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Preparing Activity: NASA Superseding
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2009

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HVAC POWER VENTILATORS

08/08

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SECTION 23 34 23

HVAC POWER VENTILATORS 08/08

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

Provide drawings that 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. Direct them to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Submit recommended changes to a UFGS as a Criteria Change Request (CCR).

PART 1 GENERAL

1.1 REFERENCES

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 are automatically deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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 7-05 (2006; Errata 2007) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM A 653/A 653M (2008) 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 (2008) Standard Specification for Aluminum for Use in Iron and Steel Manufacturer

UNDERWRITERS LABORATORIES (UL)

UL 705 (2004; Rev thru Mar 2009) Standard for Power Ventilators

1.2 SUBMITTALS

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. Keep submittals 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, use a code of up to three characters within the submittal tags 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.

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 reviews the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

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

Submit [Record Drawings](#) for power roof ventilators in accordance with paragraph entitled, "General Requirements," of this section.

SD-03 Product Data

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

Submit Manufacturer's catalog data for the following items:

[Housing](#)
[Fan](#)
[Motor](#)
[Bases](#)
[Roof Curbs](#)
[Dampers](#)
[Screens](#)
[Sound Baffles](#)

SD-06 Test Reports

Submit Test reports for system operational tests in accordance with the paragraph entitled, "[Tests](#)," of this section.

1.3 GENERAL REQUIREMENTS

NOTE: If Section [23 00 00](#) AIR SUPPLY, DISTRIBUTION, AND EXHAUST SYSTEMS is not included in the project specification, insert applicable requirements therefrom and delete the first paragraph. If Section [26 60 13.00 40](#) LOW-VOLTAGE MOTORS is not included in the project specification, insert applicable requirements therefrom and delete the second paragraph.

Section [23 00 00](#) AIR SUPPLY, DISTRIBUTION, AND EXHAUST SYSTEMS applies to work specified in this section.

[Section [26 60 13.00 40](#) LOW-VOLTAGE MOTORS applies to this section.]
Submit [Equipment and Performance Data](#) for power roof ventilator.

Submit [Record Drawings](#) 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

Rate and label ventilators in accordance with the applicable standards of the Air Movement Control Association, and license to bear the AMCA seal for both air and sound.

PART 2 PRODUCTS

2.1 DESIGN AND FABRICATION REQUIREMENTS

Provide roof ventilators that comply with [UL 705](#) and are furnished complete

with bases, curbs, flashing flanges, noise baffles, dampers, damper controls, louvers, and screens as indicated.

Provide ventilators that are designed for windloads in accordance with **ASCE 7-05** with the installed design not less than **210 [_____] kilometer per hour 130 [_____] miles per hour** windload. Provide structural bracing that is properly spaced to accommodate this loading and in accordance with the design requirements of the covering material. Provide ventilators that are adequately reinforced and well braced with joints properly formed. Provide edges that are wired or beaded where necessary to ensure rigidity. Prevent galvanic action between different metals in direct contact by nonconductive separators. Make all soldering even and smooth.

**NOTE: Retain the following paragraph only when
protected metal is required.**

Provide corrosion-resistant steel bolts, rivets, and other fastenings used in connection with protected metal.

2.2 HOUSING STYLE(S)

Provide [round mushroom style] [louvered penthouse style] [low contour style] [vertical discharge style] power roof ventilator as indicated.

2.3 FAN TYPE(S)

**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.**

Provide fan of the following type(s):

2.3.1 Type C-PRV Centrifugal, Direct Drive

For Type C-PRV ventilator, provide a centrifugal roof ventilator with direct drive, nonoverloading, backward-inclined wheel. Provide vibration isolated drive with elastomer. Provide drive components that are mounted in a compartment isolated from airstream.

2.3.2 Type CB-PRV Centrifugal, V-Belt Drive

For Type CB-PRV ventilator provide a centrifugal roof ventilator with V-belt drive, nonoverloading, backward-inclined wheel. Provide vibration isolated drive with elastomer. Provide drive components that are mounted in a compartment isolated from airstream.

2.3.3 Type P-PRV Propeller, Direct Drive

For Type P-PRV ventilator, provide a propeller roof ventilator with direct drive that is vibration isolated with elastomer. Provide drive components that are mounted in a compartment isolated from airstream.

2.3.4 Type PB-PRV Propeller, V-Belt Drive

For Type PB-PRV ventilator, provide a propeller roof ventilator with V-belt drive that is vibration isolated with elastomer. Provide drive components that are mounted in a compartment isolated from airstream.

