# SECTION 01 7823

**OPERATION AND MAINTENANCE DATA**

PART 1 - GENERAL

* 1. RELATED DOCUMENTS
     1. The Contract Documents in their entirety, including the Drawings, Specifications, Construction Contract Clauses, and any other documents issued as part of the Contract, apply to this Section. All submittal documentation shall be submitted in a PDF format plus program file and hard copies as required.
  2. SUMMARY
     1. Section includes administrative and procedural requirements for preparing operation and maintenance manuals and Facility Asset Data including, but not limited to, the following:
        1. Operation and maintenance documentation directory.
        2. Emergency manuals.
        3. Operation manuals for systems, subsystems, and equipment.
        4. Product maintenance manuals.
        5. Systems and equipment maintenance manuals
        6. Transfer of Building Equipment Asset Facility Data**.**
        7. Collection and Handover of Facility Data**.**
        8. Equipment and System Warranties

* + 1. Related Requirements:
       1. Division 01 section BUILDING INFORMATION MODELING (BIM) REQUIREMENTS for building information modeling (BIM) requirements.
       2. Division 02 through 33 sections for specific operation and maintenance manual requirements for the work in those sections.
    2. Contractor’s Responsibility:
       1. Develop deliverables required in this Section.
       2. Contractor is solely responsible for the quality and accuracy of all documentation and submittals of this Section.

* 1. DEFINITIONS
     1. Facility Breakdown Structure: a system-oriented hierarchical decomposition of a facility into smaller components. Typically, the facility breakdown structure is based on disciplines and trades described by CSI Master Format 2016.
     2. Facility Asset Data: Pre-Defined set of attributes that defines various characteristics of an object.
     3. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, and catalog information illustrating a material, product, or system to be installed on this project.
     4. Material Safety Data Sheets: Instructions, warnings, and recommended and required handling and use procedures for individual hazardous materials published by the product manufacturer.
     5. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
     6. Subsystem: A portion of a system with characteristics similar to a system.

* 1. QUALITY ASSURANCE
     1. Maintenance Manual Preparation: In preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.
        1. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.
        2. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings in a clear and understandable format, reference “OPDC CAD Guidelines” and/or “OPDC BIM Guidelines” for additional requirements.
     2. Instructions / Training for SI Personnel: For instruction of the SI’s operations and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the building equipment or system involved.
        1. Prior to final inspection, instruct SI personnel in operation, adjustment, and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.
           1. For equipment that requires seasonal operation, provide similar instruction during other seasons.
           2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.
           3. Video Training may be required based on complexity, COTR to determine if required.
  2. SUBMITTALS
     1. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of section submittals. Submit reviewed manual content formatted and organized as required by this section.
        1. COTR will comment on whether content of operations and maintenance submittals are acceptable.
        2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
     2. Format: Submit operations and maintenance manuals in the following format:
        1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to COTR.
           1. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically bookmarked operation and maintenance directory.
        2. Three paper copies. Include a complete operation and maintenance directory.
     3. Initial Manual Submittal: Submit draft copy of each manual within 45 working days of receipt of approved equipment submittal.
        1. COTR will comment on whether general scope and content of manual are acceptable and will return one copy within 15 working days of receipt.
     4. Final Manual Submittal: Submit each manual in final form at least 45 working days before commencing demonstration and training and/or final inspection.
        1. After demonstration and training and/or final inspection COTR will return one copy with comments within 15 working days.
        2. Submit final approved manual(s) to the COTR within 15 working days of receipt of COTR comments.
     5. Warranties
        1. Submittal: Submit written warranties on request of COTR for designated portions of the work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
        2. Partial Occupancy: Submit properly executed warranties within 15 working days of completion of designated portions of the work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
     6. Facility Asset Data:
        1. Submittals:
           1. Submit SI Facility Asset Spreadsheet(s) with equipment submittal(s) for review / approval.
           2. Submit monthly updates of the SI Facility Asset Spreadsheet(s) that include data, assets and attributes of all components being installed and / or removed. Spreadsheet(s) should reflect work completed the previous month.

