****

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

Twin City Fan & Blower Model LHBF Series, Axial Roof Ventilators, provide cost effective, general purpose ventilation solutions for commercial and light industrial applications.

Model LHBF is available in belt driven configurations. Model LHBF is UL/cUL 705 listed.

**Application**

The aesthetically pleasing low profile modular hood design minimizes extension above the roof line. Belt driven models are available in filtered supply configurations. A wide array of fixed pitch, fabricated steel or adjustable pitch, cast aluminum propellers are available to meet specific performances and application requirements. Twin City Fan also offers a complete line of options and accessories such as roof curbs, backdraft dampers, disconnect switches and special coatings to maintain single source responsibility.

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

Airflow: Up to 57,600 CFM (97,900 m3/hour)

Static Pressure: Up to 1 inches wg (248 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).

This document Copyright© 2014 Twin City Fan & Blower

SECTION 23 34 23.03 – AXIAL ROOF VENTILATORS

1. GENERAL
	* + 1. SUMMARY
				1. Section includes low profile hooded axial filtered supply 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 204 - Balance Quality and Vibration Levels for Fans

AMCA Standard 205 - Energy Efficiency Classification for Fans

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

AMCA Publication 211 - Certified Ratings Program - Product Rating Manual for Fan Air Performance

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

AMCA Publication 311 - Certified Ratings Program - Product Rating Manual For Fan Sound Performance

* + - * 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. Underwriters Laboratories, Inc. / Underwriters Laboratories of Canada (UL/cUL): [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.

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. 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 ANSI/AMCA Standard 210 (air performance) and ANSI/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 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.

* + - * 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70.
			1. AXIAL ROOF VENTILATORS
				1. Description: Belt - Driven, Axial Roof Ventilators: Hooded axial filtered supply roof ventilators units, configured for vertical flow of filtered supply air for general ventilation applications.

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

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

Specifier: In the following paragraph, the standard hood material is steel. Aluminum construction is optional. If insulated lining is required, retain the subparagraph.

* + - * 1. Hood: Provide hinged hood and hood support components fabricated of heavy gage [galvanized] [painted steel] [aluminum].
				2. Motor Mount Assemblies: Provide motor mount assemblies fabricated of heavy gage steel.

Specifier: In the following paragraph, the standard propeller material is aluminum. Steel construction is optional.

* + - * 1. Propeller: [Cast aluminum] [Fabricated steel] blades in hub, adjustable pitch.

Weld propeller hub to fan shaft, or secure with tapered bushing.

Statically and dynamically balance propeller.

* + - * 1. Fan Shaft: AISI 1040 or 1045 hot-rolled steel turned, ground, and polished; keyed to wheel hub; sized for first critical speed minimum 1.43 times maximum speed for each fan class.
				2. Bearings: Manufacturer's standard 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 for Ball Bearings, or ABMA 11 for Roller Bearings.

* + - * 1. Belt Drive:

Drive Components: V-belt drive, rated for minimum 150 percent of motor nameplate horsepower, with machined, cast-iron pulleys, and heat resistant, oil resistant, static-free V-belts.

Motor Pulley: Adjustable pitch.

* + - * 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 on Drawings. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

Specifier: Select one or both of the following two paragraphs, as indicated on the Drawing fan schedule.

Motor - Single Phase: Induction type, with split phase construction and capacitor start. Provide permanently lubricated heavy duty ball bearings.

Specifier: Select motor enclosure type in following paragraph.

Motor - Three Phase: Induction type, with [Open, Drip Proof (ODP)] [Totally Enclosed Fan Cooled (TEFC)] [Explosion Proof (XP)] enclosure. Provide permanently lubricated heavy duty ball bearings.

Specifier: If factory disconnect is required, select NEMA enclosure rating in following paragraph, and select one subparagraph below to specify factory or field mounting.

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

Ship disconnect switch loose for field mounting and wiring.

Factory mount and wire disconnect switch.

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.

Do not mix voltages between lines for 60 Hz and 50 Hz power.

Electrical Data:

Voltage: [115] [208] [230] [277] [460] [575] [\_\_\_\_\_] V; [1] [3] phase; 60 Hz.

Voltage: [190] [380] [\_\_\_\_\_] V; [1] [3] phase; 50 Hz.

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

* + - * 1. Filter: Provide 2 inch thick washable aluminum mesh filter.

Specifier: Select from standard finish options in the following paragraph, and painted finish options in the subparagraphs that follow.

* + - * 1. Coating: [Painted] [Galvanized mill] finish.

Enamel, grey, on exterior surfaces

Enamel, custom color matched, on exterior surfaces

Epoxy, air dried

Phenolic, air dried

* + - * 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.

Roof Curb: Minimum [8] [12] [18] inches [(203)] [(305)] [(457)] mm high, [galvanized steel] [aluminum], unvented, with 1.5 inch (38 mm) thick insulation.

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.

Tall Base Construction: Provide extended fan section with access door to allow access to damper from roof level.

Curb Cap: One-piece, weather-tight construction, pre-punched mounting holes for correct attachment to roof curb. Fabricate of [galvanized] [painted] steel and include flange to mate with fan unit inlet flange.

Curb Side Guard: Provide metal guard between fan and roof curb to protect personnel in unducted installation.

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.

Specifier: When specifying single point wiring, be sure to specify the tall roof curb, motorized damper, and factory wired disconnect switch.

Single Point Wiring: Provide junction box on exterior of base to house disconnect switch and motorized damper wire connections.

Tie Down Brackets: Provide four brackets to allow for unit to be anchored to roof. Furnish tie down cables in field.

Insect Screen: Provide aluminum mesh screen with frame, for mounting between fan base and roof curb. Ship insect screen loose fir field installation.

Extended Lube Lines (Polyethylene)

Aluminum Construction: Hood and exterior of fan housing constructed of aluminum in lieu of standard galvanized steel.

Insulated Hood: Inside of hood lined with fiberglass insulation.

* + - 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 ANSI/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, [install factory-furnished companion flanges and] 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."

* + - * 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