SECTION 23 3400

HVAC FANS

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LANL MASTER SPECIFICATION SECTION

|  |
| --- |
| Rev. 2 Summary of changes  Added manufacturers’ names for Plenum Fans, and minor editorial updates. |

Word file at <https://engstandards.lanl.gov>

This template must be edited for each project.  In doing so, specifier must add job-specific requirements. Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer. Once the choice is made or text supplied, remove the brackets. The specification section must also be edited to delete items for processes, items, or designs that are not included in the project -- and specifier’s notes such as these.  This template is tailored to meet requirements contained in the LANL Engineering Standards Manual (ESM). To seek a variance from requirements in this section that are applicable, contact the ESM Mechanical[POC](http://engstandards.lanl.gov/POCs.shtml#mech). Please contact POC with suggestions for improvement as well.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

This template was developed for ML-4 projects. For ML-1, 2, and 3 applications, additional requirements and independent reviews should be added if increased confidence in procurement or execution is desired; see ESM Chapter 1 Section Z10 Specifications and Quality sections.

Seismic: If HVAC fans are not exempt from seismic design per ASCE 7 paragraph 13.1.4 then, prior to attempting to edit this section to be project-specific, refer to Sections 22 0548.23, *Vibration and Seismic Controls for Mechanical Systems*, and 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*, as applicable. In order to edit this section for job-/Project-specific seismic requirements, refer to author notes that begin with “Seismic.” Also, see the Seismic Specification Guide for Mechanical Non-Structural Components webposted with the LANL Master Specifications [here](https://engstandards.lanl.gov/seismic-editing.shtml) for guidance on properly editing this section.

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1. GENERAL

SUMMARY

Section Includes:

* + - 1. Centrifugal Fans.
      2. Axial Fans.
      3. Plenum Fans.
      4. Propeller Fans.
      5. Centrifugal Roof Ventilators.
      6. Centrifugal Wall Ventilators.
      7. Gravity Roof Ventilators.

PERFORMANCE REQUIREMENTS

AMCA Compliance: Comply with AMCA performance requirements and bear the AMCA-Certified Ratings Seal.

HVAC fans and associated motors shall perform satisfactorily in the following service conditions:

* + - 1. Elevation: 7500 feet above sea level.
      2. Maximum ambient temperature: 104 degrees F.
      3. Minimum ambient temperature: Minus 20 degrees F.
      4. 24-hour average temperature: Not exceeding 86 degrees F.

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Retain and edit the following subparagraph to match project requirements; use only for outdoor equipment.

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* + - 1. Maximum solar heat gain: 110 W/sq ft.

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Seismic: Delete paragraph below if units are exempt from seismic design. However, if paragraph applies:

* Edit it in accordance with content of 22 0548.23 and/or 01 8734

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C. Seismic Performance Requirements: The unit(s) shall remain in place without separation of any parts when subjected to the design basis earthquake [per Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*] [as represented by the seismic forces derived from the criteria indicated [on the Drawings] [in Section 22 0548.23, *Vibration and Seismic Controls for Mechanical Systems]].*

RELATED SECTIONS

* + 1. Section 01 2500, *Substitution Procedures*
    2. [Section 01 8113.13, *Sustainable Design* [LEED v4 and]Guiding Principles 2020: Requirements for water efficiency, energy efficiency, material composition, and indoor air quality requirements]
    3. [Section 01 8734, Seismic Qualification of Nonstructural Components (IBC), for requirements]
    4. Section 03 3001, *Reinforced Concrete*
    5. Section 03 3053, *Miscellaneous Cast-in-Place Concrete*
    6. [Section 22 0548.23, *Vibration and Seismic Controls for Mechanical Systems*, for [seismic-design criteria,] submittal requirements, devices for seismic restraint, and installation requirements for these devices.]
    7. Section 22 0554, *Identification for Plumbing, HVAC, and Fire Piping and Equipment*
    8. Section 23 3101, *HVAC Ducts*

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Ensure conformance to codes and standards as applicable to project and type of fan selected. The reference list needs to be adjusted to project-specific needs.

