APPLICATION FOR HCAI SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0761

HCAI Special Seismic Certification Preapproval (OSP)

Type: [X] New [ ] Renewal

Manufacturer Information

Manufacturer: Trane Technologies

Manufacturer's Technical Representative: Corin Davey

Mailing Address: Building 12-1, 3600 Pammel Creek Road, La Crosse, WI 54601

Telephone: (608) 787-2857 Email: Corin.Davey@tranetechnologies.com

Product Information

Product Name: Air Conditioning Units

Product Type: Air Conditioning Units - Inline Fan and Terminal

Product Model Number: BCHE (Horizontal) Sizes 12 to 120 & BCVE (Vertical) Sizes 24 to 120

General Description: Cataloged Air Handling Units manufactured in sizes 12-120 in horizontal and sizes 24-120 in vertical configurations. Units are offered with single & three phase fan motors and electric heat.

Mounting Description: BCHEs can be suspended with spring isolators and seismic cable restraints, BCVEs with legs are rigidly base mounted with or without neoprene pads.

Tested Seismic Enhancements: Seismic enhancements made to the test units and/or modifications required to address anomalies during the tests shall be incorporated into the production units.

Applicant Information

Applicant Company Name: VMC Group

Contact Person: John Giuliano

Mailing Address: 113 Main Street, Bloomingdale, NJ 07403

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

Title: President

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

Company Name: THE VMC GROUP

Name: Kenneth Tarlow California License Number: S2851

Mailing Address: 980 9th Street, 16th Floor, Sacramento, CA 95814

Telephone: (832) 627-2214 Email: ken.tarlow@thevmcgroup.com

Certification Method

☐ GR-63-Core ☒ ICC-ES AC156 ☐ IEEE 344 ☐ IEEE 693 ☐ NEBS 3

☐ Other (Please Specify):

Testing Laboratory

Company Name: DYNAMIC CERTIFICATION LABORATORY (DCL)

Contact Person: Kelly Laplace

Mailing Address: 1315 Greg St., Ste 109, Sparks NV 89431

Telephone: (775) 358-5085 Email: Kelly@shaketest.com

Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) = See attached Table 1a

S_{DS} (Design spectral response acceleration at short period, g) = See attached Table 1a

a_p (Amplification factor) = 2.5

R_p (Response modification factor) = 2.5 (Suspended Isolated); 6.0 (Floor mounted); 2.5 (Floor mounted with neoprene pads)

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height ratio factor) = 1 and 0

Natural frequencies (Hz) = See Attachment

Overall dimensions and weight = See Attachment

HCAI Approval (For Office Use Only) - Approval Expires on 05/01/2029

Date: 5/1/2023

Name: Mohammad Karim Title: Supervisor, Health Facilities

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

Condition of Approval (if applicable):

Table 1 - Certified BCxE Cabinet Sizes

Model	Unit Size	Standard Basic Unit				Units with Accessories				Shake Tested Units[8]				Mounting Configuration	
		Weight[2] [lb]	Max Dimensions [in]			Weight[4] [lb]	Max Dimensions [in]			Weight [lb]	Dimensions [in]			Suspended w/ Isolators	Rigid Base Mounted[1]
			Width[7]	Height[5]	Length		Width[7]	Height[5]	Length[3]		Width[7]	Height[5]	Length		
BCHE	12	180	32	17	44	274	32	17	92	230	37	18	57	UUT-2	
										320	31	17	69	UUT-3	
	18	192	34	17	44	296	34	17	92						
	24	204	36	17	44	318	36	17	92						
	36	275	48	17	48	430	48	17	106					Interpolated	
	54	337	52	18	51	531	52	18	121						
	72	394	64	18	50	631	64	18	132						
	90	443	54	26	54	695	54	26	131						
	120	517	64	26	54	807	64	26	143	440	58	26	65	UUT-1	
										920	70	26	120	UUT-4	
BCVE	24	242	33	61	22										Extrapolated
	36	298	33	65	26										
	48	380	38	72	27										
	60	418	38	74	30					450	35	72	35		UUT-9
	72	494	64	68	37	731	64	68	88	320	65	69	34		UUT-5
										720	68	68	63		UUT-6
	90	549	54	81	37	801	54	81	89						Interpolated
	120	630	64	81	37	920	64	81	95	410	69	80	34		UUT-7
										930	68	80	72		UUT-8

