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USACE / NAVFAC / AFCEC / NASA UFGS-01 78 23 (July 2006)  
Change 2 - 08/14

Preparing Activity: NAVFAC

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Superseding  
UFGS-01 78 23 (April 2006)

## UNIFIED FACILITIES GUIDE SPECIFICATION

References are in agreement with UMRL dated October 2014

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### SECTION TABLE OF CONTENTS

#### DIVISION 01 - GENERAL REQUIREMENTS

#### SECTION 01 78 23

#### OPERATION AND MAINTENANCE DATA

07/06

#### PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA
  - 1.2.1 Package Quality
  - 1.2.2 Package Content
  - 1.2.3 Changes to Submittals
  - 1.2.4 Review and Approval
  - 1.2.5 O&M Database
- 1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES
  - 1.3.1 Operating Instructions
    - 1.3.1.1 Safety Precautions
    - 1.3.1.2 Operator Prestart
    - 1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures
    - 1.3.1.4 Normal Operations
    - 1.3.1.5 Emergency Operations
    - 1.3.1.6 Operator Service Requirements
    - 1.3.1.7 Environmental Conditions
  - 1.3.2 Preventive Maintenance
    - 1.3.2.1 Lubrication Data
    - 1.3.2.2 Preventive Maintenance Plan and Schedule
    - 1.3.2.3 Cleaning Recommendations
  - 1.3.3 Corrective Maintenance (Repair)
    - 1.3.3.1 Troubleshooting Guides and Diagnostic Techniques
    - 1.3.3.2 Wiring Diagrams and Control Diagrams
    - 1.3.3.3 Maintenance and Repair Procedures
    - 1.3.3.4 Removal and Replacement Instructions
    - 1.3.3.5 Spare Parts and Supply Lists
  - 1.3.4 Corrective Maintenance Work-Hours
  - 1.3.5 Appendices
    - 1.3.5.1 Product Submittal Data
    - 1.3.5.2 Manufacturer's Instructions
    - 1.3.5.3 O&M Submittal Data
    - 1.3.5.4 Parts Identification
    - 1.3.5.5 Warranty Information

- 1.3.5.6 Personnel Training Requirements
- 1.3.5.7 Testing Equipment and Special Tool Information
- 1.3.5.8 Testing and Performance Data
- 1.3.5.9 Contractor Information
- 1.4 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES
- 1.5 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES
  - 1.5.1 Data Package 1
  - 1.5.2 Data Package 2
  - 1.5.3 Data Package 3
  - 1.5.4 Data Package 4
  - 1.5.5 Data Package 5

PART 2 PRODUCTS

PART 3 EXECUTION

-- End of Section Table of Contents --

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## SECTION 01 78 23

### OPERATION AND MAINTENANCE DATA 07/06

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NOTE: This guide specification covers the requirements for operation and maintenance (O&M) data normally shipped by a manufacturer at the same time as his associated piece of equipment is shipped. The requirements specified herein are intended to require those items of O&M data normally expected from the manufacturer of the associated equipment.

Use this section on all projects. In addition, use Specification Section 01 78 24.00 20 FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI) for projects within the threshold of ECB 2014-01 and others as requested by the local PW office. Consult the Administering Public Works Office on all construction contracts to determine if Section 01 78 24.00 20 should also be used.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

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## PART 1 GENERAL

### 1.1 REFERENCES

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NOTE: NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.  
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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971 (2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings

### 1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA

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NOTE: The provisions of this section apply to those items requiring operation and maintenance data by the technical sections and to those items being commissioned. The technical sections should include a paragraph entitled "SD-10 Operation and Maintenance Data," stating: "Submit Operation and Maintenance Data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, Data Package (1) (2) (3) (4) (5). The O&M requirements specified herein may be supplemented by operation, maintenance, and repair requirements peculiar to certain equipment specified in the pertinent technical section. Information on green lease and maintenance agreements with the manufacturer, required for certain equipment and materials, shall be included as part of this supplemental O&M information. Submitting Data Packages 3, 4 or 5 as O&M Manuals for commissioned systems contributes to the following LEED credit: EA3.  
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Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors must compile and prepare data and deliver to the Contractor prior to the training of Government personnel. The Contractor must compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

### 1.2.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

### 1.2.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections must use Data Package [3] [4] [5]. Commissioned items with a Data Package 1 or 2 requirement must use instead Data Package [3] [4] [5].

### 1.2.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data must be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

### 1.2.4 Review and Approval

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**NOTE: Independent, third-party CA review of Contractor submittals for commissioned systems and equipment contributes to the following LEED credit: EA3. Edit to reflect who is providing CA services.**  
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The [Contractor's Commissioning Authority (CA)] [Government's Commissioning Authority (CA)] must review the commissioned systems and equipment submittals for completeness and applicability. The [CA] [Government] must verify that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. [The CA must communicate deficiencies to the Contracting Officer. Upon a successful review of the corrections, the CA must recommend approval and acceptance of these O&M manuals to the Contracting Officer.] This work is in addition to the normal review procedures for O&M data.

### 1.2.5 O&M Database

Develop a database from the O&M manuals that contains the information required to start a preventative maintenance program.

## ] 1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

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**NOTE: O&M Data needed for any product, system, or piece of equipment depends upon the complexity of**

that item. The types of O&M Data, defined below, are grouped into Data Packages in the paragraph titled "Schedule of Operation and Maintenance Data Packages." The Data Package numbers, in turn, appear in the technical guide specifications.

