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**Twin City Fan & Blower Guide Specification
Louvered Penthouse Filtered Supply: Model LPSF, Belt Driven**

**Twin City Fan’s Belt Driven Filtered Louvered Filtered Supply Fan, Model LPSF**, is designed specifically for roof mounted applications, supplying clean, untempered make-up air. These fans offer high efficiency and quiet operation in a compact louvered penthouse design.

The Twin City Fan & Blower penthouse unit is a self-contained, completely weatherproof filtered supply fan package. This package includes an arrangement 3F double width backward curved fan, common fan/ motor base, V-belt drive, and filters all enclosed in a louvered aluminum hood with aluminum top cap. A reinforcing rib in every louver extrusion gives additional strength to each louver.

**Application**

The Twin City Fan & Blower LPSF Louvered Penthouse Supply Fan is a roof mounted centrifugal supply fan designed to provide filtered outside air to buildings such as manufacturing plants, warehouses, and auditoriums. The louvered penthouse fan supplies fresh make-up air to replace the air lost through industrial processes, fume hood exhaust, or general building ventilation.

Sizes (wheel diameters): 12.7 to 35.6 inches (323 mm to 905 mm)

Airflow: Up to 47,000 CFM (79,852 m3/hour)

Static Pressure: Up to 5.5 inches wg (1,366 Pa)

Twin City Fan & Blower (TCF) is an industry leading designer and manufacturer of high quality commercial and industrial fans and is a division of Twin City Fan Companies, Ltd. Our extensive product line includes centrifugal fans and blowers, axial fans, and power roof ventilators. For the commercial market, TCF supplies ventilation fans for retail and office buildings, restaurants, schools, hospitals, and government buildings. TCF’s industrial fans are used in a wide variety of process applications for numerous industries including Petrochemical, Nuclear, Cement, Steel, and Air Pollution Control. Special materials, construction, coatings, and accessories are available to fit any application requirements.

TCF has completed thousands of successful installations across the globe and has a proven track record for tackling the most technically complex applications within the fan industry. TCF is also known for its technical design capabilities, comprehensive testing services, and responsive sales team. Due to the company’s extensive expertise and long-standing reputation for proven quality, TCF products continue to be specified around the globe.

TCF occupies over 1,000,000 sq. ft. of manufacturing space across ten facilities in the U.S, with expanded manufacturing and service operations located in South America, Europe, India, China, and Singapore. Headquarters are located in Minneapolis, Minnesota, which houses the management, sales and marketing, accounting, human resources, material management, engineering personnel, as well as a state-of-the-art AMCA accredited testing lab.

We recommend you consult with your Twin City Fan & Blower Sales Representative, who can be contacted through: Twin City Fan & Blower, Minneapolis MN; (763) 551-7600; email: tcf\_sales@tcf.com; [www.tcf.com](http://www.tcf.com).

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SECTION 23 34 23.02 – CENTRIFUGAL ROOF VENTILATORS

1. GENERAL
	* + 1. SUMMARY
				1. Section includes louvered penthouse, filtered supply centrifugal roof ventilators, belt driven.
			2. REFERENCE STANDARDS
				1. American Bearing Manufacturers Association (ABMA): [www.americanbearings.org](http://www.americanbearings.org/):

ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings

ABMA 11 – Load Ratings and Fatigue Life for Roller Bearings

* + - * 1. Air Movement and Control Association International, Inc. (AMCA): [www.amca.org](http://www.amca.org):

AMCA Standard 210 -  ASHRAE 51 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating

AMCA Standard 300 - Reverberant Room Method for Sound Testing of Fans

* + - * 1. National Electrical Manufacturers Association (NEMA): [www.nema.org](http://www.nema.org):

NEMA MG 1 – Motors and Generators

* + - * 1. National Fire Protection Association (NFPA): [www.nfpa.org](http://www.nfpa.org):

NFPA 70 - National Electric Code

* + - 1. ACTION SUBMITTALS
				1. Product Data: Include the following:

Rated capacities and operating characteristics.