Notes:

[1]Rigid base mounted units permitted to be installed with or without neoprene pads and must be installed with legs.
[2]Maximum weight includes basic unit, largest wet coil, motor, control box.
[3]Maximum Length includes basic unit, angle filter section, return attenuator, and discharge attenuator.
[4]Maximum weight includes basic unit, largest wet coil, motor, control box, bottom filter access section, mixing box, and discharge attenuator.
[5]Height includes legs for vertical units.
[6]All dimensions and weights are nominal and rounded to the nearest whole number.
[7]Width includes header and lug stickout
[8]Tested weights and dimensions include mounting hardware and couplings.

Table 2 - Certified BCxE Base Frame Construction

Model	Size	Base Construction	Material	MFR	UUT
BCHE	12	12 Gauge Lifting Lugs, Base Panel with Hat Channels	22 Gauge Galv CS	Trane	UUT-2, UUT-3
	18-90				Interpolated
	120				UUT-1, UUT-4
BCVE	24-48	10 Gauge Legs	22 Gauge Galv CS	Trane	Extrapolated
	60				UUT-9
	72	10 Gauge Legs, Base Panel with Hat Channels			UUT-5, UUT-6
	90				Interpolated
	120				UUT-7, UUT-8

Table 1a - Certified Levels

Model	Max Fp/Wp	S_{DS} (z/h=0)	S_{DS} (z/h=1)
Suspended BCHE	4.09	2.27	2.27
Rigid Base Mounted BCVE	1.5	2.27	2.00
Neoprene Mounted BCVE	3.6		

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

Skin	Insulation	Panel Nominal Thickness	Panel Material	Panel Type	Unit Size	MFR	UUT	
							Suspended	Base Mounted
Top Panel	Matte Faced Fiberglass	1"	22 Gauge Galv. CS	Single or Double Wall	12-120	Trane	UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9
Top Panel with Damper							UUT-3, UUT-4	UUT-6, UUT-8
Top Panel with Plug Plate							UUT-2, UUT-4	Interpolated
Bottom Panel							UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9
BAF Bottom Panel with Hinged Door							UUT-3, UUT-4	UUT-6, UUT-8
Bottom Panel with Plug Plate							UUT-2, UUT-4	Interpolated
Motor Access Panel							UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9
Coil Access Panel							UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9
Filter Access Panel							UUT-3, UUT-4	UUT-6, UUT-8
Side Panel							UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9
Side Panel with Plug Plate							UUT-2, UUT-4	Interpolated
Fan Discharge Panel							UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9
End Panel							UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9
End Panel with Damper							UUT-3, UUT-4	UUT-6, UUT-8
End Panel with Plug Plate							UUT-2, UUT-4	Interpolated
Back Corner Posts	None						UUT-1, UUT-2, UUT-3, UUT-4	UUT-5, UUT-6, UUT-7, UUT-8, UUT-9

Table 3b - Certified BCxE Drain Pans

Description	Availability	MFR	Material	UUT	
				Base Mounted	Suspended
Polymer Drain Pan	All models	Trane	Polymer	UUT-5, UUT-7	UUT-1, UUT-2
Stainless Steel Drain Pan			Stainless Steel	UUT-6, UUT-8, UUT-9	UUT-3, UUT-4

