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USACE / NAVFAC / AFCEA / NASA UFGS-23 34 23.00 40 (April 2008)  
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Preparing Activity: NASA Superseding  
UFGS-23 34 23.00 40 (July 2007)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated March 2008

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### SECTION TABLE OF CONTENTS

#### DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

#### SECTION 23 34 23.00 40

#### HVAC POWER VENTILATORS

04/08

#### PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 GENERAL REQUIREMENTS
- 1.4 QUALITY ASSURANCE

#### PART 2 PRODUCTS

- 2.1 DESIGN AND FABRICATION REQUIREMENTS
- 2.2 HOUSING STYLE(S)
- 2.3 FAN TYPE(S)
  - 2.3.1 Type C-PRV Centrifugal, Direct Drive
  - 2.3.2 Type CB-PRV Centrifugal, V-Belt Drive
  - 2.3.3 Type P-PRV Propeller, Direct Drive
  - 2.3.4 Type PB-PRV Propeller, V-Belt Drive
  - 2.3.5 Type VA-PRV Vane Axial, Direct Drive
  - 2.3.6 Type VAB-PRV Vane Axial, V-Belt Drive
  - 2.3.7 Type TA-PRV Tube Axial, Direct Drive
  - 2.3.8 Type TAV-PRV Tube Axial, V-Belt Drive
- 2.4 MATERIALS
  - 2.4.1 Aluminum Alloy
  - 2.4.2 Zinc-Coated Steel
  - 2.4.3 Fibrous Glass
- 2.5 FAN MOTOR
- 2.6 BASES
- 2.7 ROOF CURBS
- 2.8 BACK-DRAFT DAMPERS
- 2.9 SCREENS
- 2.10 SOUND BAFFLES

#### PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 TESTS
  - 3.2.1 Vibration Analyzer

- 3.3 ACCEPTANCE
- 3.4 LUBRICATION
- 3.5 FINAL TEST REPORTS

-- End of Section Table of Contents --

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## SECTION 23 34 23.00 40

### HVAC POWER VENTILATORS 04/08

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NOTE: This specification covers the requirements  
for power roof ventilators designed to exhaust air  
from a building by means of a motor-driven fan.

Drawings should indicate and schedule the following:

Unit number

Location

Cubic meter feet per minute air

Static pressure kilopascal inches of water

Fan revolutions per minute

Type of fan

Type of wheel

Housing style

Maximum tip speed

Noise level in sones

Fan motor power

Drive type

Controls

Type of damper(s)

Type of screens

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.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2005; Supp 1) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM A 653/A 653M (2007) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B 209 (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 209M (2007) Standard Specification for Aluminum

and Aluminum-Alloy Sheet and Plate (Metric)

ASTM B 37

(2003) Standard Specification for Aluminum  
for Use in Iron and Steel Manufacturer

UNDERWRITERS LABORATORIES (UL)

UL 705

(2004; Rev thru Mar 2006) Standard for  
Power Ventilators

## 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-02 Shop Drawings

Installation Drawings shall be submitted for power roof ventilator  
in accordance with the paragraph entitled, "Installation," of this  
section.

Record Drawings shall be submitted for power roof ventilators in accordance with paragraph entitled, "General Requirements," of this section.

#### SD-03 Product Data

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

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

Housing  
Fan  
Motor  
Bases  
Roof Curbs  
Dampers  
Screens  
Sound Baffles

#### SD-06 Test Reports

Test reports shall be submitted for system operational tests in accordance with the paragraph entitled, "Tests," 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 first 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 second paragraph deleted.  
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Section 23 00 00.00 40 HEATING, VENTILATING, AND AIR-CONDITIONING applies to work specified in this section.

[Section 26 60 13 MEDIUM-VOLTAGE MOTOR CONTROLLERS applies to this section.]  
Equipment and Performance Data shall be submitted for power roof ventilator.

Record Drawings shall be submitted for power roof ventilator providing current factual information such as deviations from, and amendments to, the drawings and concealed and visible changes in the work.

### 1.4 QUALITY ASSURANCE

Ventilators shall be rated and labeled in accordance with the applicable standards of the Air Movement Control Association, and shall be licensed to bear the AMCA seal for both air and sound.

