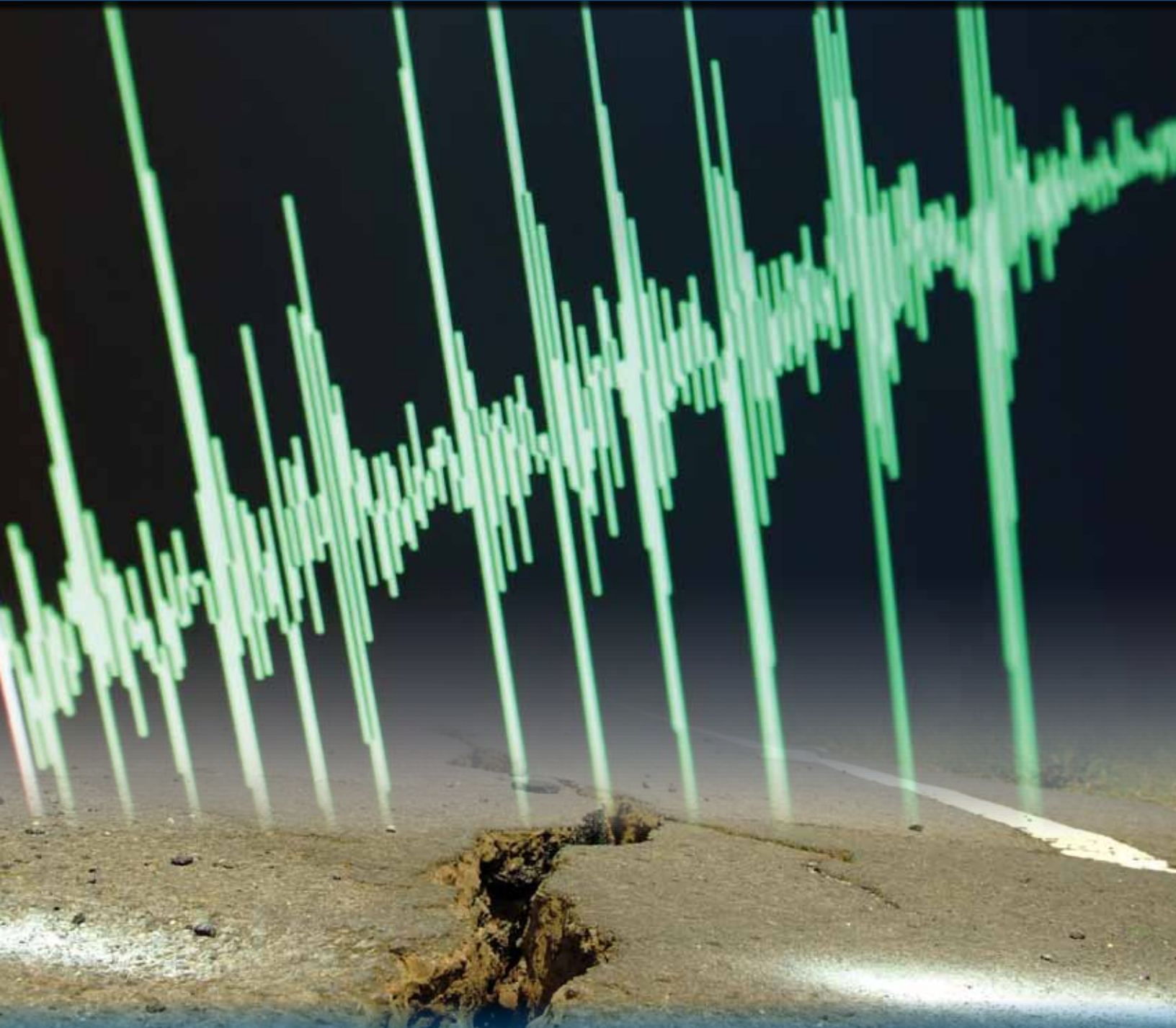


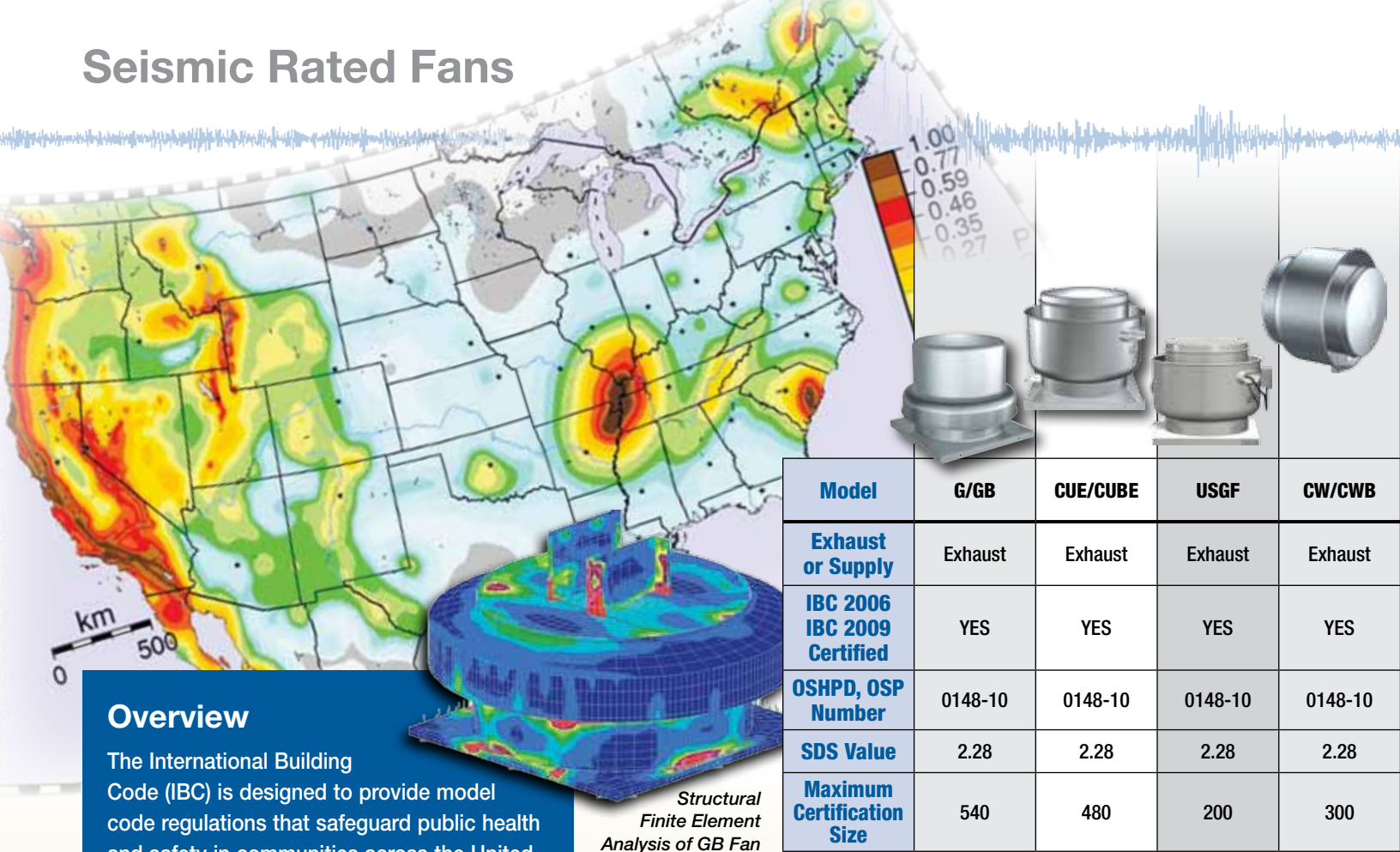
Seismic Solutions Fan Ratings Information



 **GREENHECK**
Building Value in Air.

April
2011

Seismic Rated Fans



Overview

The International Building Code (IBC) is designed to provide model code regulations that safeguard public health and safety in communities across the United States. The 2006 IBC is the latest version of outlined standards intended to improve the performance and design of non-structural systems subject to seismic events.

The Office of Statewide Health Planning and Development (OSHPD) is one division within the California Health and Human Services Agency assigned to assure the safety of health care buildings. Though OSHPD enforces building standards for health care facilities per the California Building Code (CBC), this code closely reflects the standards presented by the IBC.

Standards in the IBC and the CBC expand the emphasis for position retention of equipment and emphasize maintaining equipment functionality following a seismic event.

As an industry leader, Greenheck manufactures seismic certified products that maintain structural integrity during and after a seismic event.

Basic information on seismic certification and how our products meet these needs are provided here.

Structural Finite Element Analysis of GB Fan

Model	G/GB	CUE/CUBE	USGF	CW/CWB
Exhaust or Supply	Exhaust	Exhaust	Exhaust	Exhaust
IBC 2006 IBC 2009 Certified	YES	YES	YES	YES
OSHPD, OSP Number	0148-10	0148-10	0148-10	0148-10
SDS Value	2.28	2.28	2.28	2.28
Maximum Certification Size	540	480	200	300

Who needs Seismic Certification?

