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**Twin City Fan & Blower Guide Specification
Turbo Pressure Blower: Model TBNA, Direct or Belt Driven**

**Twin City Fan & Blower Model TBNA**, Radial Turbo Pressure Blowers are low volume, high-pressure blowers designed for stable operation throughout their operating range. Multiple outlet sizes and wheel diameters allow the most efficient selections across a wide range of operating points. These units incorporate a high efficiency wheel design at an economical price. Stable operation can be maintained from free delivery to shutoff by throttling at the discharge. The design volume of a particular fan can be varied by selecting one of the various wheel options that will fit within the housing.

**Application**

Twin City Fan & Blower’s TBNA turbo blower is designed to handle clean gas streams with temperatures up to 200 deg. F (93 deg. C) with uniform pressure through the operating range. Typical applications for model TNBA fan include: air pollution control, process cooling, dust collection, explosion-proof processes, drying applications, vacuum systems, process applications, general manufacturing, exhaust, waste water treatment, and combustion air.

Sizes (wheel diameters): 14.5 to 38.0 inches (370 mm to 970 mm)

Airflow: Up to 20,000 CFM (34,000 m3/hour)

Static Pressure: Up to 128 inches wg (31,800 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 16 – INDUSTRIAL FANS

1. GENERAL
	* + 1. SUMMARY

Specifier: Select fan drive type in the following paragraph.

* + - * 1. Section includes radial turbo pressure blowers with radial blade design, and [direct] [belt] drive.
			1. REFERENCE STANDARDS

Specifier: Retail the ABMA reference standards only when Arrangement 8 direct drive or belt drive fans are specified.

* + - * 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 210 - 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. 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

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 centrifugal turbo pressure blowers 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. RADIAL FANS
				1. Description: [Direct] [Belt] - driven, industrial fans with radial blades.

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

Permanently attach nameplate displaying serial number and unit information.

* + - * 1. Fan Capacities, Characteristics, and Configuration: Refer to Drawing schedule.
				2. Fan Wheel Impeller: Provide non-reversible, aluminum wheel with radial blade design. Hub to be keyed to shaft.

Materials of Construction: High strength aluminum alloy, based on wheel size and pressure class.

Blades to be riveted to front plate and backplate.

Statically and dynamically balance wheel before and after assembling fan.

Minimum Balance Quality Grade: G6.3, in accordance with AMCA Standard 204.

Specifier: Retain the following paragraphs for Fan Shaft and Bearings for Arrangement 8 direct drive, and belt drive units only.

* + - * 1. Fan Shaft:

AISI C1045 hot-rolled steel.

Turn, grind, and polish shaft.

Size shaft for first critical speed minimum 1.43 times maximum speed for each fan class.

Apply petroleum based rust preventative coating.

Key shaft to wheel hub.

Include OSHA compliant [shaft] [shaft and bearing] guard.

Retain the option in the following paragraph when extended grease lines are required

* + - * 1. Bearings: Heavy-duty, grease lubricated, spherical roller or anti-friction ball, self-aligning, pillow block type, based on fan size and mounting orientation located outside the airstream[, with grease lines extended to outside fan housing].

Minimum L-10 Bearing Life: 40,000 hours at maximum operating speed, in accordance with ABMA 9 for Ball Bearings or ABMA 11 for roller bearings.

* + - * 1. Housing: Continuously welded steel, reinforced with rigid bracing. Provide non-adjustable mounting position.

Specifier: Pre-punched outlet flange is standard for all fans. Plain pipe outlet is available on fans with wheel diameters 26 inches (660 mm) and smaller.

Provide [pre-punched, flanged outlet connection with class 150 pattern] [plain pipe outlet]

Specifier: Inlet venturi is standard for fans with wheel diameters 26 inches (660 mm) and smaller and optional on larger wheel diameters. Inlet flange is standard for fans with wheel diameters larger than 26 inches (660 mm) and optional on smaller wheel diameters. Plain pipe inlet is optional on all fan sizes.

Inlet flange is required on Arrangements 4HI and 4VI.

Select inlet screen in the following paragraph when required.

