APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY	
APPLICATION #:	OSP – 0105-10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Greenheck Fan Corporation

Manufacturer's Technical Representative: Mr. David Berg

Mailing Address: 400 Ross Avenue, Schofield, WI 54476

Telephone: (713) 355-6628 Email: david.berg@greenheck.com

Product Information

Product Name: LFC (Low-Profile Fan Coil) Air Handling Units

Product Type: Air Handling Equipment

Product Model Number: LFC-15L-FC, LFC-20L-FC, LFC-25-FC, LFC-30L-FC, LFC-45L-FC, LFC-50L-FC, LFC-65L-FC,LFC-85L-FC
(List all unique product identification numbers and/or part numbers)

General Description: The Greenheck Model LFC line consists of low-profile horizontal fan coil suspended units available in eight sizes. The units are designed for air conditioning and/or heating, and feature a forward curved wheel and an option of up to 8 rows of heating and cooling coils. Seismic enhancements were made to the test units and modifications required to address anomalies observed during the testing shall be incorporated into the production units.

Mounting Description: The equipment is certified for suspended mounting and cable bracing.

Applicant Information

Applicant Company Name: The VMC Group

Contact Person: Mr. John Giuliano

Mailing Address: 113 Main Street, Bloomingdale, NJ 07403

Telephone: (973) 838-1780 Email: john.giuliano@thevmcgroup.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2016.

Signature of Applicant:  Date: 12/2/16

Title: President Company Name: The VMC Group

California Licensed Structural Engineer Responsible for the Engineering and Test Report(s)

Company Name: The VMC Group

Name: Mr. Ken Tarlow California License Number: SE2851

Mailing Address: 113 Main Street, Bloomingdale, NJ 07403

Telephone: (973) 838-1780 Email: ken.tarlow@thevmcgroup.com

Supports and Attachments Preapproval

☐ Supports and attachments are preapproved under OPM- _____
(Separate application for OSHPD Preapproval of Manufacturer's Certification (OPM) of Supports and attachments is required)

☒ Supports and attachments are not preapproved

Certification Method

☒ Testing in accordance with: ☒ ICC-ES AC156

☐ Other (Please Specify): _____

Testing Laboratory

Company Name: Dynamic Certification Laboratories

Contact Name: Kelly Laplace / Josh Sailer

Mailing Address: 1315 Greg Pkwy # 109, Sparks, NV 89431

Telephone: (775) 358-5085 Email: kelly@shaketest.com / josh@shaketest.com

Seismic Parameters

Design in accordance with ASCE 7-10 Chapter 13: ☒ Yes ☐ No

Design Basis of Equipment or Components (F_p/W_p) = 2.70

S_{DS} (Design spectral response acceleration at short period, g) = 1.50

a_p (In-structure equipment or component amplification factor) = 2.50

R_p (Equipment or component response modification factor) = 2.50

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height factor ratio) = 1.0

Equipment or Component Natural Frequencies (Hz) = N/A

Overall dimensions and weight (or range thereof) = See Attached

Equipment or Components @ grade designed in accordance with ASCE 7-10 Chapter 15: ☐ Yes ☒ No

Design Basis of Equipment or Components (V/W) = _____

S_{DS} (Design spectral response acceleration at short period, g) = _____

S_{D1} (Design spectral response acceleration at 1 second period, g) = _____

R (Response modification coefficient) = _____

Ω_0 (System overstrength factor) = _____

C_d (Deflection amplification factor) = _____

I_p (Importance factor) = 1.5

Height to Center of Gravity above base = _____

Equipment or Component Natural Frequencies (Hz) = _____

Overall dimensions and weight (or range thereof) = _____

Tank(s) designed in accordance with ASME BPVC, 2015: ☐ Yes ☐ No

List of Attachments Supporting Special Seismic Certification

☒ Test Report(s) ☒ Drawings ☐ Calculations ☒ Manufacturer's Catalog

☒ Other(s) (Please Specify): UUT, Certified Product and Certified Sub-Component Matrices