Seismic requirements for a project are made when the structural engineer assigns a seismic rating to the building. This rating should be stated on the structural plans. Unless noted otherwise, non-structural components (which include mechanical equipment) are assigned the same seismic requirements as the building. The 2009 IBC states:

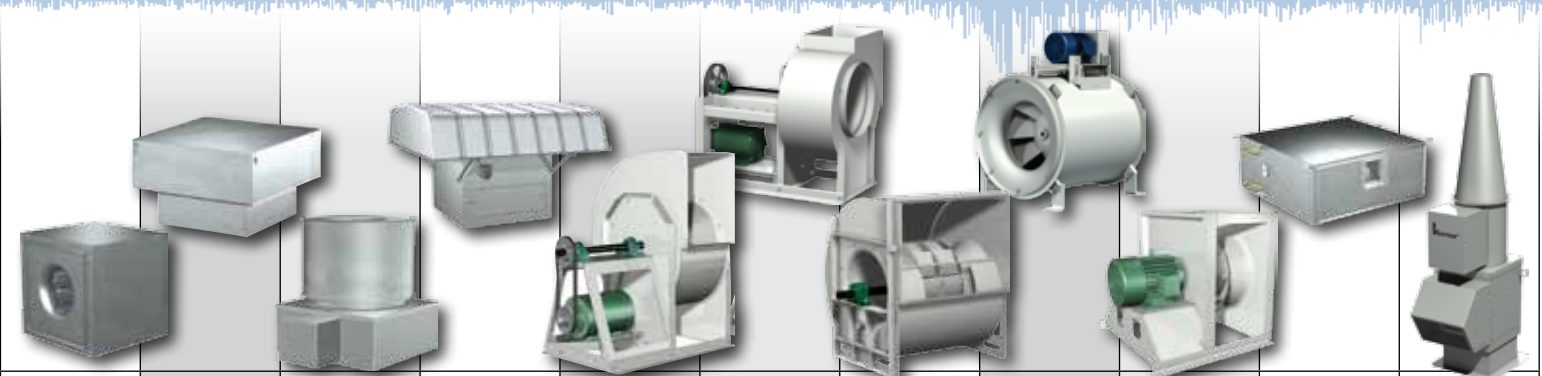
Every structure, and portion thereof, including non-structural components that are permanently attached structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE-7.

This includes components required to function for life-safety purposes or components in essential facilities where failure could impair continued operation of the facility after a seismic event (Importance Factor of 1.5).

How are Greenheck products seismically certified?

Section 1708.4.1 of the 2009 IBC, Seismic certification of non-structural components, states:

Certification shall be based on an actual test on a shake table, by three-dimensional shock tests, by an analytical method using dynamic characteristics and forces, by the use of experience data (i.e., historical data demonstrating acceptable seismic performance) or by more rigorous analysis providing for equivalent safety.



SQ/BSQ	RSF/RSFP	RBUMO	R Series	SFD/SFB SWB	AFSW/BISW	AFDW/BIDW	QEI/QEID	QEM/QEP	LFC	Vektor-H
Exhaust or Supply	Supply	Exhaust	Exhaust or Supply	Exhaust or Supply	Exhaust or Supply	Exhaust or Supply	Exhaust or Supply	Exhaust or Supply	Fan Coil	Laboratory Exhaust
YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	Consult Factory
0113-10	0113-10	0113-10	0113-10	0113-10	0113-10	—	Consult Factory	—	0105-10	Consult Factory
2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	1.50	2.28
420	200	60	72	SWB 236 SFD - 10 SFB - 30	73-AFSW 73-BISW Class II	73-AFDW 73-BIDW Class III	QEI-54 QEID-54	QEM-36 QEP-73	85L	VK-H-36

To meet the 2006 IBC, 2009 IBC and OSHPD requirements, Greenheck’s seismic certified fans have been shake table tested at an independent test facility. This is in accordance with ICC-ES AC 156 and under the responsible charge and review of a California Structural Engineer. The tests simulate the most severe seismic conditions anywhere in the United States and include the most severe spectral response accelerations, an Importance Factor of 1.5, all Site Classes, all Occupancy Categories, and all Seismic Design Categories.

Because these units are physically subjected to the same forces produced during an earthquake, you’re assured they will operate after a seismic event without problems—thus allowing Greenheck Seismically certified fans to be used anywhere in the United States.

While OSHPD standards were originally developed for health care facilities, they are also being required on projects outside of health care when specifying engineers and building owners want to ensure certified equipment is received. Equipment that’s passed OSHPD Special Seismic Certification Pre-approval (OSP), is listed on the OSHPD website providing engineers with a convenient source for seismic certified equipment.

Note: Greenheck’s seismically certified equipment is summarized above.

Fan mounting packages

Seismically rated GPF and severe duty (SD) curbs are offered on all curb mounted models to provide you with a complete seismic solution. On non-curb mounted models, individually sized and seismically certified isolators can be provided for each individual fan based on weight and size requirements.