Provide [inlet venturi [and inlet screen]] [pre-punched, flanged inlet connection with class 150 pattern] [plain pipe inlet].

Specifier: Retain following subparagraph for fans with wheel diameters 26 inches (660 mm) and smaller. Delete for fans with larger wheel diameters.

Provide six standard field adjustable mounting positions to direct discharge direction.

Partially welded seams are not acceptable.

Specifier: Shaft seals are standard on fans with wheel diameters larger than 26 inches (660 mm). Shaft seals are available for fans with wheel diameters 26 inches (660 mm) and smaller in the accessory list.

Shaft Seal: Manufacturer's standard seal, constructed of non-asbestos woven fibrous ceramic felt materials compressed between aluminum cover plate and fan housing.

* + - * 1. Supports: Steel angle and plate, intermittently welded with sealant filled between welds.
				2. Direct Drive:

Specifier: Retain paragraph below for direct drive, Arrangement 4, 4VI, and 4HI fans only.

Mount fan wheel directly on motor shaft.

Specifier: Retain paragraph below for direct drive, Arrangement 8 fans only.

Provide coupling with service factor of 1.5 x motor HP between motor and fan shaft.

Include OSHA compliant coupling guard.

Specifier: Retain paragraph and subparagraphs below for belt-driven units only. Fixed pitch drives for all fans are standard equipment. Adjustable pitch drives are optional.

* + - * 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 10 HP and Smaller: Adjustable pitch.

Motor 15 HP and Larger: Fixed pitch.

Specifier: Retain options in the following paragraph when required.

Belt Guard: Steel, ventilated, OSHA compliant [quick access designed with hinged front and rubber latches]. [Paint belt guard yellow.]

* + - * 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.

Motor Speed: Based upon performance requirements and application.

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 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.

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] [\_\_\_\_\_] V; [1] [3] phase; 60 Hz.

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

Specifier: Select motor enclosure type in first following subparagraph.

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

Specifier: For motors located in hazardous locations, select one or the other of the following. If motor is not located in hazardous location, delete subparagraph. Consult TCF for hazardous location classification availability.

[Explosion Proof] [ATEX].

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.

Specifier: Retain paragraph below for belt-driven units only.

* + - * 1. Motor Mounting Platform: Heavy-duty motor mounting platform that allows adjustment of drive belt tension. Motor location per drawing schedule.

Specifier: Retain paragraph and subparagraph below when isolation is required, and coordinate options with project design.

* + - * 1. Vibration Isolation:

Specifier: Retain paragraph and subparagraph below, and coordinate options with project design.

Provide isolation of fan from connected piping, duct work and foundation in accordance with fan manufacturer's requirements, and Division 23, Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

Specifier: Retain the following paragraphs if fan is to be mounted on a separate base.

Isolation Type Base:

Specifier: Spring isolation bases are only available on Arrangement 1 and 4 fans. Inertia type bases are only available on Arrangement 1 and 8 fans. Select base and options as required. Delete base type not used.

Spring isolation base: Provide spring isolators [and seismic restraints] with [1 inch (25.4 mm)] [2 inch (51 mm)] deflection.

Inertia type base: Provide spring isolators [and seismic restraints] with [1 inch (25.4 mm)] [2 inch (51 mm)] deflection.

Specifier: Retain the following paragraph for fans mounted directly to the foundation. Isolator rails are for smaller sized Arrangement 4 fans only (fans with wheel diameters 26 inches (660 mm) and smaller).

Vibration Rails with isolation mounts.

Equipment isolation rails with neoprene-in-shear vibration isolators.

* + - * 1. Coatings:

Specifier: Retain paragraph 1 or 2 based on application requirements. Delete remaining paragraph.

Standard Coating: All carbon steel components shall be cleaned and chemically treated by a phosphatizing process. Fan shall then be coated with blue enamel.

Special Coating: [\_\_\_\_\_].

* + - * 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.

Inspection Port.

Drain: 3/4 inch NPT [with plug].

Shaft Seal: Manufacturer's standard seal, constructed of non-asbestos woven fibrous ceramic felt materials compressed between aluminum cover plate and fan housing.

