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**Twin City Fan & Blower Guide Specification
Centrifugal, Downblast Roof Exhausters: Model BCRD-E, Belt Driven**

Twin City Fan & Blower Model BCRD-E Series, Centrifugal Downblast Roof Exhausters, are a line of quiet, efficient and economical centrifugal roof exhausters with proprietary EndurexTM polymeric housings designed to offer world-class performance and quality in a wide variety of commercial and industrial ventilating applications.

Model BCRD-E (belt driven) features polymeric construction. These units are all designed for roof mounted exhaust in applications handling relatively clean air. The polymeric construction of Endurex provides the same long lasting characteristics as aluminum but with significantly improved impact, weather, corrosion, and UV resistance.

To prove our confidence in Endurex we are providing a limited lifetime warranty on all Endurex housing components.

Model BCRD-E is AMCA Certified for Air and Sound and is UL/cUL 705 listed.

**Application**

Model BCRD-E utilizes a roof curb-mounted exhaust fan, with a bird screen at the fan discharge under the Endurex polymeric enclosure.

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

Sizes (wheel diameters): 8.5 to 27.95 inches (215mm to 710mm)

Airflow: 85 to 8,700CFM (144 to 14,800m3/hour)

Static Pressure: Up to 3.25 inches wg (807 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 23.02 – CENTRIFUGAL ROOF VENTILATORS

1. GENERAL
	* + 1. SUMMARY
				1. Section includes low profile louvered penthouse 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. Office of Statewide Health Planning and Development (OSHPD): https://www.oshpd.ca.gov/

OSHPD Special Seismic Certification Preapproval OSP-0395-10

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

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

UL/cUL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

UL/cUL 705 - Standard for Power Ventilators

UL/cUL 746A - Polymeric Materials - Short Term Property Evaluations

UL/cUL 746C - Polymeric Materials - Use in Electrical Equipment Evaluations

* + - 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. UL/cUL Compliance:

Provide units tested in accordance with UL/cUL 94, UL/cUL 705, UL/cUL 746A, and UL/cUL 746C.

* + - 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:

Mechanical and Electrical Components: 12 months from startup or 18 months from shipment by manufacturer, whichever first occurs.

Endurex Components: Lifetime.

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 roof ventilators 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. Belt-Driven, Centrifugal Roof Ventilators: Centrifugal fan units, configured for vertical flow of relatively clean supply or exhaust air for general ventilation applications.

Basis of Design Product: **Twin City Fan & Blower, Model BCRD-E**.

Permanently attach nameplate displaying serial number and unit information.

* + - * 1. Fan Capacities, Characteristics, and Configuration: Refer to Drawing schedule.
				2. Motor Mount Assemblies: Provide motor mount assemblies fabricated of heavy gage galvanized steel.
				3. Wheel: Centrifugal, backward inclined type, containing matching inlet venturi.

Statically and dynamically balance wheel.

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

* + - * 1. Fan Shaft: Turned, ground, and polished [stainless] steel shaft, with shaft keyed to wheel hub, sized for first critical speed minimum 1.25 times maximum speed for each fan class.
				2. 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.

* + - * 1. Housing: Bolt on type. Heavy gauge Endurex construction of housing and top cover, and motor bands.

Fabricate units with deep formed inlet venturi to prevent snow and rain entry into building.

Provide [galvanized steel] [aluminum] wire bird screen at fan outlet.

* + - * 1. Curb Cap: One-piece, weather-tight construction, pre-punched mounting holes for correct attachment to roof curb. Fabricate from aluminum and include flange to mate with fan unit inlet flange.
				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.

Motor and Drive Assembly: Resiliently mounted on rubber isolators.

Provide mechanism that allows for precise belt tensioning by one person.

* + - * 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] [277] [460] [575] [\_\_\_\_\_] V; [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: 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: 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."

Specifier: If factory disconnect is required, select NEMA enclosure rating in following paragraph, and select one subparagraph below to specify factory or field mounting. Select option and retain the second paragraph for explosion proof disconnect switch.

Factory mount and wire disconnect switch.

Ship [explosion proof] disconnect switch loose for field mounting and wiring.

* + - * 1. Finish: Provide manufacturer's standard Endurex housing, galvanized mill finish internal parts, and uncoated aluminum parts.
				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.

Specifier: Retain appropriate options in the following paragraph for curb type. For fan specified with a backdraft damper, select minimum 12 inch roof curb height.

Roof Curb: [Canted] [Self-flashing] [\_\_\_\_\_], [8 inches (203 mm.)] [12 inches (305 mm)] [18 inches (457 mm)] [\_\_\_\_\_] high, unvented [, with 1-1/2 inch (38 mm) thick insulation].

Specifier: Retain options in the following paragraph for fans that have backdraft dampers, and where hasp hardware is required.

Curb Hinge: Provide piano hinge type assembly to allow for access to fan [and backdraft damper] from above. [Include chain attached to curb cap and roof curb to limit how far curb hinge can open. [Provide hasp hardware that accepts [Owner furnished] padlock, to inhibit unauthorized fan removal.]

Curb Cap: One-piece, weather-tight construction, pre-punched mounting holes for correct attachment to roof curb. Fabricate aluminum and include flange to mate with fan unit inlet flange.

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.]

Specifier: An automatic belt tensioner is available for fan sizes up to 160.

Automatic belt tensioner.

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

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

Stainless steel hardware.

Aluminum wire insect screen.

Tie-Down Connections: Provide housing mounted connections for use with field-furnished tie-down cables.

Hurricane Construction: Provide fan construction certified by Miami - Dade County as acceptable for outdoor installation in hurricane zone.

High-Temperature Firestat: To de-energize single phase motor: Manual reset type, field adjustable from 100 - 170 deg F (38 - 77 deg C).

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.

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:

• Extended Lube Lines, • Curb Hinge,

• Retaining Chain, • Security Hasp,

• 2-Speed Switch, • Firestat,

• Aluminum Insect Screen • Motor and Drive Assembly,

• Rubber Isolators, • Stainless Steel Shaft,

• Automatic Belt Tensioner, • Stainless Steel Hardware,

• Tie Down Brackets, • Performance Baffle

• Aluminum Nameplate, • Stainless Steel Nameplate,

• 2-Groove Drive,

• Bird screen: Galvanized Steel, Aluminum

• Disconnect Switch: NEMA 1, NEMA 3R, NEMA 4, NEMA 7/9

• 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.

Fan will be mounted to a roof curb secured using lag bolts.

* + - 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."

* + - * 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