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**Twin City Fan & Blower Guide Specification
Upblast Tubeaxial Roof Ventilators: Model TUBSH, Smoke and Heat Removal**

**Twin City Fan & Blower Model TUBSH Series, Upblast Tubeaxial Fans** are designed to remove smoke from buildings in the event of a fire. The TUBSH is UL listed for Smoke Control Systems - 500 deg. F (260 deg. C) for 4 hours and 1000 deg. F (537 deg. C) for 15 minutes. Belt drive models are available with fabricated steel propellers to meet specific application requirements. Model TUBSH fans offer superior air and sound performance and the AMCA certified rating seal for air and sound and is UL/cUL listed for Smoke Control Systems.

**Application**

Model TUBSH is available in belt driven configurations. Model TUBSH fans mount vertically, typically on a roof curb. Upblast model TUBSH includes a heavy-duty, galvanized steel stack cap with butterfly dampers to discharge air upward and prevent recirculation into the building. A splash guard located over the damper pivot area protects against rain entry.

Sizes (propeller diameters): 24 to 60 inches (610 mm to 1,525 mm)

Airflow: 3,200 to 70,700 CFM (5,437 to 120,119 m3/hour)

Static Pressure: Up to 1.5 inches wg (373 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 upblast tubeaxial roof ventilator fans for exhaust 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 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

NFPA 92 - Standard for Smoke Control Systems

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

UL/cUL 705 - Standard for Power Ventilators

UL/cUL 793 - Standard for Automatically Operated Roof Vents for Smoke and Heat

* + - 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 AMCA Standard 210 (air performance) and AMCA Standard 300 (sound performance) in an AMCA-accredited laboratory.

Provide fan units rated according to AMCA Standard 211 (air performance) and AMCA Standard 311 (sound performance).

Provide fan units rated according to AMCA Standard 205 (fan efficiency grade).

* + - 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. AMCA Compliance: Provide units that bear the AMCA-Certified Ratings Seal.
				3. Compliance:

Classified under AMCA Standard 205.

Provide units listed in accordance with UL/cUL 705.

Provide fan listed in accordance with UL/cUL 793 for smoke control systems.

* + - * 1. Environment:

UL/cUL listed for operation for 4 hours at 500 deg. F (260 deg. C).

UL/cUL listed for operation for 15 minutes at 1,000 deg. F (538 deg. C).

* + - * 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70.
			1. AXIAL ROOF VENTILATORS
				1. Provide belt-driven fixed pitch axial fans, configured for vertical flow of relatively clean air for Heating, Ventilating, and Air-Conditioning (HVAC) applications or for air at elevated temperatures in emergency situations.

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

Permanently attach nameplate displaying serial number and unit information.

* + - * 1. Fan Capacities, Characteristics, and Configuration: Refer to Drawing schedule.
				2. Fan Propeller: Fabricated steel, fixed-pitch, 5-blade, mounted in steel hub.

Hub Attachment to Shaft: Taper-lock bushing.

Maximum Operating Temperature: 500 deg. F (238 deg. C) for four hours, 1,000 deg. F (538 deg. C) for 15 minutes.

Statically and dynamically balance propeller 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 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. Housing: Formed ASTM A 569 low carbon hot rolled steel with continuously welded seams.

Specifier: Metalized vinyl nameplate is standard. Metal options are available as required.

Apply [metalized vinyl] [aluminum] [stainless steel] nameplate, showing fan model, serial number, and pertinent fan information.

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

* + - * 1. Curb Cap: 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.
				2. Discharge Cap: Provide galvanized steel stack cap with gravity operated galvanized steel butterfly dampers at fan discharge. Include gasket. Finish with manufacturer's standard finish.

Velocity: 1,800 to 3,000 feet/min (9.1 to 15.2 m/s).

Fusible Link: Provided with spring loaded discharge cap dampers and a fusible link that melts at 165 def. F (74 deg. C). When fusible link melts, discharge cap dampers remain open at all times.

* + - * 1. Motor Cover: Galvanized steel motor cover is easily removable for inspection and service of motor and drives from the roof.
				2. Belt Drives:

Drive Components: V-belt drive, rated for minimum 200 percent of motor nameplate horsepower, with machined, cast-iron pulleys, and heat resistant, oil resistant, static-free V-belts. Provide pulleys with minimum two belt grooves.

Provide belt shield tubes to isolate drive components from airstream.

* + - * 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.

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.

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

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

Specifier: Retain following paragraph when fan will be controlled by a VFD, or when premium efficiency is required. Consider this paragraph for projects seeking LEED certification.

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

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

* + - * 1. Disconnect Switches: Provide unfused disconnect switch, NEMA [1] [3R] [4] [4X] [7/9 explosion proof], selected in accordance with Division 26 section "Enclosed Switches."

Specifier, retain option in the following paragraph when NEMA 7/9 disconnect switches are required. For other NEMA classes, retain the following paragraph as required.

 [For NEMA 7/9,] ship disconnect switch loose for field mounting and wiring.

Factory mount and wire disconnect switch.

* + - * 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. Finishes:

After fabrication, clean and chemically pretreat steel parts by phosphatization.

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

Apply two coats

[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.

Roof Curb: [Self-flashing], [12 inches (305 mm)] [18 inches (457 mm)] high, vented, without insulation.

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 and insulation. Include shelf for mounting backdraft damper.

Magnetic Damper Latches: Hold butterfly dampers on discharge closed when fan is not running.

Access Door: Bolt-on type, with gasket.

[Inlet] [Outlet] Guards: Removable, welded wire.

* + - 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, [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."

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.

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