Table 4a - Certified BCxE Hydronic Coils

Model	Height [in]	Width [in]							MFR	Tested Coil Weight [lb]	UUT	
		16	20	25	32	38	40	50			Base Mounted	Suspended
BCHE	8	Size 12	Size 18						Trane	22		UUT-2
	12		Size 24		Size 36					N/A		Interpolated
	14					Size 54		Size 72		N/A		Interpolated
	22						Size 90	Size 120		174		UUT-4
BCVE	12		Size 24						Trane	N/A	Extrapolated	
	14							Size 72		112	UUT-6	
	18		Size 36							N/A	Interpolated	
	20			Size 48						N/A	Interpolated	
	22						Size 90	Size 120		174	UUT-7, UUT-8	
	24			Size 60						22	UUT-9	

Table 4b - Certified BCxE Hydronic Coil Options

		UUT		MFR
		Base Mounted	Suspended	
Casing Material	16 Gauge Galv Steel	UUT-6, UUT-7, UUT-8, UUT-9	UUT-2, UUT-4	Trane
Tube Material	Copper			
Tube Outer Diameter	0.375			
Tube Wall Thickness	0.012			
Permitted Fin Material	Aluminum			
Permitted Fin Pitch	12			
Permitted Tube Rows	1 (Heating)	Interpolated	UUT-2	
	2 (Heating)	UUT-8, UUT-9	UUT-4	
	4 (Heating/Cooling)	UUT-7	UUT-2	
	6 (Heating/Cooling)	Interpolated	UUT-4	
	8 (Heating/Cooling)	UUT-6	Extrapolated	
Header Type	Copper	UUT-6, UUT-7, UUT-8, UUT-9	UUT-2, UUT-4	

1. 8 row coils are either an 8 row coil or a 2 row coil and 6 row coil fastened together. 2 row coil and 6 row coil fastened together are heavier than an 8 row coil.

Table 4c - Certified BCxE Direct Expansion/Heat Pump Coils

Model	Height [in]	Width [in]							MFR	Tested Coil Weight [lb]	UUT	
		16	20	25	32	38	40	50			Base Mounted	Suspended
BCHE	8	Size 12	Size 18						Trane	13		UUT-3
	12		Size 24		Size 36					N/A		Interpolated
	14					Size 54		Size 72		N/A		Interpolated
	22						Size 90	Size 120		118		UUT-1
BCVE	12		Size 24						Trane	N/A	Extrapolated	
	14							Size 72		48	UUT-5	
	18		Size 36							N/A	Interpolated	
	20			Size 48						N/A	Interpolated	
	22						Size 90	Size 120		118	UUT-8	
	24			Size 60						61	UUT-9	

Table 4d - Certified BCxE Direct Expansion/Heat Pump Coil Options

		UUT		MFR
		Base Mounted	Suspended	
Casing Material	16 Gauge Galv Steel	UUT-5, UUT-8, UUT-9	UUT-1, UUT-3	Trane
Tube Material	Copper			
Tube Outer Diameter	0.375			
Tube Wall Thickness	0.012			
Permitted Fin Material	Aluminum			
Permitted Fin Pitch	12			
Permitted Tube Rows	3	UUT-5	UUT-3	
	4	Interpolated	Interpolated	
	6	UUT-8, UUT-9	UUT-1	
Header Type	Copper	UUT-5, UUT-8, UUT-9	UUT-1, UUT-3	

Table 5 - Certified BCxE Fan Motor

Model	Phase	Rating [HP]	Voltage Rating	Tested Voltage	Weight[1] [lb]	MFR	UUT	
							Base Mounted	Suspended
Variable Speed Motor	1-Phase	0.5	115~277	115	14	Headline	Extrapolated	UUT-3
		1	115~277	277	19		UUT-5	Interpolated
	3-Phase	0.5	208~460		13	Broad Ocean Motor Company	Interpolated	Interpolated
		0.5	575		14		Interpolated	Interpolated
		1	208~460	460	17		Interpolated	UUT-2
		1	575		18		Interpolated	Interpolated
		2.3	575	575	29		UUT-9	Interpolated
Variable Speed Motor and Driver	3-Phase	1.5	208~460	460	38	Broad Ocean Motor Company	UUT-7	UUT-1
		3	208~460	460	54		UUT-6	Interpolated
		3.5	575		54		Interpolated	Interpolated
		5	208~575	460, 208	56		UUT-8	UUT-4

[1]All weights are nominal and rounded to the nearest whole number.

