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**Twin City Fan & Blower Guide Specification
Utility Ventilating Sets: Model BAV, Belt Driven**

**Twin City Fan & Blower Model BAV Series, Centrifugal Utility Sets** are designed for exhausting relatively clean air in HVAC applications.

Twin City Fan’s line of utility ventilating sets is one of the most comprehensive in the industry. Utility sets are designed to meet AMCA requirements for Class I and Class II construction with both aluminum and steel wheels. Fan housings are coated with a polyester powdercoat as standard.

BAV fans offer superior air and sound performance and the AMCA certified rating seal for air and sound. The AMCA Certified for Air and Sound applies to both inlet and outlet sound power levels.

Model BAV is available in belt driven configurations. The BAV housing is rotatable, and can be positioned in any one of eight standard fan outlet directions.

**Application**

Ventilating sets are an excellent choice for general exhaust and supply requirements of commercial and light industrial applications. They are suitable for indoor usage and outdoor usage, with the addition of a weather cover to enclose the motor and drives. Continuously welded housings are rotatable to the eight standard discharge positions. Adjustable motor plates are included inside the bearing pedestal. The fans are also more compact and have a smaller footprint than arrangement 9 fans.

Sizes (wheel diameters): 12.25 to 36.50 inches (311 mm to 927 mm)

Airflow: Up to 32,100 CFM (54,500 m3/hour)

Static Pressure: Up to 8 inches wg (1,987 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 23.01 – UTILITY SETS

1. GENERAL
	* + 1. SUMMARY
				1. Section includes utility sets, 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

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

OSHPD Special Seismic Certification Preapproval OSP-0195-10

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

* + - 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 utility sets 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.
				4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70.
			3. UTILITY SETS
				1. Description: Belt- Driven, Ventilating Utility Sets: Centrifugal utility set fan units with backward inclined airfoil blades, configured for flow of relatively clean air for Heating, Ventilating, and Air-Conditioning (HVAC) applications.

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

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-overloading type backward inclined airfoil wheels including die-formed, airfoil type blades, continuously welded to wheel cone and backplate.

Partially welded blades are not acceptable.

Statically and dynamically balance wheel.

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

* + - * 1. Fan Shaft: AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged. Select shaft diameter so that first critical speed is minimum 1.43 times maximum speed.

Apply petroleum based rust prevention coating.

* + - * 1. Bearings: Manufacturer's standard field-lubricated ball bearings, 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.

Specifier: Select steel option in following paragraph for all cases except spark-resistant construction.

* + - * 1. Housing: Continuously welded steel, reinforced with rigid bracing. Provide eight standard field adjustable mounting positions to direct discharge direction.

Specifier: In following subparagraph, a bolted access door is standard. A quick open latched access door is optional.

Include aerodynamically spun inlet cones or shrouds.

[Bolted] [Quick Open Latched] Access Door.

* + - * 1. Supports: Steel angle, intermittently welded with calk at joints between welds.
				2. Belt Drives:

Drive Components: V-belt drive, rated for minimum 120 percent of motor nameplate horsepower, with machined, [fixed] [adjustable] pitch cast-iron pulleys, and heat resistant, oil resistant, static-free V-belts.

Motor and Drive Assembly: Isolated from airstream.

Specifier: Retain first following subparagraph for indoor fans. Retain second following subparagraph for outdoor fans, if required. Weather cover is available in hinged or bolt-on configurations.

Belt Guard: Steel, totally enclosed and sealed.

Outdoor Weather Cover: 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."

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] rpm.

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

Specifier: Select motor enclosure type in first following subparagraph. For motors controlled by VFDs, retain second following subparagraph.

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

Provide premium efficiency motor, suitable for inverter duty.

* + - * 1. Motor Mounting Platform: Heavy-duty motor mounting platform that allows adjustment of drive belt tension.
				2. Vibration Isolation:

Specifier: Select from paragraphs and subparagraphs below to specify the required isolation. If more than one type of isolation is required, coordinate the selected options with project design documents to show required isolators on the Fan Schedule.

Provide [spring] [neoprene-in-shear] vibration isolators, [and seismic restraints] in accordance with fan manufacturer's requirements, and Division 23, Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

Spring Isolators: Select for [1 inch (25.4 mm)] [2 inch (51 mm)] deflection.