PART 2 - EXECUTION

* 1. OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY
     1. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
        1. List of documents.
        2. List of systems and subsystems.
           1. List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
        3. List of equipment.
           1. List equipment for each system alphabetically organized by system. For pieces of equipment not part of system, list alphabetically in separate list.
        4. Table of contents.
           1. Include a table of contents for each manual.
     2. 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."
  2. REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS
     1. 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: Include the following information
           1. Name and address of Project.
           2. Name and address of Owner: SMITHSONIAN INSTITUTION, WASHINGTON, DC
           3. Date of submittal.
           4. Subject matter included in manual
           5. Name and contact information for Contractor and Sub-Contractor(s).
           6. Name and contact information for Architect and Engineer(s)
           7. Cross-reference to related systems in other operation and maintenance manuals.
        2. Table of contents.
           1. 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.
           2. 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.
        3. Manual contents.
           1. 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.
     2. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
        1. 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.
        2. File Names and Bookmarks: Enable bookmarking of 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.
     3. Manuals, Hard Copy: Submit manuals in bound and labeled volumes.
        1. Three full sets of Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 215-by-273mm (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.
           1. 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.
           2. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
        2. 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.
        3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
        4. Supplementary Text: Where written material is required as part of the manual use the manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typed, on 215-by-273mm (8-1/2-by-11-inch) white bond paper.
        5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
           1. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
           2. 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 typed pages indicating drawing titles, descriptions of contents, and drawing locations.
  3. EMERGENCY MANUALS
     1. Content: Organize manual into a separate section for each of the following:
        1. Type of emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
           1. Fire.
           2. Flood.
           3. Gas leak.
           4. Water leak.
           5. Power failure.
           6. Water outage.
           7. System, subsystem, or equipment failure.
           8. Chemical release or spill.
        2. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
        3. Emergency Procedures: Include the following, as applicable:
           1. Instructions on stopping.
           2. Shutdown instructions for each type of emergency.
           3. Operating instructions for conditions outside normal operating limits.
           4. Required sequences for electric or electronic systems.
           5. Special operating instructions and procedures.
  4. OPERATION MANUALS
     1. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
        1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents and SI Facility Asset Spreadsheet(s). Include the following:
           1. Asset ID # (SI Provided)
           2. Asset Name (SI Provided)
           3. Product name and model number. Use designations for products indicated on Contract Documents.
           4. Manufacturer's name.
           5. Equipment identification with serial number of each component.
           6. Equipment function.
           7. Operating characteristics.
           8. Limiting conditions.
           9. Performance curves.
           10. Engineering data and tests.
           11. Complete nomenclature and number of replacement parts.
        2. Performance and design criteria if Contractor has delegated design responsibility.
        3. Operating standards.
        4. Operating procedures, Include the following as applicable:
           1. Startup procedures.
           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.
        5. Operating logs.
        6. Wiring diagrams.
        7. Systems and Equipment Controls
           1. Describe the sequence of operation, and diagram controls as installed.
        8. Piped systems diagrams.
        9. Precautions against improper use.
        10. License requirements including inspection and renewal dates.
            1. Include copy of all final inspection reports
     2. Coordination Drawings: Provide each Contractor's Coordination Drawings.
        1. Provide as-installed color-coded piping diagrams, where required for identification.
     3. Valve Tags:
        1. Provide charts of valve tag numbers, with the location and function of each valve.
     4. Circuit Directories:
        1. For electric and electronic systems, provide complete circuit directories of panel boards, including the following: a. Electric service.
           1. Controls.
           2. Communication.
  5. PRODUCT MAINTENANCE MANUALS
     1. Provide one section for architectural products, including applied materials and finishes, and a second for products designed for moisture- protection and products exposed to the weather.
        1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.
     2. ARCHITECTURAL PRODUCTS
        1. Content: Organize manual into a separate section for each product, material, and finish. Include the following as applicable:
           1. Product information
           2. Maintenance procedures
           3. Repair materials
           4. 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.

* + - 1. Product Information: Include the following, as applicable:
         1. Product name and model number.
         2. Manufacturer's name.
         3. Color, pattern, and texture.
         4. Material and chemical composition.
         5. Reordering information for specially manufactured products.
      2. Care and 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.
      3. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
    1. MOISTURE-PROTECTION AND WEATHER EXPOSED PRODUCTS
       1. Content: Organize manual into a separate section for each product, material, and finish. Include the following as applicable:
          1. Product information
          2. Maintenance procedures
          3. Repair materials
          4. 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.

* + - 1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:
         1. Applicable standards.
         2. Chemical composition.
         3. Installation details.
         4. Inspection procedures.
         5. Maintenance information.
         6. Repair procedures.
  1. SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS
     1. Content: Organize manual into a separate section for each system, subsystem, and piece of equipment not part of a system, include the following as applicable:
        1. Source information
           1. 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: Including the following information for each component part or piece of equipment:
           1. Standard 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.
        3. 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 video recording, if available.
        4. Maintenance and Service schedules
           1. 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, semi-annual, and annual frequencies.