Provide pre-punched, flanged inlet connection with class 125 pattern.

Provide [inlet bell and] screens at fan inlet.

Specifier: Retain paragraph below for units with volume control device(s) as determined by the Drawing Schedule.

Volume Control Devices:

Specifier: Select volume control device as determined by the Drawing Schedule. For outlet blast gate, select automatic or manual operation in the following paragraph.

Outlet Blast Gate: Provide wafer-type steel butterfly valve [with manual operating lever] [suitable for automatic operation].

Outlet Damper: Parallel blade with steel blade(s) nested in the outlet of the fan housing. Provide actuating arm for manual adjustment with locking setscrew.

Specifier: Select applicable paragraph and subparagraphs below when actuator is required for volume control device(s).

Actuators listed in subparagraphs below offer various construction features and options. Consult TCF for recommended options based upon Project requirements.

Actuators

Electric actuator.

Double acting pneumatic actuator (air-to-air).

Specifier: Select applicable subparagraph and delete remaining subparagraphs for the use of the blast gate.

Modulating service with pneumatic positioner.

Modulating service with electro-pneumatic positioner.

Pneumatic actuator with spring return (air-to-spring).

Specifier: Select applicable subparagraph and delete remaining subparagraphs

Two-position.

Modulating service with pneumatic positioner.

Modulating service with electro-pneumatic positioner.

Specifier: Retain following paragraph when spark-resistant construction is required. Select applicable subparagraph.

Spark Resistant Construction:

AMCA Type A: Provide parts of the fan in contact with the air or gas being handled shall be made of aluminum or other nonferrous material, and limited to 200 deg. F (93 deg. C).

AMCA Type B: Provide non-ferrous fan wheel impeller and aluminum rub ring where shaft penetrates fan housing. Maximum operating temperature: 200 deg. F (93 deg. C).

Specifier: Outlet flex connectors are available on all fans. Outlet tube adapter with rubber connector is only available on fans with outlet flange. Rubber connector without tube adapter is available on fans with plain pipe outlets.

Outlet Flex Connector

Provide Outlet Tube Adapter with Rubber Connector:

Provide collar with flange which bolts directly to the blower discharge.

Provide rubber slip-type connector with two hose clamps connects the adapter to the pipe line and helps to isolate vibration and noise transmission to the rest of the system.

Provide Outlet Rubber Connector:

Provide rubber slip-type connector with two hose clamps connects the adapter to the pipe line and helps to isolate vibration and noise transmission to the rest of the system.

Specifier: Turbo blower wheels are designed for handling clean air only. An inlet filter is recommended when a turbo blower is installed in a dust laden atmosphere to help keep the wheel clean and free of clogging, loading and erosion. Be sure to select the inlet flange housing option for mounting the filter assembly.

Inlet Filter:

High-Flow polyester filter media, replaceable, non-washable, with 2 inch wg (500 Pa) pressure drop, maximum.

Ultra-synthetic filter media, replaceable, non-washable, with 3 inch wg (750 Pa) pressure drop, maximum.

Wire Mesh filter media, cleanable with detergent or solvent, with 2 inch wg (500 Pa) pressure drop, maximum.

Provide filter assembly with mounting flange drilled to match Class 125 pattern flange.

Specifier: Turbo blower wheels are designed for handling clean air only. An inlet filter is recommended when a turbo blower is installed in a dust laden atmosphere to help keep the wheel clean and free of clogging, loading and erosion. Be sure to select the inlet flange housing option for mounting the filter assembly.

Inlet Filter/Silencer:

Provide combination filter/silencer designed to handle both dirty atmosphere and noise.

Select filter/silencer for 3 inch wg (750 Pa) pressure drop, maximum.

Provide filter assembly with mounting flange drilled to match Class 125 pattern flange.

Inlet Silencer:

Provide inlet silencer designed to minimize noise levels emanating from fan inlet.

Provide support leg when necessary to reduce load on fan inlet flange.

Provide inlet silencer with mounting flange drilled to match Class 125 pattern flange.

Outlet Silencer:

Provide outlet silencer designed to minimize noise levels emanating from fan outlet.

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

* + - * 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 options 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