OSHPD Approval (For Office Use Only) – Approval Expires on December 31, 2022

Signature: _____ Date: 3/9/2017

Print Name: M. R. Karim Title: SHFR

Special Seismic Certification Valid Up to : S_{DS} (g) = 1.5 z/h = 1.0

Condition of Approval (if applicable): _____

Table 1 - Certified LFC Cabinet Sizes

Model	Unit Size	Maximum Weight [lbs]	Maximum Length [in]	Maximum Width [in]	Maximum Height [in]	UUT	Enclosure	Roof level		Ground Level	
								S_{DS}	z/h	S_{DS}	z/h
LFC	15	270.0	42.00	38.00	11.00	UUT 1	NEMA 1	1.50	1.0	1.50	0.0
	20	330.0	42.00	38.00	14.00	Interpolated	NEMA 1	1.50	1.0	1.50	0.0
	25	400.0	42.00	38.00	16.00	Interpolated	NEMA 1	1.50	1.0	1.50	0.0
	30	460.0	47.00	38.00	18.50	Interpolated	NEMA 1	1.50	1.0	1.50	0.0
	45	560.0	47.00	50.00	18.50	Interpolated	NEMA 1	1.50	1.0	1.50	0.0
	50	660.0	50.00	50.00	21.00	Interpolated	NEMA 1	1.50	1.0	1.50	0.0
	65	780.0	54.00	50.00	26.00	Interpolated	NEMA 1	1.50	1.0	1.50	0.0
	85	890.0	54.00	62.00	26.00	UUT 2	NEMA 1	1.50	1.0	1.50	0.0

Note: 1) That the tested Sds level is highlighted in yellow

Table 2 - Certified LFC Base Frame Construction

Use	Size	Material	MFR	UUT
LFC	15	18 Gauge Galvanized CS	Greenheck	1
	20-65			Interpolated
	85			2

Note: CS stands for Cold Rolled Carbon Steel

Table 3 - Certified LFC Enclosure Construction: Wall/Roof Exterior Panels

Skin	Insulation	Panel Nominal Thickness	Wall/Roof Panel Material	Wall/Roof Panel Type	Unit Size	MFR	UUT
Motor Access Panel	Matte Faced Fiberglass	1"	18 Gauge Galvanized CS	Double Wall	15-85	Greenheck	1 and 2
Coil Access Panel	Matte Faced Fiberglass	1"	18 Gauge Galvanized CS	Double Wall	15-85		
Front Panel	Matte Faced Fiberglass	1"	18 Gauge Galvanized CS	Double Wall	15-85		
Inlet Side Panel	Matte Faced Fiberglass	1"	18 Gauge Galvanized CS	Double Wall	15-85		
Filter Access Door	Matte Faced Fiberglass	1"	18 Gauge Galvanized CS	Double Wall	15-85		
Coil Side Panel	Matte Faced Fiberglass	1"	18 Gauge Galvanized CS	Double Wall	15-85		

Note: CS stands for Cold Rolled Carbon Steel

Table 4a - Certified LFC Hydronic/DX Coils

Dimensions		Width (inches)								MFR	UUT
		31	31	31	31	43	43	43	55		
Height (inches)	7.5	Size 15								Precision Coils	1
	10.0		Size 20								Interpolated
	12.5			Size 25							Interpolated
	15.0				Size 30						Interpolated
	15.0					Size 45					Interpolated
	17.5						Size 50				Interpolated
	22.5							Size 65			Interpolated
	22.5								Size 85		2

Note: The Hydronics and DX coils are idenctical in material and construction and only differ in their use

