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**Twin City Fan & Blower Guide Specification  
Centrifugal Roof Ventilators - Filtered Supply: Model BCRFS, Belt Driven**

**Twin City Fan’s Belt Driven Filtered Supply Fan, Model BCRFS,** is designed specifically for roof mounted applications, supplying clean, untempered make-up air. These fans offer high efficiency and quiet operation in a compact design.

Model BCRFS (Belt Drive) units feature double width forward curved centrifugal wheels, which produce high air volumes at low speeds. Units are manufactured under strict quality assurance standards to ensure catalogued performance and years of trouble-free operation.

Model BCRFS is AMCA Certified for Air and Sound and is UL/CUL 705 listed.

**Application**

Models BCRFS utilizes a roof curb-mounted supply fan, with washable aluminum filters at the fan inlet.

Accessibility: All fans feature a heavy duty removable, galvanized steel top cover. The easily removable top covers provide access to motor, drives and wheel.

Sizes (wheel diameters): 8.86 to 22.05 inches (225 mm to 560 mm)

Airflow: Up to 17,000 CFM (28,900 m3/hour)

Static Pressure: Up to 4 inches wg (1000 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](mailto:tcf_sales@tcf.com); [www.tcf.com](http://www.tcf.com).

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SECTION 23 34 23.02 – CENTRIFUGAL ROOF VENTILATORS

1. GENERAL
   * + 1. SUMMARY
          1. Section includes filtered supply centrifugal 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

* + - * 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/cUL 705 - Standard for Power Ventilators

* + - * 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. Field quality-control reports.
         2. 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](mailto:tcf_sales@tcf.com); website: [www.tcf.com](http://www.tcf.com).
          2. Source Limitations: Obtain filtered supply fans from a single manufacturer.
       2. PERFORMANCE REQUIREMENTS
          1. Fan Performance Ratings: [Project site elevation- based] [Sea level elevation-based].
          2. AMCA Seal: 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.

* + - * 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70.
      1. CENTRIFUGAL ROOF VENTILATORS
         1. Description: Belt- Driven, filtered supply, centrifugal roof ventilators, for flow of clean air for Heating, Ventilating, and Air-Conditioning (HVAC) applications.

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

Permanently attach nameplate displaying serial number and unit information.

* + - * 1. Fan Capacities, Characteristics, and Configuration: Refer to Drawing schedule.
        2. Fan Wheel: Double width, double inlet fan wheels, constructed of galvanized steel, forward curved blades, tab locked into the end rings. Provide galvanized structural steel plate mounted at center of wheel to support shaft and stabilize blades.

Statically and dynamically balance wheel.

* + - * 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.

Specifier: For wheel diameters up to 18 inches, select permanently lubricated bearing option in following paragraph. For wheel diameters 20 inches or larger, select field lubricated bearings.

* + - * 1. Bearings: Manufacturer's standard [permanently] [field] -lubricated ball bearings, based on fan size.

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

Specifier: Standard housing construction is galvanized steel. Aluminum exterior parts are available as an option.

* + - * 1. Housing: Construct unit exterior of heavy gauge [galvanized steel] [aluminum]. Provide completely removable top cover to allow access for fan maintenance.
        2. Filter: Manufacturer's standard washable aluminum mesh, 1 inch (25 mm) thick.
        3. Belt Drives:

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

Motor, Drive, and Fan Assembly: Resiliently mounted on rubber isolators.

* + - * 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.

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)] [Explosion Proof (XP)].

Provide premium efficiency motor, suitable for inverter duty.

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.

Disconnect Switch: Unfused, NEMA [1] [3R] [4] [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.

* + - * 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. Accessories:

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

Inlet Extensions: Provide side extension matching housing material and construction. Provide supports at manufacturer's recommended spacing.

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.]

Roof Curb: [8 inches (203 mm)] [12 inches (305 mm)] [18 inches (457 mm)] high, unvented, with 1-1/2 inch (38 mm) thick insulation. Fabricate from [galvanized steel] [aluminum] with welded joints.

Specifier: Select one or both of the following paragraphs to coordinate roof curbs with roofing system. If both are required, verify that fan schedule defines which curb goes with which fan.

Canted: Provide with flared base and factory installed wood nailer. Fabricate from steel and include flange to mate with fan unit inlet flange.

Self-Flashing: Provide with flat flanged base and 3/16 inch (4.8 mm) thick polystyrene gasket.

Stainless steel hardware.

Specifier: If two-speed fan operation is required, edit "Motor" paragraphs to indicate that a two-speed motor is required.

Two-Speed Switch: Provide HI/LO speed manual selector switch. Mount switch in NEMA enclosure where indicated on Drawings.

Duct Adaptor: Fabricate from galvanized steel. Provide with flat plate to seal top of roof curb and make tight seal at ventilator connection.

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