Provide equipment mounting rails with [neoprene-in-shear] [spring] isolators integral to mounting surface.

Provide hanger rods from overhead structure, with integral [neoprene-in-shear] [spring] isolators.

Provide ceiling mounting isolation brackets, with integral [neoprene-in-shear] [spring] isolators.

* + - * 1. Coatings: [Uncoated [stainless steel] [aluminum] parts.] [Custom finish:]

Air-dried enamel.

High-temperature aluminum paint.

Asphaltum.

Vinyl PVC.

Zinc.

Air-dried epoxy.

Synthetic resin, Santile 855.

Air-dried phenolic, Heresite VR 506.

Epoxy, Carboguard 890 series.

Phenolic epoxy, Plasite 7122L

Baked phenolic, Heresite P 413

Coal tar epoxy.

High-Build baked epoxy, Skotchkote 324.

* + - * 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.

Specifier: Retain paragraph below for units with control dampers only.

Dampers:

Outlet Backdraft Dampers: Parallel-blade backdraft dampers, [gravity] [motor actuated] type. Provide dampers with galvanized steel blades and felt blade edge seals.

All-Aluminum Construction: Construct entire fan assembly, including mounting pedestal from aluminum.

Safety Screens: Removable, galvanized steel wire with radial supports.

Provide screens at fan [inlet] [outlet].

Access Doors: [Flush] [Raised 4 inches (100 mm)] [Bolted] [Quick Open Latched] Access Door.

Companion Flanges: Steel, with pre-punched bolt holes to connect ductwork to fan flanged connections.

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

Spark Resistant Construction:

AMCA Type A: Provide non-ferrous metal parts in contact with flowing airstream, and aluminum rub ring where shaft penetrates fan housing.

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

AMCA Type C: Provide construction that will not permit shaft or fan wheel impeller to contact or strike ferrous metal parts.

High Temperature Construction Packages for Class I and Class II Fans - 301 to 500 deg. F (149 to 260 deg. C)

High temperature grease.

Expansion and non-expansion bearings.

Shaft Seal: Provide shaft seal to reduce fan air to escape where shaft penetrates fan housing.

Shaft Cooler: Provide split, bolt on finned flange to prevent heat conduction through fan shaft from fan wheel to bearings.

Specifier: The heat shield in the following paragraph is standard equipment for Class I fans, sizes 122 to 270.

Heat shield.

Specifier: The insulated drive stand in the following paragraph is standard equipment for Class I fans, sizes 300 to 365, and all Class II fans.

Insulated drive stand.

High Temperature Construction Packages for Class II Fans - 501 to 600 deg. F (261 to 316 deg. C)

High temperature grease.

Expansion and non-expansion bearings.

Shaft Seal: Provide shaft seal to reduce fan air to escape where shaft penetrates fan housing.

Shaft Cooler: Provide split, bolt on finned flange to prevent heat conduction through fan shaft from fan wheel to bearings.

Heat shield.

Insulated drive stand.

High temperature aluminum paint.

Provide shaft seal, including PTFE wear plate and rubber seal, to limit airstream infiltration.

Specifier: The outlet flange in the following paragraph is standard equipment for fan sizes 222 and larger.

Provide [inlet] [outlet] flanges for making connections to ductwork.

Inlet Box: Match housing construction, with [bolt-on] [free-standing] [integral] configuration with fan housing.

Provide [factory fabricated insulated housing] [aluminum clad insulated housing; minimum thickness [2 inches (51 mm)] [\_\_\_\_\_]. Anchor housing insulation with weld pins].

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

Provide fan scroll drain with 3/4 inch NPT plug.

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

Available fan arrangements for OSHPD Seismic certification include 1, 9, 10, and 4.

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

• Weather Cover • Shaft Seal

• Extended Lube Lines • Mounted Disconnect Switch

• High Temperature Construction • Painted Finish

• Outlet Screen

• Drain: Standard type, Drain with Plug

• Flange: Inlet, Outlet; Punched, Unpunched

• Belt Guard: OSHA type, Quick access type

• Discharge Shutter: Motorized, Gravity

• Access Door: Bolt, Hinged

• Spark Resistant Construction: Type A, Type B, Type C

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.

Fan will be mounted to seismic isolators.

* + - 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. 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.

[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