Table 4b - Certified LFC Hydronic/DX Coil Options

		MFR	UUT
Casing Material	Galvanized Carbon Steel (18 Gauge)	Precision Coils	1 and 2
Tube Material	Copper		
Tube Outer Diameter	0.5"		
Tube Wall Thickness	0.016"		
Permitted Fin Material	Aluminum		
Permitted Fins per Inch	6-14		
Permitted Tube Rows	1 (Heating)		--
	2 (Heating)		1 and 2
	4 (Heating/Cooling)		--
	6 (Cooling)		1 and 2
	8 (Cooling)		--
Header Material	Copper		1 and 2

Note: The Hydronics and DX coils are idenctical in material and construction and only differ in their use

Table 5 - Certified LFC Fan Motor

Model	Phase	Rating [HP]	Voltage Rating	MFR PN	MFR	Casing Material	UUT
Fixed Speed (1800) Open Drip Motor	3.00	2.0	208-230 / 460	GF-001180S3E56	Marathon Electric	Galvanized Carbon Steel	1
		5.0	208-230 / 460	M3218T 184 T			2

Table 6 - Certified LFC Fans

• Forward Curved Centrifugal Fan

	HP	2.00	5.00	Fan MFR
	Weight	85.6 lbs	150 lbs	
Size (Dia - Width)	5.75"	UUT 1		Greenheck
Impeller Weight	~ 1.5 lbs			
Size (Dia - Width)	11.62"		UUT 2	
Impeller Weight	~ 2 lbs			

Wheel Material	Fan Diameter	Part No.	MFR	UUT
Galvanized Carbon Steel	5.75"	335496	Revcor	1
Galvanized Carbon Steel	11.62"	335480		2

MFR	Part No.	Housing Material	UUT
Greenheck	826093	Galvanized Carbon Steel	1
	826074		2

Motor Mount Configuration	HP Range	Material	UUT
Horizontal Shaft Rear Mount	2 Hp Max	Galvanized Carbon Steel	1
	5 HP Max	Galvanized Carbon Steel	2

Table 7 - Certified LFC Flat Filter (2" MERV 8)

Unit	Cartridge Quantity	Frame Material Options	Dimensions [in]		MFR	UUT
			Width	Height		
Size 15	2	Galvanized Carbon Steel	9	18	AirGuard	UUT 1
Size 20	1	Galvanized Carbon Steel	12	12 or 24"		Interpolated
Size 25	2	Galvanized Carbon Steel	14	18		Interpolated
Size 30	1	Galvanized Carbon Steel	16	16 or 20"		Interpolated
Size 45	2	Galvanized Carbon Steel	16	24		Interpolated
Size 50	2	Galvanized Carbon Steel	18	24		Interpolated
Size 65	2	Galvanized Carbon Steel	24	24		Interpolated
Size 85	2	Galvanized Carbon Steel	24	24		UUT 2

Table 8 - Certified LFC Flat Media Options

Type	Filter Material	MFR	UUT
2" MERV 8	Pleated	AirGuard	1 and 2

Table 10 - Certified LFC Dampers

Unit Size	Supply		Return		Qty	MFR	UUT
	Height (in.)	Width (in.)	Height (in.)	Width (in.)			
15	8.25	34.625	5.75	33	1	Greenheck	1
20	11.563	34.625	8.75	33	1		Interpolated
25	13.5	34.625	10.75	33	1		Interpolated
30	14.625	46.625	13.25	33	1		Interpolated
45	14.625	46.625	13.25	45	1		Interpolated
50	17.25	46.625	15.5	45	1		Interpolated
65	22.25	46.625	20.75	45	1		Interpolated
85	22.25	58.625	20.75	57	1		2

Damper Material		Blade Orientation	MFR	Part No.	Supply		Return		UUT
Frame	Blades				Height (in.)	Width (in.)	Height (in.)	Width (in.)	
Galvanized Carbon Steel	Galvanized Carbon Steel	HZ Opposed	Greenheck	VCD-23	8.25 - 22.5	34.625 - 58.625	5.75 - 20.75	33 - 57	1 and 2