Fan Performance Data: Fan performance curves with flow, static pressure and horsepower.

Sound Performance Data: Fan sound power levels in eight octave bands and, A-weighted overall sound power level or sone values.

Motor ratings and electrical characteristics.

Furnished specialty components.

Specified accessories.

Dimensioned standard drawings indicating dimensions, weights, and attachments to other work.

Specifier: If Contractor will be required to provide engineering drawings and calculations for vibration, seismic, or high wind design, insert requirements here.

* + - 1. INFORMATIONAL SUBMITTALS
				1. Field quality-control reports.
				2. ISO-9001 certificate.
			2. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: Include routine maintenance, adjustment requirements, safety information, and troubleshooting guide.
			3. QUALITY ASSURANCE
				1. Manufacturer Qualifications: Approved ISO 9001-compliant manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications, and with an ASME NQA-1 compliant Program.

Specifier: Retain paragraph below if Owner allows substitutions but requires strict control over qualifying of substitutions.

Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

Product data, including certified independent test data indicating compliance with requirements.

Project references: Minimum of 5 installations not less than 5 years old, with Owner contact information.

Sample warranty.

Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.

Approved manufacturers must meet separate requirements of Submittals Article.

* + - * 1. AMCA Compliance:

Provide fan types tested in accordance with AMCA Standard 210 (air performance) and AMCA Standard 300 (sound performance) in an AMCA-accredited laboratory.

* + - 1. COORDINATION
				1. Coordinate sizes and locations of supports required for fan units.
				2. Coordinate sizes and locations of equipment supports, roof curbs, and roof penetrations.
			2. FIELD CONDITIONS
				1. Handling and Storage: Handle and store fan units in accordance with manufacturer's published instructions. Examine units upon delivery for damage. Store units protected from weather.
			3. WARRANTY

Specifier: Consult TCF for available special Project-specific warranties.

* + - * 1. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to furnish replacement components for fan units that demonstrate defects in workmanship or materials under normal use within warranty period specified.

Warranty Period: 12 months from startup or 18 months from shipment by manufacturer, whichever first occurs.

1. PRODUCTS
	* + 1. MANUFACTURER
				1. Basis-of-Design Manufacturer: Provide fan units manufactured by **Twin City Fan & Blower**, Minneapolis MN; (763) 551-7600; email: tcf\_sales@tcf.com; website: [www.tcf.com](http://www.tcf.com).
				2. Source Limitations: Obtain louvered penthouse, filtered supply centrifugal roof ventilators from a single manufacturer.
			2. PERFORMANCE REQUIREMENTS
				1. Fan Performance Ratings: [Project site elevation- based] [Sea level elevation-based].
				2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70.
			3. CENTRIFUGAL ROOF VENTILATORS
				1. Description: Belt- Driven, filtered supply, centrifugal roof ventilators, for flow of clean air for Heating, Ventilating, and Air-Conditioning (HVAC) applications.

Basis of Design Product: **Twin City Fan & Blower, Model LPSF**.

Permanently attach nameplate displaying serial number and unit information.

* + - * 1. Fan Capacities, Characteristics, and Configuration: Refer to Drawing schedule.

Specifier: Select steel option in following paragraph for all cases except spark-resistant construction.

* + - * 1. Fan Wheel: Double width, double inlet fan wheels, constructed of galvanized steel, backward inclined, single thickness blades, continuously welded into rim and back plate.

Statically and dynamically balance wheel.

* + - * 1. Fan Shaft: AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged.

Apply petroleum based rust prevention coating.

* + - * 1. Bearings: Manufacturer's standard field-lubricated ball or roller bearings, based on fan size.

Minimum L-50 Bearing Life: 200,000 hours at maximum operating speed, in accordance with ABMA 9 for ball bearings, or ABMA 11 for roller bearings.

