

SECTION 220170 - OPERATION AND MAINTENANCE OF PLUMBING SYSTEMS**PART 1 - GENERAL****1.1 SUBMITTAL REQUIREMENTS**

- A. Closeout Submittal
 - 1. Operation and Maintenance Manuals: Include operation and maintenance manuals for all fixtures, equipment, and systems specified under Division 22.
- A. Shop Drawings
 - 1. As-Built Drawings: For recording installed conditions that deviate from design documents.

1.2 OPERATING AND MAINTENANCE MANUAL

- A. The contents of operating and maintenance manual shall include the following:
 - 1. Project Information Cover: Title of Project; Name and address of Owner, Design Professionals, Contractor of Record and Subcontractor; System name and specification references.
 - 2. Index: Contents of the manual.
 - 3. Warranty Statements: Furnish a warranty statement for each system, reiterating the terms of warranty identified within the Contract Documents, and identifying how the Owner is to obtain warranty service. Clearly identify which products are covered by Manufacturer warranties beyond the Contractor required minimum warranty period. The term of manufacturer warranty shall also be identified (e.g., 1-year parts and labor). Identify the date that the warranty for the system starts. This date shall be the date listed on the Certificate of Substantial Completion (if one was issued to the contractor specifically for the system) or the date listed on the Notice of Final Completion. Supply standard out-of-warranty service rates and service contact information.
 - 4. Bill of Materials: List of products supplied, and serial numbers of each product.
 - 5. Product Datasheets and Shop Drawings: Manufacturer datasheets and shop drawings for each product and system supplied.
 - 6. Manufacturer Owner / User Manuals: Manufacturer's Owner's or User's manual for each product, and Manufacturer's Installation instructions and other documentation supplied with the product.
 - 7. Spare and Replacement Parts Schedule:
 - a. Complete spare parts schedule for components of equipment furnished, which are not factory generic information, but accurate for the equipment provided.

8. Maintenance Procedures: Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; testing, aligning and adjusting instructions.
9. Function and Operating Descriptions: Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
10. Operating Procedures: Manufacturer's printed operating procedures including start-up, break-in, normal operating instructions, regulation, control, stopping, shutdown, and emergency instructions.
11. Test Reports and Checklists: Test reports, checklists, and other forms generated and completed for the Project.
12. Training Information: Copy of training outlines/agendas, training session handouts, training sign-in sheets, and signed delivery receipt for each training session recording; Separate USB drive, labeled, for audio/video-recorded instructions to Owner, for operations and maintenance for each system.
13. As-Built Drawings.

1.3 AS-BUILT DRAWINGS

- A. Obtain two complete sets of plumbing prints and use them to provide progress record drawings which are separate, clean, prints reserved for the purpose of showing a complete picture of the work as actually installed (including routing of conduit and cables). These drawings also serve as work progress report sheets. Make notations, neat and legible thereon daily as work proceeds. Make these drawings available for inspection at all times and keep them at the job at a location designated by the Owner's Representative.
- B. Maintain the clean, undamaged set of prints of drawings as well as a set of submittal drawings and coordination drawings. Mark the sets to show the actual installation where the installation varies from the Documents as originally shown. Include locations of underground and concealed items if placed other than shown on the Documents. Where shop drawings are used, record a cross-reference at the corresponding location on the Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
- C. Show changes in: size, type, capacity, etc., of material, device or piece of equipment, location of device or piece of equipment; location of source of building service systems; routing of piping, and/or other building services. Record location of concealed equipment, plumbing service work, piping, and other work by indication of measured dimensions to each line from readily identifiable and accessible walls, column lines or corners of building. Indicate approved substitutions, modifications, and actual equipment and materials installed.
- D. Affix near the titleblock on each drawing the Contractor's Company Name(s), signature of Contractor's Representative(s) and current date.

- E. For plumbing work installed below slabs, pavements, grade, etc., record location of nearby concealed water piping, sewers, wastes, vents, ducts, conduit and other piping, etc. by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building and from adjacent electrical work. Show invert elevation of underground plumbing work relative to work installed by other trades.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSTRUCTION OF THE OWNER'S PERSONNEL

- A. Provide instruction in the proper operation and maintenance of equipment that requires routine servicing. Include the following:
 - 1. Review of operation and maintenance manuals.
 - 2. Required tools.
 - 3. Lubricants.
 - 4. Spare parts.
 - 5. Cleaning.
 - 6. Hazards.
 - 7. Warranties and maintenance agreements.
- B. Demonstrate equipment and systems operation including the following:
 - 1. Start-up.
 - 2. Shut-down.
 - 3. Emergency conditions.
 - 4. Safety procedures.
 - 5. Setpoint and schedule adjustments.
 - 6. Economy and efficiency adjustments.

END OF SECTION 220170