Actuator MFR	Part No.	Material	UUT
Belimo	LMP24-3	Galvanized Carbon Steel	1
Belimo	NMB24-3	Galvanized Carbon Steel	2

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-01

VMA-51133-01C

Model Line	Model Number	Manufacturer
LFC Air Handling Equipment	LFC-15L-FC	Greenheck

Product Construction Summary

18 Gauge Galvanized Carbon Steel Base, 18 Gauge Galvanized Carbon Steel Walls, Fiberglass Insulation

Options / Subcomponent Summary

Coils: Precision Coils; Fan: Greenheck/Revcor; Damper: Greenheck; Filter: AirGuard; Actuator: Belimo
Unit was full of operating contents during AC156 test.

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
270	42	38	11	N/A	N/A	N/A

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2016	ICC-ES AC156	1.50	1.00	1.50	2.40	1.80	1.00	0.40

Test Mounting Details

The UUTs were attached to the fixturing wall at four corners utilizing the International Seismic Application Technology (ISAT) C10 splayed cable braces oriented at 45 degrees, and 1/2" ASTM A307 rod. Seismic enchancements were made in the form of a 1-5/8" x 12GA strut channel along the front and back of the UUT and 1-5/8" x 12GA strut channel rod sitffeners.

UUT 1

All units were filled with contents and maintained structural integrity and functionality after AC 156 test.

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-02

VMA-51133-01C

Model Line	Model Number	Manufacturer
LFC Air Handling Equipment	LFC-85L-FC	Greenheck

Product Construction Summary

18 Gauge Galvanized Carbon Steel Base, 18 Gauge Galvanized Carbon Steel Walls, Fiberglass Insulation

Options / Subcomponent Summary

Coils: Precision Coils; Fan: Greenheck/Revcor; Damper: Greenheck; Filter: AirGuard; Actuator: Belimo
Unit was full of operating contents during AC156 test.

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
890	54	62	26	N/A	N/A	N/A

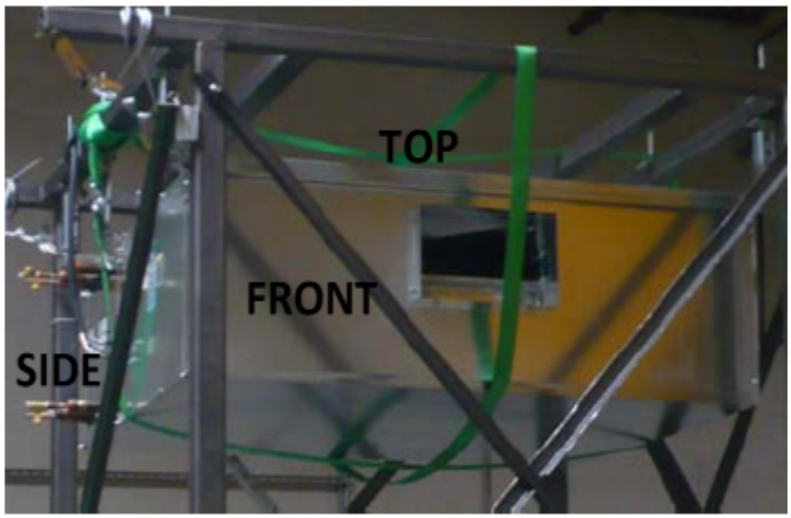
UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2016	ICC-ES AC156	1.50	1.00	1.50	2.40	1.80	1.00	0.40

Test Mounting Details

The UUTs were attached to the fixturing wall at four corners utilizing the International Seismic Application Technology (ISAT) C10 splayed cable braces oriented at 45 degrees, and 1/2" ASTM A307 rod. Seismic enchancements were made in the form of a 1-5/8" x 12GA strut channel along the front and back of the UUT and 1-5/8" x 12GA strut channel rod sitffeners.

UUT2



All units were filled with contents and maintained structural integrity and functionality after AC 156 test.