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USACE / NAVFAC / AFCEA / NASA                      UFGS-23 82 19.00 40 (February 2011)  
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Preparing Activity:    NASA                              Superseding  
    UFGS-23 82 19 (August 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2012

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### SECTION 23 82 19.00 40

#### FAN COIL UNITS 02/11

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NOTE: This guide specification covers the requirements for fan-coil units for temperature-control assemblies.

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: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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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.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S12.23 (1989; R 2011) Method for the Designation of Sound Power Emitted by Machinery and Equipment

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 440 (2008) Room Fan-Coils and Unit Ventilators

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 1940-1 (2003; Cor 2005) Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2009) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (2012) Standard for the Installation of Air Conditioning and Ventilating Systems

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-810 (2008; Rev G) Environmental Engineering Considerations and Laboratory Tests

UNDERWRITERS LABORATORIES (UL)

UL 1995 (2011) Heating and Cooling Equipment

UL Bld Mat Dir (2011) Building Materials Directory

1.2 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be

reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

Material, Equipment, and Product Installation Lists

#### SD-02 Shop Drawings

Fabrication Drawings

Installation Drawings

#### SD-03 Product Data

Equipment and Performance Data

Coils

Casing

Enclosure

Motors

Fan

Drain Pans

Filters

Controls

Vibration Isolation

SD-04 Samples

Manufacturer's Standard Color Chart

SD-07 Certificates

Listing of Product Installations

Certificates of Conformance

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals

1.3 GENERAL REQUIREMENTS

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NOTE: If Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted. If Section 23 05 48.00 40 VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT is not included in the project specification, applicable requirements therefrom should be inserted and the second paragraph deleted. If Section 26 60 13.00 40 LOW-VOLTAGE MOTORS is not included in the project specification, applicable requirements therefrom should be inserted and the third paragraph deleted.  
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[ Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS applies to work specified in this section.

] Submit vibration isolation components.

[ Section 26 60 13.00 40 LOW-VOLTAGE MOTORS applies to this section.

] Submit the listing of product installations for fan coil units showing a minimum of 5 installed units, similar to those proposed for use, that have been in successful service for a minimum period of 5 years. Include purchaser, address of installation, service organization, and date of installation.

Submit fabrication drawings for fan coil units consisting of fabrication and assembly details to be performed in the factory.

Submit material, equipment, and product installation lists including the manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site information.

Submit equipment and performance data for fan coil units consisting of use life, system functional flows, safety features, and mechanical automated details. Curves indicating tested and certified equipment response and performance characteristics shall also be submitted, including vibration

isolation. Submit [certificates of conformance](#) for the following:

- a. [Coils](#)
- b. [Casing](#)
- c. [Enclosure](#)
- d. [Motors](#)
- e. [Fan](#)
- f. [Drain Pans](#)
- g. [Filters](#)
- h. [Controls](#)

Submit [manufacturer's standard color chart](#) indicating the manufacturer's standard color selections and finishes for fan coil units.

## PART 2 PRODUCTS

### 2.1 GENERAL

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NOTE: Specify fan and motor balance conforms to ISO Std. 1940/1 - (1986) Balance Quality Requirements of Rigid Rotors - Determination of Permissible Residual Unbalance unless otherwise noted. Specify motor vibration levels conform to NEMA Specification MG-1, Motors and Generators, Part 7 unless otherwise noted.

When possible the use of sealed bearings is encouraged. One of the major causes of bearing failures is overlubrication and lubrication contamination. Using sealed bearings helps to eliminate this failure mode.

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[ Include an enclosure for cabinet models and casing for concealed models.

] Provide base unit complete with galvanized casing, water-coil assembly with auxiliary water or steam heating-coil, valve and piping package, drain pans, air filter, fan motor, and motor control. Sound-power-level, decibels reference, 10 to the minus 12 power watt, at the fan operating speed selected to meet the specified capacity, is not to exceed the following values at the midfrequency of each octave band:

|                           | <u>OCTAVE BANDS</u> |     |       |       |       |
|---------------------------|---------------------|-----|-------|-------|-------|
|                           | 3RD                 | 4TH | 5TH   | 6TH   | 7TH   |
| Frequency<br>(hertz)      | 250                 | 500 | 1,000 | 2,000 | 4,000 |
| Power Level<br>(decibels) | 60                  | 55  | 53    | 50    | 48    |

Obtain sound-power-level data or values for these units in accordance with the test procedures specified in [ASA S12.23](#). Sound-power values apply to units provided with factory-fabricated cabinet enclosures and standard grilles. Values obtained for the standard cabinet models are acceptable for concealed models without separate tests provided there is no variation between models as to the coil configuration, blowers, motor speeds, or relative arrangement of parts. Fasten each unit securely to the building structure. Capacity of the units is as indicated. Ensure room fan-coil units are certified as complying with [AHRI 440](#) and shall meet the requirements of [UL 1995](#).