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REFERENCES

American Bearing Manufacturers Association (ABMA):

* + - 1. ABMA 9 – *Load Ratings and Fatigue Life for Ball Bearings.*
      2. ABMA 11 – *Load Ratings and Fatigue Life for Roller Bearings.*

Air Movement and Control Association International, Inc. (AMCA):

* + - 1. AMCA 99 – *Standards Handbook.*
      2. AMCA 204 – *Balance Quality and Vibration Levels for Fans.*
      3. AMCA 210 – *Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.*
      4. AMCA 300 – *Reverberant Room Method for Sound Testing of Fans.*
      5. AMCA 301 – *Methods for Calculating Fan Sound Ratings from Laboratory Test Data.*

National Electrical Manufacturers Association (NEMA):

* + - 1. NEMA 250 – *Enclosures for Electrical Equipment (1000 Volts Maximum).*

Institute of Electrical and Electronics Engineers (IEEE):

* + - 1. IEEE 841 – *Premium-Efficiency, Severe-Duty, Totally Enclosed Squirrel Cage Induction Motors from 0.75 kW to 370 kW (1 HP to 500 HP)*

National Fire Protection Association (NFPA):

* + - 1. NFPA 70 – *National Electrical Code*

Underwriters Laboratories Inc. (UL):

* + - 1. UL 705 – *Power Ventilators.*
    1. Code of Federal Regulations (CFR):
       1. 29 CFR 1910 - *Occupational Safety and Health Standards*

ACTION SUBMITTALS

Product Data: For each type of product.

* + - 1. Include rated capacities, furnished specialties, and accessories for each fan.
      2. Certified fan performance curves with system operating conditions indicated.
      3. Certified fan sound-power ratings.
      4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
      5. Material thickness and finishes, including color charts.
      6. Dampers, including housings, linkages, and operators.
      7. Fan speed controllers.

Shop Drawings:

* + - 1. Include plans, elevations, sections, and attachment details.
      2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
      3. Include diagrams for power, signal, and control wiring.
      4. [Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.]

INFORMATIONAL SUBMITTALS

* + 1. Field quality-control reports.
    2. Installation instructions.
    3. At Closeout:
       1. Operation and Maintenance Data: For all fans to include in operation, and maintenance manuals.
       2. Warranty

QUALITY ASSURANCE

Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.

Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

Balance Quality: Conform to AMCA 204.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by any nationally recognized testing laboratory (NRTL) recognized under 29 CFR 1910.7.

DELIVERY, STORAGE, AND HANDLING

Protect motors, shafts, and bearings from weather and construction dust.

WARRANTY

The equipment manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first.

EXTRA MATERIALS

Furnish two additional sets of belts for each belt driven fan.

1. PRODUCTS

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For HVAC fans that are not exempt from seismic, if project specification package includes 22 0548.23, and if mounting and/or anchorage devices are to be used that differ from those specified in 22 0548.23, they must be described herein (in PART 2).

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PRODUCT OPTIONS AND SUBSTITUTIONS

* + 1. Alternate products may be accepted; follow Section 01 2500, *Substitution Procedures*.

CENTRIFUGAL FANS

Manufacturers:

* + - 1. Acme Engineering and Manufacturing Corp.
      2. Twin City Fans
      3. Chicago Blower Corporation
      4. Cincinnati Fan
      5. Greenheck Corp.
      6. Howden Buffalo, Inc.
      7. Loren Cook Company
      8. Penn Barry
      9. New York Blower Company

Description: Factory fabricated, assembled, tested, and finished, [belt] [direct]-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, support structure, and factory installed and wired disconnect switch. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.

Wheel and Inlet:

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Retain one of the three “Wheel and Inlet” Assemblies subparagraphs below.

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* + - 1. Forward Curved: [Single-width-single-inlet] [Double-width-double-inlet] galvanized steel construction with inlet flange, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to back plate and keyed to shaft with set screw.
      2. Airfoil Wheel: [Single-width-single-inlet] [Double-width-double-inlet] steel construction with smooth curved inlet flange, back plate die formed hollow airfoil shaped blades continuously welded at tip flange, and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.
      3. Backward Inclined: [Single-width-single-inlet] [Double-width-double-inlet] steel construction with smooth curved inlet flange, back plate, backward curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

Housing:

* + - 1. Steel, designed to minimize turbulence with spun inlet bell and shaped cut-off.
      2. Factory finish before assembly to manufacturer's standard.
      3. Bolted construction with horizontal flanged split housing, where required.

Shafts:

* + - 1. Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.
      2. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
      3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

Bearings and Sleeves:

* + - 1. Bearings: Self-aligning, pillow block type, [pre-lubricated and sealed shaft bearings] [grease-lubricated shaft bearings], ball or roller bearings.
      2. Ball Bearings Rating Life: ABMA 9, [L-10 life at 50,000 hours] [L-50 life at 100,000 hours].
      3. Roller Bearings Rating Life: ABMA 11, [L-10 life at 120,000 hours] [L-50 life at 400,000 hours].

Belt Drives:

Factory mounted, with adjustable alignment and belt tensioning.