Seismic Solutions

Greenheck Fan Corporation adheres to rigorous testing standards and strives to provide the most comprehensive selection of equipment available to address the HVAC industry’s seismic needs.

The submittal process is simple—the consulting engineer just needs to specify IBC or OSHPD seismic compliant equipment.



73-AFSW fan being shake table tested..

Model G and GB Centrifugal Roof Exhaust

G (direct drive) and GB (belt drive) are centrifugal roof exhaust fans designed specifically for seismic applications. The downblast design is ideal for general clean air applications where air is discharged directly onto the roof surface. Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.



Model CUE, CUBE, S-CUBE, USGF, CW and CWB Centrifugal Upblast Exhaust

CUE (direct drive), CUBE and S-CUBE (belt drives)

Upblast roof exhaust fans designed specifically for seismic applications. The upblast design is ideal for restaurant (grease laden), general clean air, smoke and mild contaminants (fume hood) where air is discharged away from the mounting surface. Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.

CW/CWB

These spun aluminum fans are specifically designed for sidewall mounted applications. General clean or lightly contaminated exhaust air can be discharged directly away from the mounting surface. Certified through analysis to IBC 2006 and 2009 and ASCE 7-05 certification standards for all seismic design categories.

USGF (belt drive)

The only spun steel fan in the industry for heavy-grease applications (as stated in NFPA 96 Vapor Removal from Cooking Equipment). Specifically designed for severe grease applications, to remove high amounts of grease and/or solid fuels and to discharge air directly away from the mounting surface. Seismic certified through analysis to IBC 2006 and 2009 and ASCE 7-05 certification standards for all seismic design categories.



Model SQ and BSQ Centrifugal Inline Fans

SQ (direct drive) and BSQ (belt drive) are backward inclined centrifugal fans designed for clean air applications (intake, exhaust, return or make-up air systems) where space is a prime consideration. Multiple mounting and discharge options allow for flexibility in design and installation. Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.



Model RSF and RSFP

Centrifugal Roof Supply Penthouse Style

Models RSF and RSFP are untempered filtered centrifugal supply fans. RSF and RSFP are designed to provide unrestricted clean air airflow and maximum weather protection. Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.



Models RBUMO

Propeller Upblast Roof Fan

This upblast propeller fan is designed to discharge contaminants up and away from the building for most commercial jobs and many industrial applications. The RBUMO has the motor out of the airstream, which allows for high temperature air to be exhausted. Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.



Models R and RB

Hooded Propeller Roof Fans

Hooded propeller roof fans include both belt and direct drive fans with fabricated steel, fabricated aluminum or cast aluminum blades. A variety of model configurations are available to handle exhaust and supply requirements. Belt drive fans offer the ability to adjust fan speed for system balancing if necessary. Direct drive fans are often preferred for jobs where maintenance access is difficult. They can operate from general ventilation up to industrial duty applications with airstream temperatures up to 130°F (54°C). Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.



Models SWB, SFB, and SFD

Centrifugal Blowers

SWB is a backward inclined centrifugal fan designed to handle a variety of applications that include clean air, high temperatures, restaurant grease, lab exhaust and high temperature smoke.

SFB and SFD are belt and direct driven forward curved utility set fans. Designed for clean air applications where high efficiency is needed.

Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.



Models BISW and AFSW

Centrifugal Blowers

Greenheck's airfoil (AFSW) and backward inclined (BISW) centrifugal fans are designed to handle a variety of commercial and industrial applications including: general supply, return or exhaust systems, emergency smoke exhaust, restaurant grease exhaust, process heat exhaust, filtration, dust collectors, built up or custom air handlers, grain drying, and corrosive fume exhaust.

Seismic certified single wide centrifugal blowers for sizes 7-73, series 21 and 41, arrangements 9 and 10, class I and II.

Certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for all seismic design categories.



Models AFDW and BIDW

Double Width Centrifugal Blowers

Greenheck's double inlet, double width airfoil (AFDW) and backward inclined (BIDW) centrifugal fans are designed to handle a variety of commercial and industrial applications including: general supply, return or exhaust systems, and built up or custom air handlers.

Models AFDW and BIDW are seismic certified for sizes 07 to 73 arrangements # 3, classes I through III.

Model AFDW and BIDW fans were certified compliant per IBC 2006 and 2009 and ASCE 7-05 via analysis



Models QEI and QEID

Mixed Flow Fans

Mixed flow inline fans are more efficient than comparably sized tubular centrifugal and vane axial fans, thus reducing the required motor horsepower and lowering operating costs.

Greenheck's mixed flow fans are recommended for any ventilation application (supply, exhaust, or return) that requires low sound and high efficiency including: office buildings, parking garages, concert halls, libraries, educational facilities, emergency smoke exhaust, restaurant grease exhaust, and much more.

