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**Twin City Fan & Blower Guide Specification
Axial Roof Ventilators: Model THBF, Belt Driven**

Twin City Fan & Blower Tubeaxial Roof Ventilators provide cost effective, general-purpose ventilation of commercial buildings. Belt driven models are available with adjustable pitch, cast aluminum or fixed pitch, fabricated steel propellers to meet specific application requirements.

Hooded filtered supply model THBF features a removable galvanized steel hood for cleaning purposes and is available in supply configuration only.

Model THBF is available in belt driven configurations. The THBF mounts vertically, allowing for roof ventilation applications. This unit is UL 705 Listed.

**Application**

Hooded model THBF is configured for supply air only.

Sizes (propeller diameters): 21 - 60 inches (533 - 1,524 mm)

Airflow: Up to 76,400 CFM (129,000 m3/hour)

Static Pressure: Up to 1.5 inches wg (374 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 23.03 – AXIAL ROOF VENTILATORS

1. GENERAL
	* + 1. SUMMARY
				1. Section includes belt driven hooded tubeaxial roof ventilator fans for filtered supply air.
			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

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

AMCA Standard 99 - Standards Handbook

AMCA Standard 204 - Balance Quality and Vibration Levels for Fans

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)

MG 1 – Motors and Generators

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

NFPA 70 - National Electric Code

* + - * 1. Underwriters Laboratories, Inc. (UL): [www.ul.com](http://www.ul.com):

UL 705 - Standard for Power Ventilators

* + - 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.

* + - 1. INFORMATIONAL SUBMITTALS
				1. Source quality-control reports.
				2. Field quality-control reports.
				3. 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
				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 axial roof ventilators from a single manufacturer.
			2. PERFORMANCE REQUIREMENTS
				1. Fan Performance Ratings: [Project site elevation- based] [Sea level elevation-based].
				2. Compliance: Listed in accordance with UL/cUL 705.
				3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70.
			3. AXIAL ROOF VENTILATORS
				1. Provide belt-driven hooded tubeaxial roof ventilator fans for filtered supply air.

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

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

Hood: Provide hinged hood and hood support components fabricated of heavy gage [galvanized] [painted] steel] [aluminum].

For fans larger than size 36. Hoods larger than 48 inches (1,219 mm) are shipped knocked down for field assembly.

Specifier: Select propeller metal option in the following paragraph.

* + - * 1. Fan Propeller: [Cast aluminum] [Fabricated steel] blades mounted in hub.

Hub Attachment to Shaft: Split, taper-lock bushing.

Statically and dynamically balance wheel in accordance with AMCA Standard 204 when fabricated, and again after fan unit has been assembled.

* + - * 1. Fan Shaft: AISI 1045 steel, turned, ground, and polished steel. Select shaft diameter for the first critical speed of at least 1.43 times the maximum speed. Apply petroleum-based rust protectant.
				2. Bearings: Manufacturer's standard sealed field-lubricated pillow block ball or roller bearings, based on fan size and mounting orientation, with grease lines extended to outside fan housing.

Minimum L-50 Bearing Life: 200,000 hours at maximum operating speed, in accordance with ABMA 9.

* + - * 1. Casing: Formed ASTM A569/A569M low carbon hot rolled steel with continuously welded seams. Casing thickness: 12 Ga, 0.1046 inch (2.66 mm).
				2. Belt Drives:

Drive Components: V-belt drive, [adjustable] [fixed] pitch, rated for minimum 150 percent of motor nameplate horsepower. Provide machined, cast-iron pulleys, and heat resistant, oil resistant, conductive, static-free V-belts. Provide motor cover to shield motor and drives.

Motor and Drive Assembly: Resiliently mounted on rubber isolators.

Outdoor Weather hood: Provide steel weather cover to shield motor and belt-drive from weather. Fabricate with rainproof ventilation slots.

* + - * 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."

Manufactured in accordance with current applicable standards of IEEE and NEMA.

Foot-mounted, NEMA standard, rated for continuous duty with class “B” insulation.

