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**Twin City Fan & Blower Guide Specification
Square In-line Fans: Model BSI, Belt Driven**

**Twin City Fan & Blower Model BSI** is a belt driven, square, inline fan suitable for duct installations handling clean ventilation air. Duct collars are provided to eliminate the need for square to round transition fittings.

Model BSI (belt driven) features galvanized steel construction. These units are designed for duct applications handling relatively clean air, including supply, exhaust and return air systems. BSI fans offer high efficiency and quiet operation in a compact design that can be mounted in any position (horizontal, vertical or angular).

Model BSI is AMCA Certified for Air and Sound and is UL/cUL 705 listed.

**Application**

A square inline fan features highly efficient, non-overloading, backward inclined centrifugal wheel precisely matched to a spun inlet venturi. Fan wheels are statically and dynamically balanced.

Accessibility: These units can be easily serviced through access panels without removing duct connections.

Sizes (wheel diameters): 10.5 to 44.5 inches (20mm to 1,130mm)

Airflow to 230 to 27,500 CFM (425 to 46,722 m3/hour)

Static pressure to 3.5 inches wg (869 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 23.07 - IN-LINE CENTRIFUGAL FANS

1. GENERAL
	* + 1. SUMMARY
				1. Section includes square in-line centrifugal fans, belt driven.
			2. REFERENCE STANDARDS

Specifier: If retaining this optional References Article, edit to include only those references included in edited section.

* + - * 1. Anti-Friction Bearing Manufacturers Association (AFBMA): [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)

MG 1 – Motors and Generators

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

NFPA 70 - National Electric Code

* + - * 1. Office of Statewide Health Planning and Development (OSHPD): https://www.oshpd.ca.gov/

OSHPD Special Seismic Certification Preapproval OSP-0271-10

ICC-ES AC 156 – Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components

* + - * 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.

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.

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, [vibration isolation mounts] [seismic mounts and restraints].
			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 Twin City Fan & Blower 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

Specifier: Retain option for substitutions below when required for Project.

* + - * 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).

Submit comparable products of other manufacturer for approval in accordance with Instructions to Bidders and Division 01 General Requirements.

* + - * 1. Source Limitations: Obtain mixed flow fans from a single manufacturer.
			1. PERFORMANCE REQUIREMENTS
				1. Fan Performance Ratings: [Project site level- based] [Sea level-based].
				2. AMCA Compliance:

Specifier: AMCA-Certified Ratings Seal is not available for fans with speed control.

Provide units that bear the AMCA-Certified Ratings Seal.

* + - * 1. Compliance:

Classified under AMCA Standard 205

Provide units that comply with requirements of UL 705.

* + - 1. SQUARE INLINE CENTRIFUGAL FANS
				1. Square Inline Centrifugal Fans: Belt-driven, square, inline fan suitable for duct installations handling clean ventilation air.

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

Permanently attach nameplate displaying serial number and unit information.

Specifier: Include option in the following paragraph if insulated fan housing is required.

* + - * 1. Housing: Heavy-gauge [galvanized steel] [aluminum] with continuously gasketed contact surfaces [and interior insulation].

Provide inlet venturi matched to fan wheel.

Provide removable side panels for maintenance.

Construct fan to allow complete removal of motor, drives, and fan wheel when side panel is removed.

Provide universal mounting brackets to allow for horizontal or vertical fan orientation.

Specifier: Retain following paragraph and select option if internal insulation is required.

Provide one inch thick fiberglass [neoprene coated] [foil faced] insulation liner in fan housing. Do not expose fiberglass to moving airstream.

* + - * 1. Fan Shaft:

Specifier: Select option in the following paragraph when a stainless steel shaft is required.

Turn, grind, and polish [stainless] steel shaft.

Key shaft to wheel hub.

Size shaft for first critical speed minimum 1.25 times maximum speed for each fan class.

* + - * 1. Bearings: Manufacturer's standard, heavy duty, field-lubricated pillow block ball type, based on fan size and mounting orientation.

