SECTION **01 78 23** - **OPERATION AND MAINTENANCE DATA**

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Government." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL

Retain or delete this article in all Sections of Project Manual.

* + - 1. SUMMARY

Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

Operation and maintenance documentation directory manuals.

Systems and equipment operation manuals.

Systems and equipment maintenance manuals.

Product maintenance manuals.

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Retain first subparagraph below to reference the Section that specifies preparation of material frequently included in operation and maintenance manuals.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

System: An organized collection of parts, equipment, or subsystems united by regular interaction.

* + - * 1. Subsystem: A portion of a system with characteristics similar to a system.
			1. CLOSEOUT SUBMITTALS

Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

Government will comment on whether content of operation and maintenance submittals is acceptable.

Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

Format: Submit operation and maintenance manuals in the following format:

Retain one or both subparagraphs below.

Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.

Submit 2 paper copies.

Retain "Initial Manual Submittal" Paragraph below, which facilitates completion of manuals prior to their use in demonstration and training applications specified in Section  01 79 00 "Demonstration and Training."

Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training for review by the Government.

* + - * 1. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Government   and Commissioning Authority will return copy with comments.

Correct or revise each manual to comply with Government’s and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Government’s and Commissioning Authority's comments and prior to commencing demonstration and training.

Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

* + - 1. FORMAT OF OPERATION AND MAINTENANCE MANUALS

Retain "Manuals, Electronic Files" or "Manuals, Paper Copy" Paragraph below, or both, based on type of deliverables required for operation and maintenance data. Retain first paragraph for projects requiring electronic manuals.

Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

Retain "Manuals, Paper Copy" Paragraph below for projects requiring paper copy manuals.

Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

If 2 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.

Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents,  and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. 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.

"Protective Plastic Sleeves" Subparagraph below provides protection for troubleshooting software diskettes used in some operation systems. Retain requirements if necessary.

Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.

Requirements in "Supplementary Text" and "Drawings" subparagraphs below are typical. Insert unique requirements, such as special paper or plastic lamination of important items for permanent preservation, if needed.

Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.

Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

Avoid placing loose, oversize drawings in binder pockets. Use reduced drawings or place folded drawings in labeled envelopes bound in manual.

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.

Consider other special requirements, such as using photographs instead of drawings to demonstrate unusual installations.

* + - 1. REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

Organization of Manuals: 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:

Title page.

Table of contents.

Manual contents.

Title Page: Include the following information:

Subject matter included in manual.

Name and address of Project.

Date of submittal.

Name and contact information for Contractor.

Name and contact information for Government.

Name and contact information for Commissioning Authority.

Names and contact information for major consultants to the Government that designed the systems contained in the manuals.

Cross-reference to related systems in other operation and maintenance manuals.

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.

Retain subparagraph below if paper copies of operation and maintenance data are required.

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.

"Manual Contents" Paragraph below describes typical requirements for binding copies of operation and maintenance manuals. Revise to suit Project.

Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

* + - * 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, "Preparation of Operating and Maintenance Documentation for Building Systems."
			1. OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

Delete this article for less-complex projects.

Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

* + - 1. SYSTEMS AND EQUIPMENT OPERATION MANUALS

In this article, include information needed for daily operation and management of systems and equipment.

Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Government's operating personnel.

Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.

Performance and design criteria if Contractor has delegated design responsibility.

Operating standards.

Operating procedures.

Operating logs.

Wiring diagrams.

Control diagrams.

Piped system diagrams.

Precautions against improper use.

License requirements including inspection and renewal dates.

Descriptions: Include the following:

Product name and model number. Use designations for products indicated on Contract Documents.

Manufacturer's name.

Equipment identification with serial number of each component.

Equipment function.

Operating characteristics.

Limiting conditions.

Performance curves.

Engineering data and tests.

Complete nomenclature and number of replacement parts.

Operating Procedures: Include the following, as applicable:

Startup procedures.

Equipment or system break-in procedures.

Routine and normal operating instructions.

Regulation and control procedures.

Instructions on stopping.

Normal shutdown instructions.

Seasonal and weekend operating instructions.

Required sequences for electric or electronic systems.

Special operating instructions and procedures.

Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

* + - * 1. Piped Systems: Diagram piping as installed and identify color coding where required for identification.
			1. SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Government's operating personnel.

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 warranties and bonds as described below.

Revise "Source Information" Paragraph below to suit Project. For simple projects that require few manuals, this information may be included on title page.

* + - * 1. 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 and drawing or schedule designation or identifier where applicable.
				2. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

Standard maintenance instructions and bulletins; 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.

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.

Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.

Identification and nomenclature of parts and components.

List of items recommended to be stocked as spare parts.

Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

Test and inspection instructions.

Troubleshooting guide.

Precautions against improper maintenance.

Disassembly; component removal, repair, and replacement; and reassembly instructions.

Aligning, adjusting, and checking instructions.

Demonstration and training video recording, if available.

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.

Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

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.

Retain "Maintenance Service Contracts" Paragraph below if service contracts are specified for systems, subsystems, or equipment.

* + - * 1. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

"Warranties and Bonds" Paragraph below provides information if product fails. For specific products, additional information may be necessary.

* + - * 1. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

Include procedures to follow and required notifications for warranty claims.

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.

Retain first subparagraph below. Including record Drawings in operation and maintenance manuals is not recommended. See Evaluations.

Do not use original project record documents as part of maintenance manuals.

* + - 1. PRODUCT MAINTENANCE MANUALS

Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

Revise "Content" Paragraph below to suit Project. For simple projects that require few manuals, this information may be included on title page.

* + - * 1. 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.
				2. 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 and drawing or schedule designation or identifier where applicable.
				3. Product Information: Include the following, as applicable:

Product name and model number.

Manufacturer's name.

Color, pattern, and texture.

Material and chemical composition.

Reordering information for specially manufactured products.

Maintenance Procedures: Include manufacturer's written recommendations and the following:

Inspection procedures.

Types of cleaning agents to be used and methods of cleaning.

List of cleaning agents and methods of cleaning detrimental to product.

Schedule for routine cleaning and maintenance.

Repair instructions.

Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

"Warranties and Bonds" Paragraph below provides information if product fails. For specific products, additional information may be necessary.

* + - * 1. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

Include procedures to follow and required notifications for warranty claims.

1. PRODUCTS (Not Used)
2. EXECUTION (Not Used)

**END OF SECTION**