* + - * 1. Louvered Penthouse: Provide louvered penthouse ventilator enclosure. Units through size 32 ship assembled and size 36 is shipped knocked down to 38 feet of deck space. Unit sizes 21 and larger require contract haul.

Fabricate unit of extruded aluminum louvers on welded aluminum structural frame, and reinforced, pitched, removable, aluminum hood.

Fabricate unit top cover of 0.050 inch [1.3 mm] aluminum, with cross-break and reinforcement. Miter cut corners and continuously weld seams.

Fabricate unit louvers of 0.081 inch [2.1 mm] aluminum.

Provide internal reinforcement and bracing.

Fabricate unit base of 0.080 inch [2.0 mm] aluminum.

Provide louvered, top-hinged side access panel to allow entry without removing top hood.

Specifier: The standard filter is removable, washable aluminum wire mesh. An optional filter is throw-away fiberglass.

* + - * 1. Filters: Provide [2 inch (51 mm) thick aluminum mesh removable, washable] [fiberglass throw-away] filters, and rigid support rack.
				2. Belt Drives:

V-belt drive, rated for minimum [120] [150] percent of motor nameplate horsepower, with machined, cast-iron, fixed pitch pulleys, and heat resistant, oil resistant, static-free V-belts.

Motor and Drive Assembly: Resiliently mounted on rubber isolators.

Provide heavy-duty motor mounting slide base that allows adjustment of drive belt tension.

* + - * 1. Housing: Fabricate of galvanized steel with lock seam construction. Brace housing to minimize vibration or pulsation.

Fabricate housing with spun, aerodynamically designed, cone or venturi at each inlet.

* + - * 1. Motors: Comply with NEMA MG-1 for designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 section "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

Specifier: Select motor electrical data in following subparagraphs, or show this data on the drawing fan schedule. Do not show the data in both places.

Electrical Data:

Voltage: [115] [208] [230] [460] [575] [\_\_\_\_\_] VAC; [1] [3] phase; 60 Hz.

Full Load Amps: [\_\_\_\_\_] A.

Specifier: Select motor enclosure type in first following subparagraph. For motors controlled by VFDs, retain second following subparagraph.

Enclosure Type: [Open, Drip Proof (ODP)] [Totally Enclosed Fan Cooled (TEFC)] [Explosion Proof (XP)].

Provide motors that comply with the Energy Independence and Security Act of 2007 (EISA).

Specifier: For motors controlled by VFDs, retain following paragraph.

When required, provide premium efficiency motor, suitable for inverter duty, for motors controlled by Variable Frequency Drive (VFD).

Specifier: If factory disconnect is required, select NEMA enclosure rating in following paragraph.

Provide unfused disconnect switch, NEMA [1] [3R] [4] [7/9], selected in accordance with Division 26 section "Enclosed Switches."

Specifier: Select one subparagraph below to specify factory or field mounting of disconnect.

When NEMA 7/9 disconnect is provided, select the first subparagraph below.

Ship disconnect switch loose for field mounting and wiring.

Factory mount and wire disconnect switch.

* + - * 1. Finish: Galvanized mill finish internal parts, and uncoated external [aluminum] and [galvanized steel] parts exposed to weather.

Specifier: The first paragraph below is manufacturer's standard finish. Those that follow are optional finishes. Select finish that is required.

If fans specified for the project have different finishes, include the finish for each fan on the Drawings and delete here.

[None]

[Enamel, Gray]

[Enamel, Color Matched]

[Epoxy, Black]

[Phenolic Heresite, Gray]

[Carbocoat 30, Black]

[Transcoat 161, Black].

* + - * 1. Accessories:

Specifier: Accessories listed in subparagraphs below are optional TCF features for this unit. Consult TCF representative for recommended options based upon Project requirements.

Dampers:

Specifier: When backdraft dampers are required, select one of the following two paragraphs. If both types of dampers are required on various units, coordinate with fan schedule on drawings to indicate which damper type is associated with each fan.

