes unless specifically indicated otherwise.
- O. Settling: When backfilling is completed there shall be no settling. If any settling should occur, the Contractor shall correct it at no expense to the Owner.
- P. Restoring: Replace existing pavement, curbs, sidewalks, fences, sodding, shrubs, other appurtenances removed or damaged in connection with work. Restore to original condition. Sod must be replaced with sod. Any trees which are damaged shall be replaced by the Contractor with trees of similar type and size. For work in public streets, comply with municipal agencies' requirements or make necessary arrangement with such agency to make the repairs. Pay for all permits, inspection fees and cost of work so there will be no extra cost to Owner.

3.8 CUTTING AND PATCHING

- A. Do all cutting and patching necessary to install plumbing work.

- B. The cutting of walls, floors, partitions, slabs and decks for the passage and/or accommodation of piping and equipment, the closing of superfluous openings and the removal of all debris caused by said work under this contract shall be performed by the Contractor.

END OF SECTION 220500