Models QEI and QEID are seismic certified for sizes 15 to 54 in arrangements # 4 and # 9 and roof upblast configuration.

Model QEI and QEID fans are currently certified compliant per IBC 2006 and 2009 and ASCE 7-05 via analysis. Consult factory for certification per shake table testing.



Models QEM and QEP

Plenum Fans

Plenum fans are designed for unhooused operation in commercial or industrial applications. Typical applications include: parking garages, packaged air handlers, built-up air handlers, custom air handlers, general supply and return systems.

Model QEM is seismic certified for sizes 12 to 36 arrangements # 4 and # 9. Model QEP is certified for sizes 12 to 73, classes I through III in horizontal arrangements # 3 and # 4.

Model QEM and QEP fans were certified compliant per IBC 2006 and 2009 and ASCE 7-05 via analysis.



Model LFC

Low Profile Fan Coil

Model LFC is a low-profile fan coil unit that provides an effective, low-cost method to air conditioning and heating. Product features include forward-curved fans with internal flexible connection, double wall construction, and up to 8 row cooling coils. The LFC is designed for commercial applications including schools, medical facilities, and office buildings.

Models LFC-20 though LFC-85 are certified to IBC 2006 and 2009, ASCE 7-05 and California OSHPD certification standards for suspended mounting arrangements for all seismic design categories.

Consult factory for mounting arrangements.



Model Vektor-H

Laboratory Exhaust Fans

Model Vektor-H uses a tapered outlet nozzle to accelerate the exhaust to a high velocity. This provides the exhaust with additional momentum for displacement high above the roof. Because the Vektor-H is a curb-mounted unit, installation time is reduced by eliminating costly field fabricated inlet and outlet duct. The bypass air plenum and damper accommodates constant and variable volume laboratories.

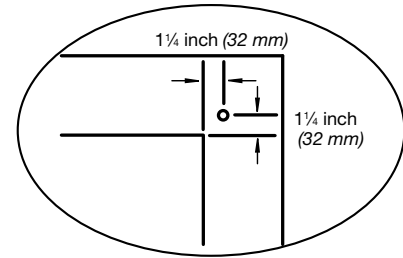
The Vektor-H and roof curb has been designed to withstand 125 mph wind loads without the use of guy wires. Capacities range from 500 to 24,000 cfm (850 to 40,766 m³/hr) and 3.5 in. wg (868 PA). UL 762 listed. AMCA Licensed for Sound and Air Performance.

Consult Factory for seismic certification.