Minimum L-50 Bearing Life: 500,000 hours at maximum operating speed, in accordance with AFBMA 9.

Provide belt and bearing enclosure to shield from airstream.

* + - * 1. Fan Wheels: Aluminum hub and non-overloading wheel with backward-inclined blades, statically and dynamically balanced.
				2. 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. 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.

Specifier: Select either 60 Hz or 50 Hz electrical data from the following subparagraphs. Do not mix voltages between 50 Hz and 60 Hz paragraphs.

Electrical Data:

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

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

Specifier: Select motor enclosure type in following subparagraph.

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

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

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, and select one subparagraph below to specify factory or field mounting. Retain second subparagraph when NEMA 7/9 (explosion proof) option is selected.

Provide unfused disconnect switch, NEMA [1] [3R] [4] [4X] [7/9], 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: When required, retain custom finish option below and describe custom finish required.

* + - * 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. Filter Box: Provide filter box constructed of galvanized steel, with removable, [washable aluminum ] [disposable paper] element filters.
				2. Accessories:

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

Backdraft Damper, [Automatic] [Motorized], parallel-blade type. Adjust backdraft damper to close when fan is not running.

Fabricate frame from galvanized steel.

Fabricate blades from aluminum, mill finish, with vinyl edge seals.

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

Backdraft damper actuator suitable for [24] [115] [208] [230] [460] [575] Vac, single phase. [Provide transformer for [575] V actuator.]

Belt Guard: Provide formed galvanized steel guard to cover the complete drive assembly.

Motor Cover: Provide formed galvanized steel guard to cover the motor and complete drive assembly.

Guards: provides ½” x ½” [galvanized steel] [aluminum] mesh protective guards for fan [inlet] [outlet].

AMCA Type B Spark Resistant Construction: Provide non-ferrous fan wheel impeller and aluminum rub ring where shaft penetrates fan housing.

Stainless steel hardware.

Extended lube lines.

Specifier: When required for single phase motors, 1 HP or smaller, retain the following paragraph for two-speed selector switch.

Two-Speed Switch: Provide two speed switch (Hi Speed - Off - Low Speed) with two-speed, dual winding motor.

Specifier: Select options in the following paragraph. If isolator details are on drawings, retain last option in the following paragraph.

Provide [spring] [rubber in shear] vibration isolators or isolation hangers [, as indicated on Drawings].

Side Discharge Kits: Provide replacement side panels to add 1-way, 2-way, or 3-way discharge.

Specifier: Retain the following paragraph when OSHPD Seismic Certification is required for the project

Available accessories when OSHPD Seismic Certification is required are limited to the following:

• Inlet Collar • Outlet Collar

• Stainless Steel Shaft • Stainless Steel Hardware

• Motor Cover Std. Type with modification • Belt Guard

• Belt Tube • Fins on Wheel Backplate

• Shaft Seal-Std. type • Extended Lube Lines

• Painted Finish

• Insulated Housing: Neoprene Coated insulation, Foil Backed Insulation

• Inlet Screen: Galvanized Steel, Aluminum

• Outlet Screen: Galvanized Steel, Aluminum

• Disconnect Switch: NEMA 1, NEMA 3R, NEMA 4

• Backdraft Damper: Motorized, Automatic

• Roof Curb: 8”, 12”, 18” tall; Self-flashing or Straight Sided; Galvanized or Aluminum

OSHPD Seismic Certification: Provide unit construction compliant with California’s Office of Statewide Health Planning and Development seismic certification of equipment and components.

The Design will be in Accordance with ASCE 7-10 Chapter 13.

Specifier: Retain paragraph B for HBM discharge fans. Retain paragraph C for HCH discharge fans.

Fan will be mounted to seismic spring isolators.

Fan will be mounted to seismic spring isolators with seismic restraint cables.

* + - * 1. Fan Capacities and Characteristics: Refer to Drawing schedule.
			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."
				2. 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.

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