Service Factor Based on Fan Motor Size: [1.5] [1.4] [1.3] [1.2].

Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.

Motor Pulleys: Adjustable pitch for use with motors through [5] [Insert number] hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

Belts: Oil resistant, non-sparking, and non-static; matched sets for multiple belt drives.

Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

Motor Mount: Adjustable for belt tensioning.

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Select one or more of the following subparagraphs appropriate to equipment requirements.

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Accessories:

* + - 1. Inlet/Outlet Screens: Galvanized steel welded grid.
      2. Access Doors: Shaped to conform to scroll, with quick opening latches and gaskets.
      3. Scroll Drain: 1/2-inch steel pipe coupling welded to low point of fan scroll.
      4. Spark-Resistant Construction: AMCA 99.

AXIAL FANS

Manufacturers:

* + - 1. Acme Engineering and Manufacturing Corp.
      2. Greenheck Corp.
      3. Hartzell Fan Inc.
      4. Howden Buffalo, Inc.
      5. Loren Cook Company
      6. Penn Barry

Description: [Tubeaxial] [Vaneaxial] fan wheel and housing, factory-mounted motor with [belt] [direct] drive, [an inlet cone section,] and accessories.

Hub and Impeller:

* + - 1. Airfoil Impeller Blades: [Adjustable die cast aluminum alloy] [welded steel die formed blades with belt drive].
      2. Hub: [Die cast aluminum alloy] [Cast-iron hub] [Belt drive of spun, welded steel], bored and keyed to shaft; to facilitate indexing of blade angle with [manual] [automatic] adjustment stops.
      3. [Controllable Pitch Assemblies: Incorporate permanently lubricated and sealed ball bearing counterbalanced blade and variable pitch assembly into hub with mechanical link to casing exterior mounted actuator, or electric actuator incorporated within hub.]

Casing:

* + - 1. Continuously welded, with inlet and outlet flange connections, and motor or shaft supports.
      2. Integral flow straightening guide vanes designed to straighten airflow.

Shafts:

* + - 1. Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.
      2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

Bearings:

* + - 1. Bearings: Radial, self-aligning, ball or roller bearings.
      2. Ball Bearings Rating Life: ABMA 9, [L-10 life at 50,000 hours] [L-50 life at 100,000 hours].
      3. Roller Bearings Rating Life: ABMA 11, [L-10 life at 120,000 hours] [L-50 life at 400,000 hours].
      4. Lubrication: For direct driven units, extend lubrication lines to outside of casing and terminate with grease fittings.

Belt Drives:

* + - 1. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of motor.
      2. Belt Guard: Fabricate to comply with OSHA and SMACNA Standard requirements. Fabricate of steel for motors mounted on outside of fan cabinet, 0.106 inch thick, 3/4-inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

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Select one or more of the following subparagraphs appropriate to equipment requirements.

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Accessories:

* + - 1. Mounting Clips: [Horizontal ceiling] [Vertical mounting] clips welded to fan housing, of same material as housing.
      2. Horizontal Support: Pair of supports bolted to fan housing, of same material as housing.
      3. Inlet Bell: Bell mouth inlet, when fan is not attached to duct, fabricated of same material as casing with flange.
      4. Inlet Screens: Galvanized steel welded grid to fit inlet bell.
      5. Inlet Cone: Round-to-round transition of same material as housing.
      6. Outlet Cones: Round-to-round transition, of same material as casing with flanges.
      7. Access Doors: Shaped to conform to casing with quick opening latches and gaskets.
      8. Motor Cover: Cover with side vents to dissipate motor heat, of same material as housing.
      9. Direct-Driven Units: Encase motor in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.
      10. [Stall Alarm Probe: Factory installed sensing probe to detect fan operation in stall.]
      11. [Vibration Detector: Factory installed vibration switch to stop fan.]

PLENUM FANS

Manufacturers:

* + - 1. Acme Engineering and Manufacturing Corp.
      2. Greenheck Corp.
      3. Hartzell Fan Inc.
      4. Howden Buffalo, Inc.
      5. Loren Cook Company
      6. Penn Barry
    1. Description: Factory fabricated, assembled, tested, and finished, belt-driven centrifugal fans consisting of wheel, fan shaft, bearings, motor, drive assembly, and support structure. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations. Factory installed and wired disconnect switch.
    2. Airfoil Wheels:
       - 1. Single-width-single-inlet construction with smooth-curved inlet flange.
         2. Heavy backplate.
         3. Hollow die-formed, airfoil-shaped blades continuously welded at tip flange and backplate.
         4. Cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.
    3. Shafts:
       - 1. Statically and dynamically balanced and selected for continuous operation at maximum-rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
         2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
         3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
    4. Pre-lubricated and Sealed Shaft Bearings:
       - 1. Self-aligning, pillow-block-type ball bearings.
         2. Ball-Bearing Rating Life: ABMA 9, L-10 life at [50,000] [120,000] [Insert hours] hours.
         3. Roller-Bearing Rating Life: ABMA 11, L-10 life at [50,000] [120,000] [Insert hours] hours.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*OR\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