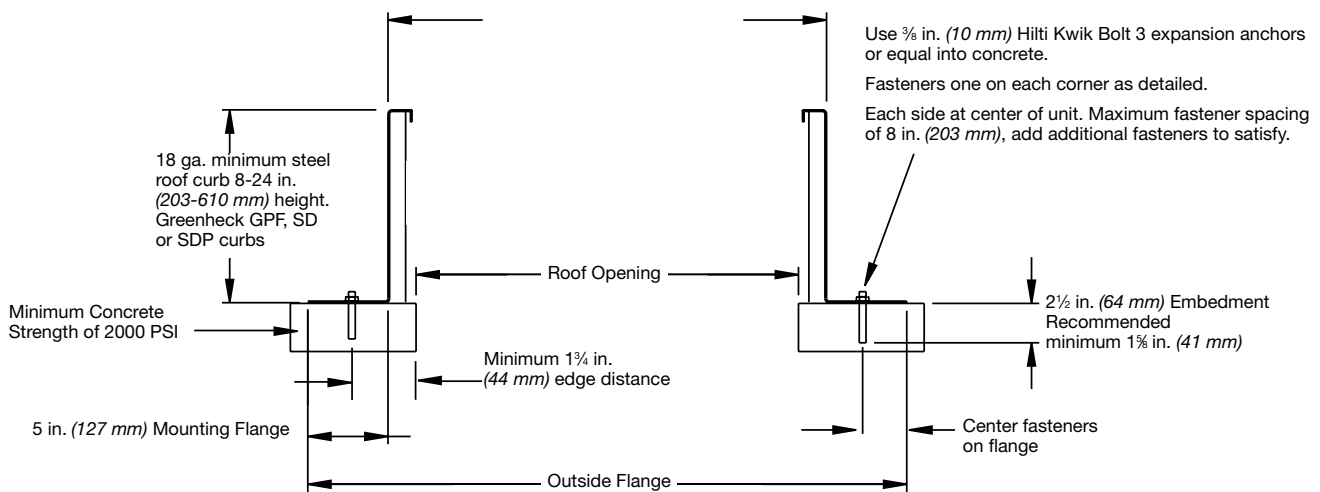
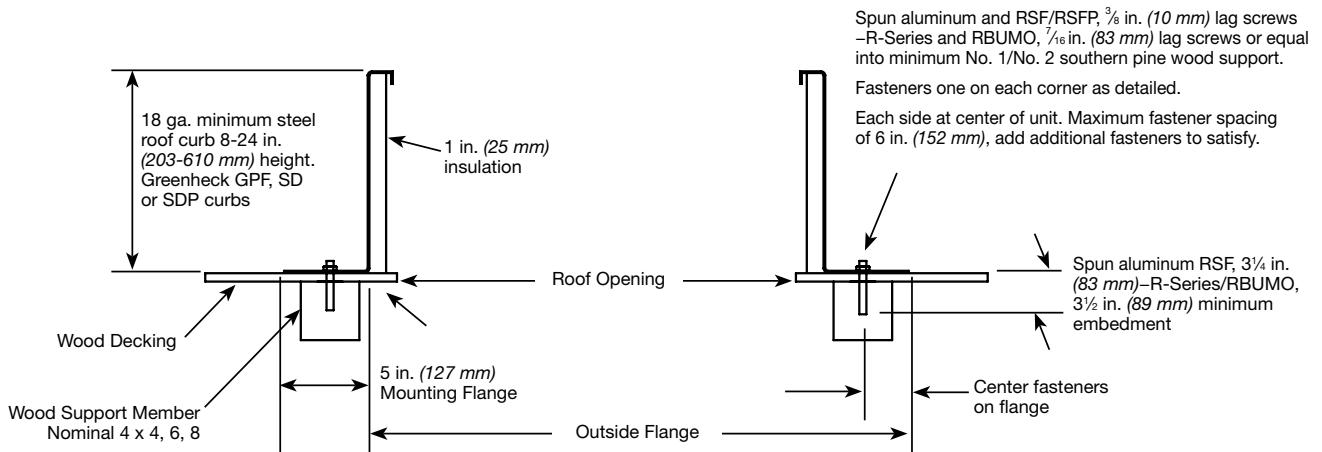
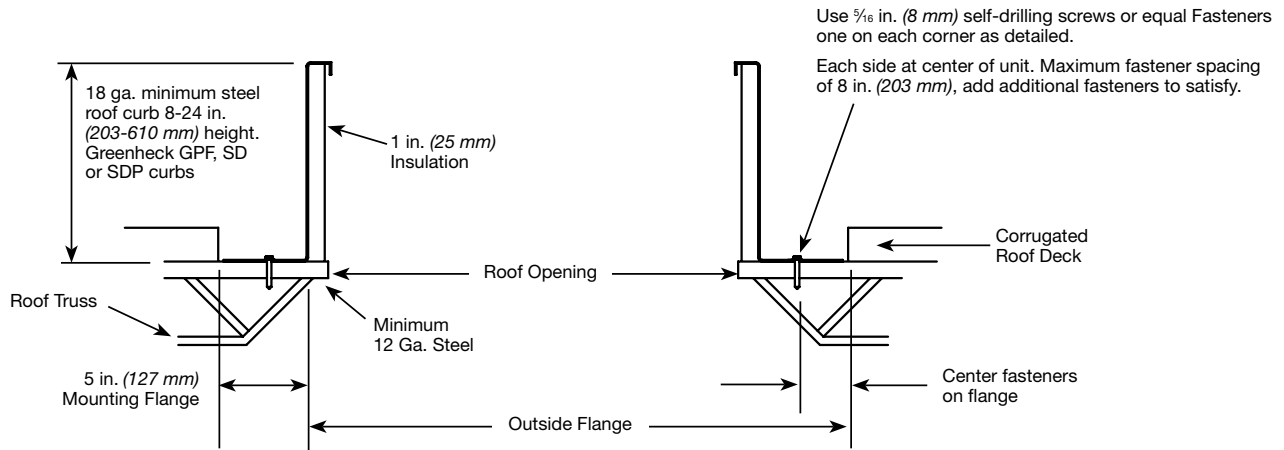
Roof Curb to Roof Deck Anchoring Requirements