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

* + - 1. Spare Parts List and Source Information
         1. 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.
      2. Maintenance service contracts
         1. Include copies of maintenance agreements with name and telephone number of service agent.
  1. WARRANTIES
     1. Submission of original warranties for all products, equipment, and systems.
        1. The Contractor shall assemble original warranty certificates or notarized copies of warranty certificates executed by the Contractor, Subcontractors, suppliers, and manufacturers in a tab-indexed, three-ring loose-leaf binder with a durable plastic cover. Provide electronic copy, in PDF format. The table of contents shall identify:
           1. Asset ID # (SI Provided)
           2. Asset Name (SI Provided)
           3. Date of Substantial Completion
           4. Expiration date of the warranty
           5. Supplier
           6. Vendor
           7. Installing Contractor
        2. Each warranty certificate or bond shall identify the date(s) for:
           1. Substantial Completion status in accordance with project closeout requirements.
           2. Beginning and ending of the warranty period.
           3. The Contractor shall provide any coincidental product warranty, which is available on a product incorporated in the Work, but for which the warranty is not specifically required by the contract documents.
           4. List(s) of circumstances and conditions that would affect validity of warranties or bonds.
           5. Include procedures to follow and required notifications for warranty claims.
           6. Provide any extended warranties offered by manufactures and/or installers (including labor) for all equipment for Owner to review.
        3. Warranty of Construction: The Contractor shall warrant that the work performed under this contract conforms to the contract requirements and is free of any defect in equipment, materials, design furnished or workmanship performed by the Contractor or any subcontractor or supplier at any tier. Unless otherwise stated in the technical sections of the Specifications, the warranty of the Work shall continue for a period of one (1) year from the date of Final Completion status. If the Smithsonian takes partial occupancy before Final Completion, then the warranty for that portion shall be in effect for a period of one (1) year beginning on the date of Substantial Completion for that portion of the Work

* 1. FACILITY ASSET DATA
     1. The following building information, obtained and developed by the Architect, Engineer(s) and/or SI during the design phase, may be available to the Contractor:
        1. SI Facility Asset Data Spreadsheet (.xlsx)
     2. Collect, verify, and provide Facility Asset Data for import by the SI into the TRIRIGA Facility Center data system. Utilizes templates as provided by SI and procedures described below:
        1. Contractor will complete / verify information on spreadsheet provided by SI
        2. Submit SI Facility Asset Data Spreadsheet(s) with equipment submittal(s) for review / approval
        3. Provide monthly SI Facility Asset Data Spreadsheet updates. Spreadsheet(s) should reflect work completed the previous month. Monthly Updates to include:
           1. Attribute Updates
           2. Submittal Package approved (Yes or No)
           3. Installed Date
           4. In Service Date
           5. Out of Service Date for Assets being removed or retired.
        4. SI to review for Accuracy and Status and will upload into FC as required.
        5. Meeting between SI COTR, FM Asset Manager and Contractor to be scheduled.
           1. SI would return spreadsheet(s) and Asset Tags with Asset ID# and Asset Name
           2. Labels to be placed on equipment by FM Asset Manager in coordination with contractor and OPDC COTR.
        6. Contractor will input the required attributes into Final As-Built Model per 01 section BUILDING INFORMATION MODELING (BIM) REQUIREMENTS
     3. Verify and update required data attributes for assets, as needed to conform to As-Built conditions.

PART 3 - EXECUTION

* 1. MANUAL PREPARATION
     1. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
     2. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
     3. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
     4. 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 Owner's operating personnel.
     5. 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.
     6. 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. WARRANTIES
     1. The Contractor shall assemble original warranty certificates or notarized copies of warranty certificates executed by the Contractor, Subcontractors, suppliers, and manufacturers
  3. FACILITY ASSET DATA
     1. Design Intent Facility Asset Data Spreadsheet will be provided to the Contractor to be used in the development of Facility Asset Data. The Design Intent Facility Asset Data Spreadsheet communicates the creative objectives of the Architect, and is not intended to be used for direct import into Facility Center in that the assets and attributes contained within it are suitable as a basis of design only, and will require verification, updating, and supplementation by the Contractor.
     2. Facility Asset Data shall include attributes for assets as defined in spreadsheet(s) provided by SI. Please refer to the SI Facility Asset Data Spreadsheet for data fields (parameters) and requirements.

**END OF SECTION 01 7823**