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

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2007

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SECTION 23 82 19.00 40

### FAN COIL UNITS 07/07

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NOTE: This 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.

Recommended changes to a UFGS should be submitted as a [Criteria Change Request \(CCR\)](#).

Use of electronic communication is encouraged.

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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.

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 440 (2005) Standard for Room Fan-Coils and Unit Ventilators

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S12.23 (1989; R 2006) Standard Method for the Designation of Sound Power Emitted by Machinery and Equipment

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2006; Errata 2007) Standard for Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (2002; Errata 2003; Errata 2005) Standard for the Installation of Air Conditioning and Ventilating Systems

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-810 (Rev F; Notice 3) Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests

UNDERWRITERS LABORATORIES (UL)

UL 1995 (2005) Standard for Heating and Cooling Equipment

UL Bld Mat Dir (2007) 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

Material, Equipment, and Product Installation Lists shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

### SD-02 Shop Drawings

Fabrication Drawings shall be submitted for fan coil units in accordance with paragraph entitled, "General Requirements," of this section.

Installation Drawings shall be submitted for fan coil systems in accordance with the paragraph entitled, "Installation," of this section.

### SD-03 Product Data

Equipment and Performance Data shall be submitted for fan coil units in accordance with paragraph entitled, "General Requirements," of this section.

Manufacturer's catalog data shall be submitted for the following items:

Coils  
Casing  
Enclosure  
Motors  
Fan  
Drain Pans  
Filters  
Controls  
Vibration Isolation

### SD-04 Samples

Manufacturer's Standard Color Chart shall be submitted for fan coil units in accordance with paragraph entitled, "General Requirements," of this section.

### SD-07 Certificates

Listing of Product Installations shall be submitted for fan coil units in accordance with paragraph entitled, "Installation," of this section.

Certificates shall be submitted 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

Operation and Maintenance Manuals shall be submitted in accordance with paragraph entitled, "Operation and Maintenance," of this section.

## 1.3 GENERAL REQUIREMENTS

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NOTE: If Section 23 00 00.00 40 HEATING, VENTILATING, AND AIR-CONDITIONING 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 MEDIUM-VOLTAGE MOTOR CONTROLLERS 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 00.00 40 HEATING, VENTILATING, AND AIR-CONDITIONING applies to work specified in this section.]

Submit vibration isolation components.

[Section 26 60 13 MEDIUM-VOLTAGE MOTOR CONTROLLERS applies to this section.]

Listing of Product Installations shall be submitted 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.

Fabrication Drawings shall be submitted 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.

Equipment and Performance Data shall be submitted 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.

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NOTE: 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 (hertz)	250	500	1,000	2,000	4,000
Power Level (decibels)	60	55	53	50	48

Sound-power-level data or values for these units shall be obtained in accordance with the test procedures specified in [ANSI 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. Each unit shall be fastened securely to the building structure. Capacity of the units shall be as indicated. Room fan-coil units shall be certified as complying with [ARI 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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Enclosure shall be constructed of not lighter than [1.3 millimeter 18-gage](#) steel, properly reinforced and braced. Front panel of enclosure shall be removable and provided with [13 millimeter 1/2-inch](#) thick insulation conforming to [NFPA 90A](#), to prevent condensation. Discharge louvers shall be four-way adjustable and shall be designed to properly distribute air throughout the conditioned space. All ferrous-metal surfaces shall be galvanized or treated with a rust-inhibiting finish. All exposed-to-view enclosure corners and edges shall be rounded. Discharge louvers shall be mounted in a top panel that is removable for coil cleaning. Access doors shall be hinged and shall be provided for all piping and control compartments. Enclosure finish shall be manufacturer's standard in color selected by the Contracting Officer.

## 2.3 [CASING](#)

Casing shall be 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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Fan shall be galvanized steel or aluminum, centrifugal type with [\_\_\_\_\_] blades. In lieu of metal, wheels and scrolls shall be fabricated or molded 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. Assemblies shall be accessible for maintenance. Disassembly and reassembly shall be by mechanical fastening devices, not adhesives. Fan shall be balanced dynamically and statically 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 shall be provided under Section 23 09 33.00 40 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC coordinate with unit description.  
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Water coils shall be constructed 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 shall be provided 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. Provisions shall be made for coil removal.

## 2.6 DRAIN PANS

Drain pans shall be sized and located to collect condensed water dripping from any item within the unit enclosure. Drain pans shall be constructed of not lighter than 1 millimeter 20-gage galvanized steel, [stainless steel] [plastic] [\_\_\_\_\_] thermally insulated to prevent condensation. Thermal insulation shall be coated 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

Filters shall be provided for each unit and shall be glass fiber throwaway or permanent washable type, 25 millimeter 1-inch nominal thickness, in conformance with UL Bld Mat Dir. Filters shall be removable without tools.

## 2.8 MOTORS

Motors shall be direct connected, two-bearing, permanent split-capacitor type with built-in overload protection, conform to NEMA MG 1, and shall be mounted on a resilient base. Motors shall be designed for 1,060



revolutions per minute maximum on 115-volt, single-phase, 60-hertz power. Motors shall be furnished with three built-in speeds, with four insulated leads (common, high, medium, and low) to terminate in a control-junction box.

A solid-state variable speed controller capable of not less than 50 percent speed reduction shall be provided 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.

Controls shall be in a unit-mounted control panel. Remote-mounted controllers shall be provided where indicated.

Motor speed-control switch shall provide speed selection and off position and shall be mounted to be conveniently accessible from an access door.

## 2.10 INSULATION

All thermal and acoustical insulation shall be contained within a double walled enclosure or sealed with a coating which is impervious to moisture.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Equipment shall be installed as indicated and specified and in accordance with manufacturer's recommendations. Dampers shall be set in a fixed position to provide the outside air quantity scheduled.

Installation Drawings shall be submitted for fan coil systems in accordance with referenced standards in this section.

### 3.2 TESTS

Coils shall be hydrostatically tested at 1750 kilopascal 250 pounds per square inch (psi) or under water at 1750 kilopascal 250 psi air pressure and shall be 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. Data shall be updated and resubmitted for final approval no later than 30 calendar days prior to contract completion.

-- End of Section --