Corner Detail
Wood, Metal or Concrete



Roof Curb to Roof Deck Anchoring Requirements			Metal Building Steel Deck		Wood Deck		Concrete Deck	
Fan Model	Fan Size	Curb Cap Size	Fasteners per side	* Total Fasteners	Fasteners per side	* Total Fasteners	Fasteners per side	* Total Fasteners
G, GB	060 to 300	17 x 17 to 40 x 40 (432 x 432 to 1016 x 1016 mm)	2	4	2	4	2	4
G, GB	330 to 540	46 x 46 to 64 x 64 (1168 x 1168 to 1626 x 1626 mm)	3	6	3	6	3	6
CUE, CUBE, S-CUBE, USGF	060 to 240	17 x 17 to 34 x 34 (432 x 432 to 864 x 864)	2	4	2	4	2	4
CUE, CUBE, S-CUBE, USGF	300 to 360	40 x 40 to 46 x 46 (1016 x 1016 to 1168 x 1168)	3	6	3	6	3	6
CUE, CUBE, S-CUBE, USGF	420 to 480	52 x 52 to 58 x 58 (1321 x 1321 to 1473 x 1473)	5	10	5	10	5	10
R/RB	18 to 24	28 1/4 x 28 1/4 to 34 1/4 x 34 1/4 (718 x 718 to 870 x 870 mm)	2	4	2	4	2	4
R/RB	30 to 36	40 1/4 x 40 1/4 to 46 1/4 x 46 1/4 (1022 x 1022 to 1175 x 1175 mm)	3	6	3	6	3	6
R/RB	42	52 1/4 x 52 1/4 (1327 x 1327 mm)	4	8	4	8	4	8
R/RB	48 to 54	58 1/4 x 58 1/4 to 64 1/4 x 64 1/4 (1480 x 1480 to 1632 x 1632 mm)	6	12	5	10	4	8
R/RB	60 to 72	70 1/4 x 70 1/4 to 82 1/2 x 82 1/2 (1784 x 1784 to 2095 x 2096 mm)	8	16	6	12	5	10
RSF/RSFP	90 to 120	26 x 26 to 34 x 34 (660 x 660 to 864 x 864 mm)	3	6	3	6	3	6
RSF/RSFP	150	40 x 40 (1016 x 1016 mm)	4	8	4	8	4	8
RSF/RSFP	180 to 200	46 x 46 to 52 x 52 (1168 x 1168 to 1321 x 1321 mm)	5	10	5	10	5	10
RBUMO	20 to 30	29 1/2 x 29 1/2 to 39 1/2 x 39 1/2 (749 x 749 to 1003 x 1003 mm)	3	6	3	6	2	4
RBUMO	36 to 42	45 1/2 x 45 1/2 to 51 1/2 x 51 1/2 (1156 x 1156 to 1308 x 1308 mm)	4	8	4	8	3	6
RBUMO	48 to 60	57 1/2 x 57 1/2 to 72 x 72 (1461 x 1461 to 1829 x 1829 mm)	6	12	6	12	5	10

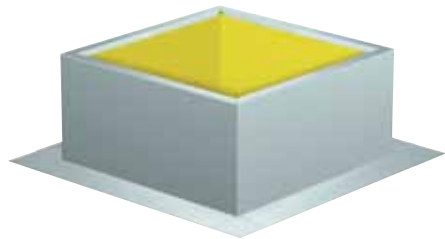
* Note: Fasteners required only on two opposite sides of curb. Fasten on longer sides of curb if rectangular.



Roof Curbs

Greenheck seismically certified fans are designed for easy mounting to a variety of roof curbs. For your convenience Greenheck offers the industry's largest selection of tested and approved seismic roof curbs. Greenheck Models GPF, GPFV, GPFV, SD and SDP curbs offer fully configurable sizes for both flat and pitched roofs. Selectable in sizes up to 80 x 80 inches (2032 x 2032 mm) and heights ranging from 8 inches (203 mm) to 24 inches (610 mm) tall.

For applications where factory supplied curbs are not an option, the Greenheck seismic certified fans can be used in conjunction with any previously installed or customer supplied curbs as long as they meet a series of minimum requirements. Considerations like no wood nailers, minimum material gauges and specific material types may allow field supplied curbs to be acceptable.



GPF

The GPF is a straight sided curb constructed of heavy gauge galvanized steel with a 5-inch (127 mm) flashing flange. It is designed specifically for use in seismic applications on flat roofs. Roofing material can be wrapped up over the top of the curb or can be directly flashed to the side of the curb for a complete tested and certified installation.

GPFV

The GPFV is similar in construction to the GPF. It is constructed of heavy gauge galvanized steel and can be configured to match the pitch of the roof ensuring that any fan mounted to the GPFV is going to sit level and operate properly. The 5-inch (127 mm) flashing flange can be used to secure the curb to the roof of metal (steel), concrete or wood frame building and easily flashed over to ensure weather tightness.



GPFV

The GPFV vented roof curb is typically used for kitchen applications; the vents allow hot air and gases to escape between the ductwork and roof curb. This curb is designed for use with Greenheck fan models CUBE and CUE to provide the required 40 inch (1016 mm) minimum discharge height above the roof line per NFPA 96. This curb is to be used on non-insulated flat roof decks. Model GPFV is mounted directly to the roof deck structure, roofed to the vertical surface and sealed to the 5-inch flashing flange. It is available in nine different sizes.