2.3.5 Type VA-PRV Vane Axial, Direct Drive

For Type VA-PRV ventilator, provide a vane axial roof ventilator with direct drive that is vibration isolated with elastomer.

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

For Type VAB-PRV ventilator, provide a vane axial roof ventilator with V-belt drive that is vibration isolated with elastomer.

2.3.7 Type TA-PRV Tube Axial, Direct Drive

For Type TA-PRV ventilator, provide a tube axial roof ventilator with direct drive that is vibration isolated with elastomer.

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

For Type TAV-PRV ventilator, provide a tube axial roof ventilator with V-belt drive that is vibration isolated with elastomer.

2.4 MATERIALS

Provide manufacturers' standard materials.

**NOTE: When more than one material is required,
indicate location of various materials on the
drawings.**

2.4.1 Aluminum Alloy

Provide aluminum alloy in accordance with **ASTM B 209M ASTM B 209** and **ASTM B 37**.

2.4.2 Zinc-Coated Steel

Provide zinc-coated steel in accordance with **ASTM A 653/A 653M**.

2.4.3 Fibrous Glass

Provide fibrous glass ventilators that are molded from a glass-fiber reinforced polyester resin with a pigmented polyester resin gel coat in manufacturer's standard color, and that are not less than **0.51 or more than 1.53 millimeter .02 and .06 inch** thick. Provide matrix material that is not less than 30 percent, by weight, of chopped-fiber and random-strand glass fibers, and that is 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. Provide material that is smooth, dense, and uniform in texture, color, and cross section and that is 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

NOTE: Modify voltage as required and select motor power based on air flow and static pressure in millimeter inches of water.

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.

For belt drive motors smaller than 375 watt 1/2 horsepower, provide single-phase, 120 volts, 60 hertz with permanently lubricated ball bearings and provide split-phase type.

For motors 375 watt 1/2 horsepower and larger, provide three-phase [____], 460 [____] volts, 60 hertz.

Provide motors that have local disconnects to provide means for fan and motor maintenance. Provide all motors with thermal overload protection. For motors located in airstreams, provide totally enclosed type.

For direct drive motors 375 watt 1/2 horsepower and smaller, provide the energy efficient permanent split capacitor type, single phase, 60 hertz.

2.6 BASES

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

2.7 ROOF CURBS

Provide factory-formed metal ventilator curbs of the type and design required for the ventilator and suitable for roof configuration and flashing.

Provide job-built curbs that conform to the recommendations of the ventilator manufacturer, sized correctly for the ventilator, and suitable for type of supporting roof construction.

2.8 BACK-DRAFT DAMPERS

Provide gravity operated back-draft dampers with adjustable counterweight of the same material as fan housing.

[Provide motor operated back-draft dampers of the same material as fan housing.]

[Interlock damper actuating motor with fan motor.]

2.9 SCREENS

Provide [bird screens] [insert screens] with frames of the same material as that used in the ventilators and securely attach in a manner that permits easy removal for access and cleaning.

2.10 SOUND BAFFLES

Provide permanent construction sound baffles that are impervious to moisture. Provide removable baffles.

PART 3 EXECUTION

3.1 INSTALLATION

Install power roof ventilators in accordance with manufacturer's installation instructions. Properly coordinate installation of ventilators with other work. Coordinate anchors, attachments, and other items to be built, for installation as the work progresses. Rigidly install ventilators in a weathertight and watertight manner free from vibration. Refer to Section 23 05 48 VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT for vibration isolation considerations.

Submit [Installation Drawings](#) for power roof ventilator in accordance with referenced standards in this section.

3.2 TESTS

After installation, test each power roof ventilator 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

Use an FFT analyzer to measure vibration levels. The following characteristics are required: 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.

Use either stud-mounted accelerometer or mount using a rare earth, low mass magnet and sound disk (or finished surface) with the FFT analyzer to collect data. Provide accelerometer with mass and mounting that minimally influence the frequency response of the system over the selected measurement range.

3.3 ACCEPTANCE

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

Prior to final acceptance, verify conformance to specifications with vibration analysis. Provide vibration levels that are not 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

Provide movable parts of dampers and related operating hardware that are lubricated in accordance with manufacturer's printed instructions and that operate smoothly and quietly without binding.

3.5 FINAL TEST REPORTS

Provide final test reports to the Contracting Officer. Provide reports with 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 --