Backdraft Damper, Duct Mounted, Gravity Type: Aluminum construction, parallel-blade type. Adjust backdraft damper to close when fan is not running.

Backdraft Damper, Duct Mounted, Motorized Type: Aluminum construction, parallel-blade type. Adjust backdraft damper to close when fan is not running.

Specifier: Retain the following paragraph for motorized backdraft dampers, and select required voltage for actuator power.

Backdraft damper actuator suitable for [115] [208] [230] [460] [575] VAC, [1] [3] phase.

Specifier: When required, select option for mastic coating on exposed side of insulation lining in the following paragraph.

Insulated Penthouse Cap: Provide bolt-on weatherproof aluminum penthouse cap with 1 inch (25 mm) fiberglass lining [coated with mastic on side exposed to airflow]. Form penthouse cap with pitch to assure positive runoff.

Select roof curb insulation option in the following paragraph, when required.

Roof Curb: Minimum 12 inches (300 mm) high, unvented [, with 1-1/2 inch (38 mm) thick insulation].

Fabricate curb from [galvanized steel] [aluminum].

Provide roof curb with [canted] [self-flashing] base, as required by the roofing system. Refer to Division 07, Roofing.

Specifier: If a bird screen is required, retain the following paragraph and delete the filter paragraph above.

Bird Screen: Provide expanded aluminum bird screen on inboard face of louvered surfaces.

Safety Screen: Provide formed wire screens shielding fan inlet.

Access Door: Bolted, gasketed type door supplied in fan scroll.

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine areas to receive fans. Notify Engineer regarding conditions that may adversely affect installation, operation, or maintenance of fans. Proceed with installation once conditions are in accordance with manufacturer's published instructions.
			2. PROTECTION
				1. Protect adjacent construction and finished surfaces during installation and testing.
				2. Except for operational testing, do not operate fan during construction.
			3. INSTALLATION
				1. Install fans in accordance with Contract documents and manufacturer's published instructions.

Specifier: Insert applicable installation requirements for vibration, seismic, and high wind design if applicable to installation.

* + - * 1. Install fan units with adequate clearances for service and maintenance.

Specifier: Coordinate duct installation and specialty arrangements with schematics on Drawings and with requirements specified in duct systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Duct Connections: Drawings indicate general arrangement of ducts and duct accessories. Where indicated on Drawings, make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 section "Air Duct Accessories."

Install connecting ducts with adequate clearances for service and maintenance.

* + - * 1. Electrical Connections: Connect wiring in accordance with NFPA 70 and Division 26 section "Low-Voltage Electrical Power Conductors and Cables."

Ground and bond equipment according to Division 26 section "Grounding and Bonding for Electrical Systems."

Ground and bond metal parts exposed to flow airstream for spark-resistant fans.

* + - * 1. Equipment Identification: Label units according to Division 23 section "Identification for HVAC Piping and Equipment."
			1. FIELD QUALITY CONTROL

Specifier: Select option in paragraph below to define the party responsible for final tests and inspections to be performed.

* + - * 1. [Owner will retain] [Contractor shall retain] qualified testing agency to perform field tests and inspections.

Specifier: Retain first paragraph below to describe tests and inspections to be performed.

* + - * 1. Tests and Inspections:

Verify that unit is secured to supports, and that duct and electrical connections are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

Verify that cleaning and adjusting are complete.

Specifier: Retain option in following paragraph for belt driven units. Otherwise, delete option.

[Disconnect fan belt 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.

Verify that manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in fully open position.

Disable automatic temperature-control actuators, energize motor, adjust fan to indicated rpm, and measure and record motor voltage and amperage.

Shut unit down and reconnect automatic temperature-control actuators.

Remove and replace malfunctioning units and retest as specified above.

* + - * 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
				2. Submit test and inspection reports.
			1. ADJUSTING AND CLEANING
				1. Adjust, clean, and maintain installed fan units in accordance with manufacturer's published instructions.

END OF SECTION