## PART 2 PRODUCTS

### 2.1 DESIGN AND FABRICATION REQUIREMENTS

Roof ventilators shall comply with **UL 705** and be furnished complete with bases, curbs, flashing flanges, noise baffles, dampers, damper controls, louvers, and screens.

Ventilators shall be designed for windloads in accordance with **ASCE 7** and in no case shall the installed design be for less than **130 [\_\_\_\_\_]kilometer per hour 80 [\_\_\_\_\_] miles per hour** windload. Structural bracing shall be properly spaced to accommodate this loading and in accordance with the design requirements of the covering material. Ventilators shall be adequately reinforced and well braced with joints properly formed. Edges shall be wired or beaded where necessary to ensure rigidity. Galvanic action between different metals in direct contact shall be prevented by nonconductive separators. All soldering shall be even and smooth.

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**NOTE: Retain the following paragraph only when  
protected metal is required.**  
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Bolts, rivets, and other fastenings used in connection with protected metal shall be corrosion-resistant steel.

### 2.2 HOUSING STYLE(S)

Power roof ventilator shall be [round mushroom style] [louvered penthouse style] [low contour style] [vertical discharge style] as indicated.

### 2.3 FAN TYPE(S)

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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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Fan shall be of the following type(s):

#### 2.3.1 Type C-PRV Centrifugal, Direct Drive

Type C-PRV ventilator shall be a centrifugal roof ventilator with direct drive, nonoverloading, backward-inclined wheel. Drive shall be vibration isolated with elastomer. Drive components shall be mounted in a compartment isolated from airstream.

#### 2.3.2 Type CB-PRV Centrifugal, V-Belt Drive

Type CB-PRV ventilator shall be a centrifugal roof ventilator with V-belt drive, nonoverloading, backward-inclined wheel. Drive shall be vibration isolated with elastomer. Drive components shall be mounted in a compartment isolated from airstream.

### 2.3.3 Type P-PRV Propeller, Direct Drive

Type P-PRV ventilator shall be a propeller roof ventilator with direct drive and shall be vibration isolated with elastomer. Drive components shall be mounted in a compartment isolated from airstream.

### 2.3.4 Type PB-PRV Propeller, V-Belt Drive

Type PB-PRV ventilator shall be a propeller roof ventilator with V-belt drive and shall be vibration isolated with elastomer. Drive components shall be mounted in a compartment isolated from airstream.

### 2.3.5 Type VA-PRV Vane Axial, Direct Drive

Type VA-PRV ventilator shall be a vane axial roof ventilator with direct drive and shall be vibration isolated with elastomer.

### 2.3.6 Type VAB-PRV Vane Axial, V-Belt Drive

Type VAB-PRV ventilator shall be a vane axial roof ventilator with V-belt drive and shall be vibration isolated with elastomer.

### 2.3.7 Type TA-PRV Tube Axial, Direct Drive

Type TA-PRV ventilator shall be a tube axial roof ventilator with direct drive and shall be vibration isolated with elastomer.

### 2.3.8 Type TAV-PRV Tube Axial, V-Belt Drive

Type TAV-PRV ventilator shall be a tube axial roof ventilator with V-belt drive and shall be vibration isolated with elastomer.

## 2.4 MATERIALS

Materials shall be manufacturers' standard materials.

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NOTE: When more than one material is required,  
indicate location of various materials on the  
drawings.  
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### 2.4.1 Aluminum Alloy

Aluminum alloy shall be in accordance with ASTM B 209M ASTM B 209 and ASTM B 37.

### 2.4.2 Zinc-Coated Steel

Zinc-coated steel shall be in accordance with ASTM A 653/A 653M.

### 2.4.3 Fibrous Glass

Fibrous glass ventilators shall be molded from a glass-fiber reinforced polyester resin with a pigmented polyester resin gel coat in manufacturer's standard color, and shall be not less than 0.51 or more than 1.53 millimeter thick. Matrix material shall have not less than 30 percent, by weight, of chopped-fiber and random-strand glass fibers, and shall be thoroughly saturated and impregnated with not more than 70 percent



high-solids polyester resin with not less than 5-percent antimony trioxide fire-retardant additive. Material shall be smooth, dense, and uniform in texture, color, and cross section and shall be shatter-resistant, rigid, and free from visual defects, foreign inclusions, cracks, crazing, die lines, pinholes, striations, unsaturated and resin-poor areas, and excessive-resin areas.

