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USACE / NAVFAC / AFCEA / NASA UFGS-23 82 19 (August 2008)  
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Preparing Activity: NASA Superseding  
UFGS-23 82 19.00 40 (July 2007)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010

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### SECTION 23 82 19

#### FAN COIL UNITS 08/08

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

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 and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS 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 2006) 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 1 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 (2007; Errata 2008) Standard for Motors  
and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (2009; Errata 09-1) 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 (2005; R 2009) Heating and Cooling  
Equipment

UL Bld Mat Dir (2009) 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. Submittals should be kept  
to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" 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

Submit [Material, Equipment, and Product Installation Lists](#) in accordance with paragraph entitled, "General Requirements," of this section.

#### SD-02 Shop Drawings

Submit [Fabrication Drawings](#) for fan coil units in accordance with paragraph entitled, "General Requirements," of this section.

Submit [Installation Drawings](#) for fan coil systems in accordance with the paragraph entitled, "Installation," of this section.

#### SD-03 Product Data

Submit [Equipment and Performance Data](#) for fan coil units in accordance with paragraph entitled, "General Requirements," of this section.

Submit the manufacturer's catalog data for the following items:

[Coils](#)  
[Casing](#)

Enclosure  
Motors  
Fan  
Drain Pans  
Filters  
Controls  
Vibration Isolation

#### SD-04 Samples

Submit the [Manufacturer's Standard Color Chart](#) for fan coil units in accordance with paragraph entitled, "General Requirements," of this section.

#### SD-07 Certificates

Submit the [Listing of Product Installations](#) for fan coil units in accordance with paragraph entitled, "Installation," of this section.

Submit the certificates for following items showing conformance with the referenced standards contained in this section.

Coils  
Casing  
Enclosure  
Motors  
Fan  
Drain Pans  
Filters  
Controls

#### SD-10 Operation and Maintenance Data

Submit the [Operation and Maintenance Manuals](#) in accordance with paragraph entitled, "Operation and Maintenance," of this section.

### 1.3 GENERAL REQUIREMENTS

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NOTE: If Section 23 00 00 AIR SUPPLY, DISTRIBUTION, 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 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, 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. List shall 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.

Material, Equipment, and Product Installation Lists shall include 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.

Manufacturer's Standard Color Chart shall indicate the manufacturer's standard color selections and finishes for fan coil units.

## PART 2 PRODUCTS

### 2.1 GENERAL

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NOTE: Fan and motor balance shall conform to ISO Std. 1940/1 - (1986) Balance Quality Requirements of Rigid Rotors - Determination of Permissible Residual Unbalance unless otherwise noted. Motor vibration levels shall 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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[Units shall include an enclosure for cabinet models and casing for concealed models.]

Base unit shall be 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, shall not exceed the following values at the midfrequency of each octave band:

	<u>OCTAVE BANDS</u>				
	3RD	4TH	5TH	6TH	7TH
Frequency	250	500	1,000	2,000	4,000

	<u>OCTAVE BANDS</u>				
(hertz)					
Power Level (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 will be 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 shall be as indicated. Room fan-coil units shall be 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. All surfaces shall be smooth. Ensure that assemblies are accessible for maintenance. Ensure 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 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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Construct the water coils of 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. Not less than M20, (ISO) 3/4-inch National Pipe Thread (NPT) or DN18 5/8-inch od copper drain connection shall be provided in the drain pan. Pans shall 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 shall apply.

Unit manufacturer shall factory-install control valves furnished by the



automatic temperature-control manufacturer.

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

Motor speed-control switch shall provide speed selection and off position and be 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 --