Special Purpose Roof Curbs

SD

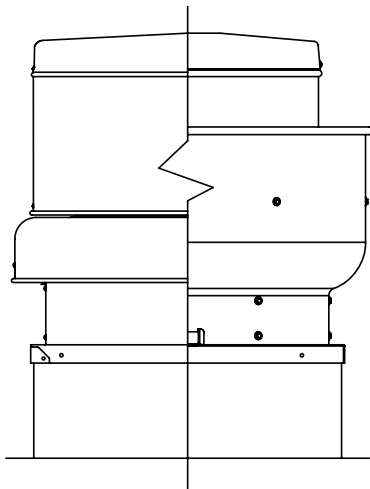
The SD curb is Greenheck's highest strength curb constructed with a minimum 12 gauge high strength steel. A 2-inch (51 mm) reinforcement angle is provided on taller sizes. The fan curb is coated as standard with our Permator™ high performance coating (other coatings available). The SD curb is available in heights up to 24 inches (610 mm) and is ideal for larger and heavier units.

SDP

The SDP curb is similar in construction to the SD. Minimum 12 gauge steel with the 2-inch (51 mm) reinforcements and a 4-inch (102 mm) flashing flange make it strong and easy to install. The curb can be configured to match the pitch of a sloped roof so that the fans sit level on the curb. This curb is ideal for supporting heavier, larger equipment.

Typical Mounting

Fan to Curb - G, GB, CUE, CUBE, S-CUBE and USGF



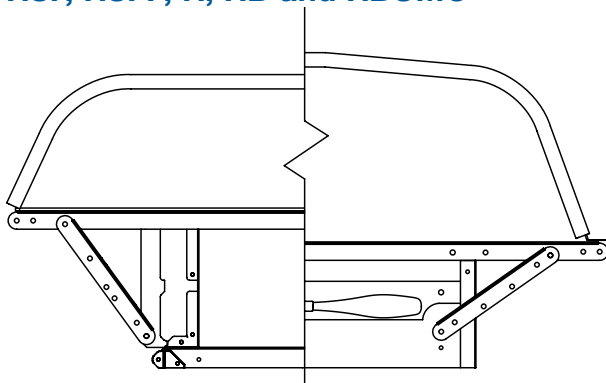
CUE/CUBE, S-CUBE and USGF

5/16 inch (8 mm) recommended, 1/4 inch (6mm) fastener minimum. Table shows fastener requirements.

Fan to Curb Requirements			
Seismic		Fasteners Per Side	Total Fasteners
G/GB Size	CUE/CUBE USGF sizes		
060 - 161	060 - 161	4	16
180 - 360	180 - 360	6	24
420 - 540	420 - 480	10	40

Fasteners on each side of the fan are to be installed with one fastener 4 inches (102 mm) from each edge and the remaining fasteners are to be equally spaced between.

RSF, RSFP, R, RB and RBUMO



Six fasteners required per side on all sizes. Fasteners shall be 5/16 in. (8 mm) minimum installed one each corner and one at center per side.

Spring Isolator

Isolators to be specified per models below



SQ and BSQ

All mounting configurations are acceptable, however if a unit is hung, the mounting and restraint system must be designed by others.

Spring isolators are to be to be Mason RW30, VMC HRS or equivalent (Certified by others).

SWB, SFB and SFD

Models must be mounted using specified spring isolators. Isolators must be similar to those tested and sized appropriately for the weight of the fan.

Spring isolators are to be Mason SLR, VMC AMSR or equivalent (Certified by others).

BISW and AFSW

Models BISW and AFSW must be mounted on a Greenheck structural steel base or base with equivalent strength and stiffness. Fans require a minimum of 4, seismically approved isolators, one located at each corner of the structural base. Isolators are certified by others. Greenheck recommends connection between the isolators and structural base to be with grade 8 bolt(s) and for any restraint bolts located on the isolator to be grade 8.

Laboratory Exhaust

For Vektor models, consult factory for mounting requirements

LFC Fan Coil

Consult factory for mounting requirements.

Other Severe Duty Fans



Hurricane and High Wind Fans

Greenheck is the first fan manufacturer to certify products to hurricane standards and is committed to offering the widest selection of hurricane rated ventilation fans in the industry. All products are third-party certified and designed to out-perform the competition.

Greenheck will provide you with what you need to meet the challenges for high winds and hurricanes. See the Hurricane and High Wind Fans brochure for detailed information.



Building Value in Air

Greenheck delivers value to mechanical engineers by helping them solve virtually any air quality challenges their clients face with a comprehensive selection of

top quality, innovative air-related equipment. We offer extra value to contractors by providing easy-to-install, competitively priced, reliable products that arrive on time.

And building owners and occupants value the energy efficiency, low maintenance and quiet dependable operation they experience long after the construction project ends.



Prepared to Support Green Building Efforts

