

SECTION 01 78 23 OPERATING AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and Maintenance Documentation Directory.
 - 2. Record Product Data, Record Shop Drawings and SubSubcontractor /Sub-Subcontractor / Supplier/ Manufacturer Contact Information including, but not limited to the following:
 - a. Instruction Manuals Covering the Care, Preservation and Maintenance of Architectural Products and Finishes
 - b. Schedule of Finishes and Colors of Architectural Products
 - c. Warranties and Guarantees for Products Provided by each SubSubcontractor
 - 3. Operation Manuals for Systems, Subsystems, and Equipment.
- B. Related Sections:
 - 1. Document 00 72 53 - General Conditions (Design-Build)
 - 2. Section 01 33 00 - Submittal Procedures
 - 3. Section 01 77 00 - Closeout Procedures
 - 4. Section 01 78 39 - Project Record Documents
 - 5. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.02 REFERENCES

- A. [American Society of Heating, Refrigerating and Air-Conditioning Engineers \(ASHRAE\)](#) Publications:
 - 1. Guideline 4-2008 "Preparation of Operating and Maintenance Documentation for Building Systems".

1.03 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 SUBMITTALS

- A. Operating and Maintenance Manuals:
 - 1. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals:
 - a. Before Final Completion, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit one (1) draft copy of each manual to the Design-Builder for review. Include a complete index or table of contents of each manual.

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- b. After final inspection, make corrections or modifications to comply with the AOR's comments. Submit the specified number of copies of each approved manual to the Design-Builder within fifteen days of receipt of the AOR's comments.
 - 1) Operations and maintenance manuals will be required to be submitted prior to the processing of the final application for payment.
- 2. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by the University's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.
 - a. Final Submittal: Submit three (3) copies of each manual in hard copy final form.
 - b. Submit one copy in electronic Adobe "Portable Document Format" (PDF).
- 3. Drawings: Where Drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the Drawings and bind in with the text.
 - a. Where oversize Drawings are necessary, fold the Drawings to the same size as the text pages and use as a fold-out.
 - 1) If Drawings are too large to be used practically as a fold-out, place the Drawing, neatly folded, in the front or rear pocket of the binder. Insert a typewritten page indicating the Drawing title, description of contents and Drawing location at the appropriate location in the manual.

1.05 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.
- B. Where operating and maintenance manuals include information on installations by the Subcontractor and from their Sub-Subcontractors, the Subcontractor shall prepare the manuals, including collection, collation and binding of the material and submittal of data as specified.

PART 2 PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List all products, systems and equipment organized by their specification section number.
 - 2. Table of contents.
- B. List of Systems and Subsystems: List systems as categorized by the specifications section numbering. Systems are to be listed as a system only when the system has single source responsibility, otherwise individual components of that system will be categorized within their respective specification section. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized by specification section number.
- D. Tables of Contents: Include a table of contents for all manuals.
 - 1. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to [ASHRAE](#) Guideline 4-2008, "Preparation of Operating and Maintenance Documentation for Building Systems."

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2.02 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve within the binder or affix to the front face of the binder. Include the following information:
1. Subject matter included in manual.
 2. Name, number and address of Project.
 3. Name and address of University.
 4. Date of submittal.
 5. Name, address, and telephone number of Subcontractor.
 6. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents according to their specifications section number.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, (color: white) in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers (color: white) with plastic-covered tabs for each specification section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Sub-dividers: Each divided specification section will contain sub dividers for each product listed within the section.
 - a. Each sub-divider will be of a heavy weight type paper (color: dark green).
 - b. Each sub-divider will contain the following:
 - 1) The product name

- 2) The specification section
- 3) The sub-Subcontractors / installer name, address and contact numbers
and/or
- 4) The material suppliers name, address and contact numbers
and/or
- 5) The manufactures name, address and contact numbers
4. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
5. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
6. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and Drawing locations.

2.03 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. Copies of Applicable Shop Drawings and Product Data
 2. System, subsystem, and equipment descriptions.
 3. Performance and design criteria if Sub-Subcontractor is delegated design responsibility.
 4. Operating standards.
 5. Operating procedures.
 6. Operating logs.
 7. Wiring diagrams.
 8. Control diagrams.
 9. Piped system diagrams.
 10. Precautions against improper use.
 11. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.

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8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
 10. Sources of Required Maintenance Materials and Related Services
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures and certifications.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.04 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.

5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.05 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
1. All content should be "As-built" or record content.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's, supplier's and installer's name, address and contact numbers located on sub-divider.
 3. Size
 4. Color, pattern, and texture.
 - a. Color Schedules: Provide information showing manufacturer's color name and catalog number for all exposed finishes, including paint, carpet, wall coverings, and other finish materials.
 5. Material and chemical composition.
 6. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.

5. Repair instructions.
 6. Parts list if available
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.01 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: will be included within the respective Operations and Maintenance manual.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by University's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 2. Drawings should be sized to fit within the manuals as a bound insert. Either 8 ½" x 11" or 11" x 17".
 3. Comply with requirements of newly prepared Record Drawings in Section 01 78 39 "Project Record Documents."
- F. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

3.02 SCHEDULE OF REQUIRED DATA

- A. The following is a minimum list of required data to be provided in addition to items listed in the above paragraphs and as specified in individual Specification Sections.
1. Piping Systems:

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- a. Printed diagrams showing tagged valves.
- 2. HVAC Controls:
 - a. Printed diagrams and operating instructions.
- 3. Valves:
 - a. Type written directory of tagged valves.
- 4. Communications:
 - a. Point-to-point wiring diagrams and operating instructions.
- 5. Motor Control Centers:
 - a. Overload heater charts.
- 6. Equipment:
 - a. Operating instructions.

END OF SECTION 01 78 23

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