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#### 1.3.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

##### 1.3.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

##### 1.3.1.2 Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

##### 1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

##### 1.3.1.4 Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

##### 1.3.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

##### 1.3.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

##### 1.3.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

#### 1.3.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance

to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

#### 1.3.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications.
- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

#### 1.3.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

#### 1.3.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

#### 1.3.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

##### 1.3.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

##### 1.3.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

#### 1.3.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

#### 1.3.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

#### 1.3.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

#### 1.3.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

#### 1.3.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

##### 1.3.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

##### 1.3.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

##### 1.3.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

##### 1.3.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations



and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

#### 1.3.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

#### 1.3.5.6 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

#### 1.3.5.7 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

#### 1.3.5.8 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

#### 1.3.5.9 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

### 1.4 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES

Include Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply all functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of all checkout tests and calibrations performed by the Contractor (not Cx tests).

- [ d. Full points list. A listing of rooms shall be provided with the following information for each room:
  - (1) Floor
  - (2) Room number
  - (3) Room name
  - (4) Air handler unit ID
  - (5) Reference drawing number
  - (6) Air terminal unit tag ID
  - (7) Heating and/or cooling valve tag ID
  - (8) Minimum cfm
  - (9) Maximum cfm]
- [ e. Full print out of all schedules and set points after testing and acceptance of the system.]
- [ f. Full as-built print out of software program.]
- [ g. Electronic File:
  - (1) Assemble each manual into a composite electronically indexed file in PDF format. Provide HDD's, DVD's or CD's as appropriate, so that each one contains all maintenance and record files, and also the Project Record Documents and Training Videos, of the entire program for this facility.
  - (2) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
  - (3) Link the index to separate files within the composite of files. Book mark maintenance and record files, that have a Table of Contents, according to the Table of Contents]
- [ h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.]

#### 1.5 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

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**NOTE:** The type of O&M data needed for any product, system, or piece of equipment depends upon the complexity of that item. If not, the specifier, guided by this criteria note, shall include the appropriate Data Package number in the technical section; the Data Package Number shall be selected from the choices 1 through 5 below. Custom or other non-SpectsInTact- based technical specifications may be missing the Data Package numbers

Data Package 1 would typically be used for

architectural items requiring simple but specific maintenance and replacement; for example, acoustical ceiling, floor tile or carpeting system.

Data Package 2 would be used for an item that is less simple; for example, an item having a motor and some sequence of operation such as a refrigerated drinking fountain.

Data Package 3 would be used for a complex piece of equipment, having a specific troubleshooting sequence, but one which does not require an operator on watch; for example, HVAC temperature controls.

Data Package 4 would be used for an extremely complex piece of equipment, having an extensive sequence of operation, a complex troubleshooting sequence and one requiring frequent operator attention; at least for start-up and shut-down. Examples of this case would be small boilers and small diesel generator sets.

Finally, Data Package 5 would be used for electrical equipment, components or systems on which, wiring and control diagrams are needed for operation, maintenance or repair. Examples of this case are 400 Hz frequency converters, annunciator panels and cathodic protection systems.

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Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.5.1 Data Package 1

- a. Safety precautions
- b. Cleaning recommendations
- c. Maintenance and repair procedures
- d. Warranty information
- e. Contractor information
- f. Spare parts and supply list

1.5.2 Data Package 2

- a. Safety precautions
- b. Normal operations
- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan and schedule

- f. Cleaning recommendations
- g. Maintenance and repair procedures
- h. Removal and replacement instructions
- i. Spare parts and supply list
- j. Parts identification
- k. Warranty information
- l. Contractor information

#### 1.5.3 Data Package 3

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Environmental conditions
- g. Lubrication data
- h. Preventive maintenance plan and schedule
- i. Cleaning recommendations
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- l. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Product submittal data
- p. O&M submittal data
- q. Parts identification
- r. Warranty information
- s. Testing equipment and special tool information
- t. Testing and performance data
- u. Contractor information

#### 1.5.4 Data Package 4

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Operator service requirements
- g. Environmental conditions
- h. Lubrication data
- i. Preventive maintenance plan and schedule
- j. Cleaning recommendations
- k. Troubleshooting guides and diagnostic techniques
- l. Wiring diagrams and control diagrams
- m. Maintenance and repair procedures
- n. Removal and replacement instructions
- o. Spare parts and supply list
- p. Corrective maintenance man-hours
- q. Product submittal data
- r. O&M submittal data
- s. Parts identification
- t. Warranty information
- u. Personnel training requirements
- v. Testing equipment and special tool information
- w. Testing and performance data
- x. Contractor information

#### 1.5.5 Data Package 5

- a. Safety precautions
- b. Operator prestart
- c. Start-up, shutdown, and post-shutdown procedures
- d. Normal operations

- e. Environmental conditions
- f. Preventive maintenance plan and schedule
- g. Troubleshooting guides and diagnostic techniques
- h. Wiring and control diagrams
- i. Maintenance and repair procedures
- j. Removal and replacement instructions
- k. Spare parts and supply list
- l. Product submittal data
- m. Manufacturer's instructions
- n. O&M submittal data
- o. Parts identification
- p. Testing equipment and special tool information
- q. Warranty information
- r. Testing and performance data
- s. Contractor information

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

Not Used

-- End of Section --