Provide ball bearings with external grease fittings.

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.

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.

Motor Speed: [3,600] [1,800] [1,200] [900] rpm.

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] [277] [460] [575] V; [1] [3] phase; 60 Hz.

Specifier: Select motor enclosure type in first 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 the following subparagraph.

When controlled with a Variable Frequency Drive (VFD), provide premium efficiency motors suitable for inverter duty use.

* + - * 1. Motor Mounting Platform: Heavy-duty motor mounting platform with bracing and a single jackscrew and slides to allow adjustment of drive belt tension.
				2. Filter: 2 inch (51 mm) thick, washable aluminum mesh.
				3. Accessories:

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

Retain first paragraph below for roof mounted units only.

Roof Curb: Minimum 8 inches (300 mm) high, unvented [, with 1-1/2 inch (38 mm) thick insulation].

Fabricate curb from 18 gage (0.0516 inch) (1.3 mm) galvanized steel

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

Specifier: Retain roof curb base when ventilator will be placed on an existing roof curb.

Roof Curb Base: Welded steel, one-piece, weather-tight construction, to adapt from square roof curb to round fan inlet. Fabricate from steel and include pre-punched flange to mate with fan unit inlet flange.

Specifier: Retain roof curb extension when ventilator will be placed on an existing roof curb, but is not as high above the roof surface as required.

Roof Curb Extension: Provide welded steel extension matching existing roof curb dimensions. Include shelf for mounting backdraft damper.

Shaft Seal: Elastomeric Viton rotary seal and Teflon wear plate bolted to fan housing.

Maximum Ambient Temperature: 250 deg. F (121 deg. C).

Specifier: If factory disconnect is required, select NEMA enclosure rating in following paragraph, and select one subparagraph below to specify factory or field mounting. Retain second subparagraph when NEMA 7/9 (explosion proof) option is selected.

Disconnect Switch: Unfused, NEMA [1] [3R] [4] [4X] [7/9 explosion proof], selected in accordance with Division 26 section "Enclosed Switches."

Factory mount and wire disconnect switch.

Ship disconnect switch loose for field mounting and wiring.

Access Door: Allows for inspection and maintenance of the internal sections of the fan in the drive area, bolted to the housing exterior.

Inlet Safety Guard: Recommended for all non-ducted propeller roof ventilators.

Specifier: If spark resistant construction is required, select……….

Spark Resistant Construction, Type B - Aluminum bearing cover, with standard cast aluminum propeller. (Available on "E" and "C" wheels only.)

Curb Extension with Damper Shelf, compatible with canted roof curb: 13 inches (330 mm) high galvanized curb extension with 8 by 8 inch (203 by 203 mm) removable panel to allow access to damper from roof.

Backdraft Damper, [gravity] [motorized], parallel-blade type mounted on outboard side of fan. Adjust backdraft damper to close when fan is not running.

Specifier: For motorized dampers, edit and retain the first subparagraph below. Retain the second subparagraph below if 460 or 575 V power is required

Actuator: Electric, suitable for operation with [115] [230] [460] [575].

Provide transformer for actuators requiring [460] [575] V power.

* + - * 1. Finishes:

After fabrication, deburr, clean and chemically pretreat metal parts by phosphatization.

Apply two coats of following finish:

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.

Air dry enamel.

Carbocoat 30

Hot Dip Galvanizing.

Plasite 4310 Vinyl Ester

Plasite 9500

Plasite 7122L Air Dry Phenolic

Plasite 3070

Heresite VR506 Air Dry Phenolic.

Dupont ASA, 70 Gray polyester.

* + - 1. SOURCE QUALITY CONTROL
				1. Factory Run Test: Test run assembled fan units prior to shipment at specified operating speed or maximum RPM allowed. Statically and dynamically balance each wheel in accordance with AMCA 204 "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Obtain balance readings by electronic equipment in the axial, vertical, and horizontal directions on each set of bearings.

Submit report of factory run test.

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.

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."

* + - * 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.

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