## 2.5 FAN MOTOR

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NOTE: Modify voltage as required and select motor power based on air flow and static pressure in millimeter inches of water.  
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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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Belt drive motors smaller than 375 watt 1/2 horsepower shall be single-phase, 120 volts, 60 hertz with permanently lubricated ball bearings and shall be split-phase type.

Motors 375 watt 1/2 horsepower and larger shall be three-phase [\_\_\_\_], 460 [\_\_\_\_] volts, 60 hertz.

Motors shall have local disconnects to provide means for fan and motor maintenance. All motors shall be provided with thermal overload protection. Motors located in airstreams shall be totally enclosed type.

Direct drive motors 375 watt 1/2 horsepower and smaller shall be of the energy efficient permanent split capacitor type, single phase, 60 hertz.

## 2.6 BASES

Bases provided with the ventilators shall be factory formed, of the type indicated, shall be the same material as the hoods, and the thickness necessary to meet the design requirement for connection to the roof. Bases shall be suitable for raised curb mounting where indicated. Curb flanges of the base shall be formed as cap flashing extending at least 50 millimeter 2 inches over roofing base. Where indicated or required, shafts of ventilators shall be extended a sufficient distance through the supporting construction to permit attachment of vent ducts.

## 2.7 ROOF CURBS

Factory-formed metal ventilator curbs shall be of type and design required for the ventilator and suitable for roof configuration and flashing.

Job-built curbs shall conform to the recommendations of the ventilator manufacturer, shall be sized correctly for the ventilator, and shall be suitable for type of supporting roof construction.

## 2.8 BACK-DRAFT DAMPERS

Back-draft dampers shall be gravity operated with adjustable counterweight of the same material as fan housing.

[Back-draft dampers shall be motor operated and of the same material as fan housing.]

[Damper actuating motor shall be interlocked with fan motor.]

## 2.9 SCREENS

[Bird screens] [Insert screens] shall be provided with frames of the same material as that used in the ventilators and shall be securely attached in a manner that will permit easy removal for access and cleaning.

## 2.10 SOUND BAFFLES

Sound baffles shall be permanent construction and impervious to moisture. Baffles shall be removable.

# PART 3 EXECUTION

## 3.1 INSTALLATION

Power roof ventilators shall be installed in accordance with manufacturer's installation instructions. Installation of ventilators shall be properly coordinated with other work. Anchors, attachments, and other items to be built shall be coordinated for installation as the work progresses. Ventilators shall be rigidly installed in a weathertight and watertight manner and shall be free from vibration. Refer to Section 23 05 48 VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT for vibration isolation considerations.

Installation Drawings shall be submitted for power roof ventilator in accordance with referenced standards in this section.

## 3.2 TESTS

After installation, each power roof ventilator shall be tested to demonstrate proper operation at indicated and specified performance requirements including running, balance, noise, and proper direction of fan rotation.

### 3.2.1 Vibration Analyzer

Contractor shall use an FFT analyzer to measure vibration levels. It shall have the following characteristics: A dynamic range greater than 70 dB; a minimum of 400 line resolution; a frequency response range of 5 Hz-10 KHz(300-600000 cpm); the capacity to perform ensemble averaging, the capability to use a Hanning window; auto-ranging frequency amplitude; a minimum amplitude accuracy over the selected frequency range of plus or minus 20 percent or plus or minus 1.5 dB.

An accelerometer, either stud-mounted or mounted using a rare earth, low mass magnet and sound disk(or finished surface) shall be used with the FFT analyzer to collect data. The mass of the accelerometer and its mounting shall have minimal influence on the frequency response of the system over the selected measurement range.

### 3.3 ACCEPTANCE

Prior to final acceptance, precision alignment devices shall be used to demonstrate that fan and motor are aligned as specified.

Prior to final acceptance, vibration analysis shall verify conformance to specifications. Vibration levels shall not be more than .075 in/sec at 1 times run speed and at fan/blade frequency, and .04 in/sec at other multiples of run speed.

### 3.4 LUBRICATION

Movable parts of dampers and related operating hardware shall be lubricated in accordance with manufacturer's printed instructions and shall operate smoothly and quietly without binding.

### 3.5 FINAL TEST REPORTS

Final test reports shall be provided to the Contracting Officer. Reports shall have a cover letter/sheet clearly marked with the System name, Date, and the words "Final Test Reports - Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database."

-- End of Section --