## 2.2 ENCLOSURE

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**NOTE: Supplement the following when exposed-to-view surfaces are an architectural feature.**  
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Construct enclosure of not lighter than [1.3 millimeter 18-gage steel](#), properly reinforced and braced. Ensure front panel of enclosure is removable and provided with [13 millimeter 1/2-inch](#) thick insulation conforming to [NFPA 90A](#), to prevent condensation. Ensure discharge louvers are four-way adjustable and designed to properly distribute air throughout the conditioned space. Ensure all ferrous-metal surfaces are galvanized or treated with a rust-inhibiting finish. Ensure all exposed-to-view enclosure corners and edges are rounded. Ensure discharge louvers are mounted in a top panel that is removable for coil cleaning. Ensure access doors are hinged and provided for all piping and control compartments. Ensure finish is in manufacturer's standard color as selected by the Contracting Officer.

## 2.3 CASING

Ensure casing is acoustically and thermally insulated internally with not less than [13 millimeter 1/2-inch](#) thick insulation conforming to [NFPA 90A](#), fastened with waterproof and fire-resistant adhesive.

## 2.4 FAN

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**NOTE: Evaluate necessity for reference to MIL-STD-810.**  
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Ensure fan is galvanized steel or aluminum, centrifugal type with [\_\_\_\_\_] blades. In lieu of metal, fabricate or mold the wheels and scrolls from suitably reinforced nonmetallic compounds certified to have satisfactorily passed the low temperature, high temperature, temperature shock, and sand and dust tests for ground equipment, outlined in [MIL-STD-810](#), without deformation, cracking, corrosion, or loss of balance characteristics. Ensure all surfaces are smooth, that assemblies are accessible for maintenance, and that disassembly and reassembly is done by mechanical fastening devices, not adhesives. Dynamically and statically balance fan to [ISO 1940-1](#) at the factory, after assembly in unit.

## 2.5 COILS

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**NOTE: Two-way, three-way, or four-way control**  
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valves shall be indicated and provided under Section  
23 09 33.00 40 ELECTRIC AND ELECTRONIC CONTROL  
SYSTEM FOR HVAC coordinate with unit description.

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Ensure construct of the water coils is not less than DN15 1/2-inch outside diameter (od) seamless copper tubing with copper or aluminum plate fins mechanically bonded or soldered to the tubes and provide with not less than DN18 5/8-inch od female solder connectors, accessory piping package with terminal connections for control valves, and manual air vent on returns. Make provisions for coil removal.

## 2.6 DRAIN PANS

Size and locate drain pans to collect condensed water dripping from any item within the unit enclosure. Do not construct drain pans of lighter than 1 millimeter 20-gage galvanized steel, [stainless steel] [plastic] [\_\_\_\_\_] thermally insulated to prevent condensation. Coat thermal insulation with a waterproofing compound. Provide no less than M20, (ISO) 3/4-inch National Pipe Thread (NPT) or DN18 5/8-inch od copper drain connection in the drain pan, with a slope not less than 3 millimeter per 300 millimeter 1/8-inch per foot to drain.

## 2.7 FILTERS

Provide filters for each unit that are glass fiber throwaway or permanent washable type, 25 millimeter 1-inch nominal thickness, in conformance with UL Bld Mat Dir. Ensure filters are removable without tools.

## 2.8 MOTORS

Provide motors that are direct connected, two-bearing, permanent split-capacitor type with built-in overload protection, conform to NEMA MG 1, and mounted on a resilient base. Design motors for 1,060 revolutions per minute maximum on 115-volt, single-phase, 60-hertz power. Furnish motors with three built-in speeds, with four insulated leads (common, high, medium, and low) to terminate in a control-junction box.

Provide a solid-state variable speed controller capable of not less than 50 percent speed reduction in lieu of step speed control, when so specified.

## 2.9 CONTROLS

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NOTE: Coordinate with Section 23 09 33.00 40  
ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC.

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Applicable requirements of Section 23 09 33.00 40 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC applies.

Provide unit with factory-installed control valves furnished by the automatic temperature-control manufacturer.

Install the controls in a unit-mounted control panel. Provide remote-mounted controllers where indicated.

Ensure motor speed-control switch provides speed selection and off position, mounted for convenient use from an access door.



## 2.10 INSULATION

Contain all thermal and acoustical insulation within a double walled enclosure or seal with a coating impervious to moisture.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install equipment as indicated and specified and in accordance with manufacturer's recommendations. Set dampers in a fixed position to provide the outside air quantity scheduled.

Submit [installation drawings](#) for fan coil systems in accordance with referenced standards in this section.

### 3.2 TESTS

Hydrostatically test coils at [1750 kilopascal](#) [250 pounds per square inch \(psi\)](#) or under water at [1750 kilopascal](#) [250 psi](#) air pressure. Ensure the coils are suitable for [1400 kilopascal](#) [200-psi](#) working pressure.

### 3.3 OPERATION AND MAINTENANCE

Contractor shall submit [6] [\_\_\_\_\_] copies of the [operation and maintenance manuals](#) 30 calendar days prior to testing the fan coil units. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

-- End of Section --