* + 1. Grease-Lubricated Shaft Bearings:
       - 1. Self-aligning, pillow-block-type, tapered roller bearings with double-locking collars and two-piece, cast-iron housing.
         2. Ball-Bearing Rating Life: ABMA 9, L-10 at [50,000] [120,000] [Insert hours] hours.
         3. Roller-Bearing Rating Life: ABMA 11, L-10 at [50,000] [120,000] [Insert hours] hours.
    2. Belt Drives:
       - 1. Factory mounted, with adjustable alignment and belt tensioning.
         2. Service Factor Based on Fan Motor Size: [1.5] [1.4] [1.3] [1.2].
         3. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
         4. Motor Pulleys: Adjustable pitch for use with motors through [5] [Insert number] hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
         5. Belts: Oil resistant, non-sparking, and non-static; matched sets for multiple belt drives.
         6. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
         7. Motor Mount: Adjustable for belt tensioning.
    3. Accessories:
       - 1. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
         2. Spark-Resistant Construction: AMCA 99.
         3. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

PROPELLER FANS

Manufacturers:

* + - 1. Acme Engineering and Manufacturing Corp.
      2. Greenheck Corp.
      3. Hartzell Fan Inc.
      4. Loren Cook Company
      5. Penn Barry

Construction:

* + - 1. Impeller: [Shaped steel] [Steel reinforced aluminum blade] with hubs, statically and dynamically balanced, keyed and locked to shaft, [directly connected to motor] [furnished with V-belt drive, sheaves, and belt guard].
      2. Frame: One-piece, square steel with die formed venturi orifice, mounting flanges and supports, with baked enamel finish.

Fan Drive:

* + - 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
      2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
      3. Pulleys: Cast iron with split tapered bushing; dynamically balanced at factory.
      4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
      5. Belts: Oil resistant, non-sparking, and non-static; matched sets for multiple belt drives.
      6. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

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Select one or more of the following subparagraphs appropriate to equipment requirements.

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Accessories:

* + - 1. Back-draft Damper: Multiple blades with offset hinge pin, blades linked.
      2. Outlet Damper: Multiple blades with offset hinge pin, blades linked, line voltage motor drive, power open, spring return.
      3. Wall Sleeve: Galvanized steel to match fan and accessory size.
      4. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
      5. Hood: Weather shield, to exclude rain and snow. Galvanized steel to match fan and accessory size.
      6. Fan speed controller for direct driven fans.
      7. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

CENTRIFUGAL ROOF VENTILATORS

Manufacturers:

* + - 1. Acme Engineering and Manufacturing Corp
      2. Twin City Fans
      3. Greenheck Corp
      4. Hartzell Fan Incorporated
      5. Loren Cook Company
      6. Penn Barry

Fan Unit: [Downblast type] [Upblast type], [V-belt] [direct] drive, spun aluminum housing with grease tray; resilient mounted motor; aluminum wire bird screen; square base to suit roof curb with continuous curb gaskets.

Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning permanently lubricated and sealed ball bearings.

Roof Curb: Manufacturer’s standard shop fabricated units modified if necessary to comply with requirements. 18 inch high, self-flashing of galvanized steel construction with continuously welded seams, and factory installed nailer strip.

Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor NEMA 250 [Type 1] [Type 3R] [Type 4] enclosure.

Accessories:

* + - 1. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, spring return.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - 1. Motor Operated Damper: Aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, motor drive, power open or closed.
      2. Fan speed controller for direct driven fans.
      3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.

CENTRIFUGAL WALL VENTILATORS

Manufacturers:

* + - 1. Acme Engineering and Manufacturing Corp.
      2. Aerovent; a Division of Twin City Fan Companies, Ltd.
      3. Greenheck Corp.
      4. Hartzell Fan Incorporated
      5. Loren Cook Company
      6. Penn Barry.

Fan Unit: [V-belt] [direct] drive with spun aluminum housing; resilient mounted motor; aluminum wire bird screen.

Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning permanently lubricated and sealed ball bearings.

Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor NEMA 250 [Type 1] [Type 3R] [Type 4] enclosure.

Accessories:

* + - 1. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, spring return.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - 1. Motor Operated Damper: Aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, motor drive, power open or closed.
      2. Fan speed controller for direct driven fans.
      3. Wall Grille: Ring type for flush mounting.

GRAVITY ROOF VENTILATORS

Manufacturers:

* + - 1. Acme Engineering and Manufacturing Corp.
      2. Greenheck Corp.
      3. Loren Cook Company
      4. Penn Barry

Product Description: [Square] [Round] type, with aluminum constructed housing; aluminum wire bird screen; square base to suit roof curb with continuous curb gaskets.

Roof Curb: Manufacturer’s standard shop fabricated units modified if necessary to comply with requirements. 18 inch high self-flashing of galvanized steel construction with continuously welded seams, and factory installed nailer strip.

Accessories:

* + - 1. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, spring return.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - 1. Motor Operated Damper: Aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, motor drive, power open or closed.

MOTORS

Provide motors that comply with IEEE 841.

SOURCE QUALITY CONTROL

Sound-Power Level Ratings: Comply with AMCA 301. Factory test fans according to AMCA 300. Label fans with the AMCA-Certified Ratings Seal.

Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210.

1. EXECUTION

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For HVAC fans that are not exempt from seismic, if project specification package includes 22 0548.23, and if requirements associated with installation, testing, and inspection of mounting and/or anchorage devices differ from those requirements in 22 0548.23, they must be described herein (in PART 3). Also, if this is applicable, identify special types of seismic-control devices required for each application using the same terminology used for those devices in PART 2.

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EXAMINATION

Verify roof curbs are installed and level [as instructed by manufacturer] [and dimensions are as shown on shop drawings].

INSTALLATION

Equipment Mounting

* + - 1. For floor mounted equipment, install fans on cast-in-place concrete equipment base(s) using [elastomeric pads] [elastomeric mounts] [restrained spring isolators]. [Comply with requirements for equipment bases specified in [Section 03 3001, *Reinforced Concrete*] [Section 03 3053, *Miscellaneous Cast-in-Place Concrete*].]
      2. For equipment suspended from structure, install continuous-thread hanger rods and [elastomeric hangers] [spring hangers] [spring hangers with vertical-limit stop] of size required to support weight of the unit.

Secure [roof] [wall] fans [and] [gravity ventilators] with [cadmium plated steel] [aluminum] [stainless steel] lag screws to [roof curb] [support frame structure].

* + 1. Install flexible connections between fan and ductwork as specified in Section 23 3101, *HVAC Ducts*. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

Install backdraft dampers on inlet to [roof] [and] [wall] exhaust fans [and] [gravity ventilators used in relief air applications].

Install safety screen where inlet or outlet is exposed.

Install backdraft dampers on discharge of exhaust fans [and as indicated on drawings.]

Provide sheaves required for final air balance.

Install fans with sufficient working space for inspection and routine maintenance.

* + 1. Label fans according to requirements specified in Section 22 0554, *Identification for Plumbing, HVAC, and Fire Piping and Equipment.*

FIELD QUALITY CONTROL

Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

Perform the following tests and inspections with the assistance of a factory-authorized service representative:

* + - 1. Verify that shipping, blocking, and bracing are removed.
      2. Verify that unit is secure on mountings and supporting devices and connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
      3. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
      4. Adjust belt tension.
      5. Adjust damper linkages for proper damper operation.
      6. Verify that cleaning and adjusting are complete.
      7. Verify lubrication for bearings and other moving parts.
      8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
      9. Replace fan and motor pulleys as required to achieve design airflow.
      10. Remove and replace malfunctioning units and retest as specified above.

Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports.

SCHEDULES

A. See the Equipment Schedule on the drawings.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

As a minimum, the following information and performance characteristics shall be shown on the drawings as part of the equipment schedule.

Capacity:

* + - 1. Air Flow, cfm
      2. Static Pressure, inch wg
      3. Fan RPM

Electrical Characteristics and Components:

* + - 1. Electrical Characteristics:
         1. Motor HP, kW, Rated load amperes.
         2. Volts, single or three phase, 60 Hz.
         3. Maximum amperes
         4. Minimum circuit ampacity
      2. Disconnect Switch: Factory mount disconnect switch [in control panel] [on equipment].

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END OF SECTION

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Do not delete the following reference information.

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THE FOLLOWING STATEMENT IS FOR LANL USE ONLY

This project specification is based on LANL Master Specification 23 3400 Rev. 2, dated   
October 21, 2024.