Table 6 - Certified BCxE Fans

HP	0.5	1	1.5	2.3	3	3.5	5	Diameter	Weight[1] [lb]	Fan MFR	UUT	
											Base Mounted	Suspended
Size (Dia - Width) Impeller Weight	UUT-3	UUT-2						9" - 4"	11	Lau, Morrison	Extrapolated	UUT-2, UUT-3
								9" - 6"	15	Lau, Morrison	Extrapolated	Interpolated
		UUT-5			UUT-6			9" - 9"	15	Lau	UUT-5, UUT-6	Interpolated
				UUT-9				12" - 8"	29	Morrison	UUT-9	Interpolated
								12" - 9"	30	Lau	Interpolated	Interpolated
			UUT-1, UUT-7				UUT-4, UUT-8	12" - 12"	35	Lau	UUT-7, UUT-8	UUT-1, UUT-4

[1]All weights are nominal and rounded to the nearest whole number.

Motor Mount Configuration	HP Range	Material	UUT	
			Base Mounted	Suspended
Horizontal Shaft	0.5	Galvanized Steel	Extrapolated	UUT-3
	1		UUT-5	UUT-2
	1.5		UUT-7	UUT-1
	2.3		UUT-9	Interpolated
	3		UUT-6	Interpolated
	3.5		Interpolated	Interpolated
	5		UUT-8	UUT-4

Note: This table is part of Table 6. Refer to previous table for manufacturer information.

Table 7 - Certified BCxE Flat Filter Rack

(1" TA, 2" MERV 8, 2" MERV 13, or 2" MERV 8 & 2" MERV 13 Combination)

Unit Size	Model	Frame Material	Filter Qty[2]	Nominal Filter Size [in]		Maximum Frame Size [in]			Max Weight[1] [lb]	MFR	UUT	
				Height	Width	Height	Width	Length[1]			Base Mounted	Suspended
12	BCHE	Galvanized Steel	1	12	20	17	22	5	9	Trane		UUT-2
18	BCHE		1	12	24	17	26	5	9			Interpolated
24	BCHE		1	12	24	17	27	5	10			Interpolated
24	BCVE		1	12	24	10	11	28	6		Extrapolated	
36	BCHE		1	12	12	17	40	5	14			Interpolated
			1	12	24							
36	BCVE		1	18	24	14	15	28	7		Extrapolated	
48	BCVE		1	20	12	15	16	33	8		Extrapolated	
			1	20	18							
54	BCHE		1	16	16	18	43	5	16			Interpolated
			1	16	25							
60	BCVE		1	24	12	18	19	33	9		UUT-9	
			1	24	18							
72	BCHE, BCVE		2	16	25	18	56	5	18		UUT-5	Interpolated
90	BCHE, BCVE		1	24	20	26	46	5	20		Interpolated	Interpolated
			1	24	24							
120	BCHE, BCVE		3	24	18	26	56	5	25		UUT-7	UUT-1[2]

[1]Maximum length and weight is for the 2" MERV 8 & 2" MERV 13 combination filter rack.

[2]Multiply filter qty by 2 for the 2" MERV 8 & 2" MERV 13 combination filter rack.

[3]All weights and dimensions are nominal and rounded to the nearest whole number.

Table 8 - Certified BCxE Angle Filter Section (2" MERV 8 or 2" MERV 13)

Unit Size	Model	Frame Material	Filter Qty	Nominal Filter Size [in]		Maximum Frame Size [in]			Max Weight[1] [lb]	MFR	UUT	
				Height	Width	Height[3]	Width[4]	Length			Base Mounted	Suspended
12	BCHE	Galvanized Steel	2	12	20	17	24	24	54	Trane		Interpolated
18	BCHE		2	12	24		28		59			
24	BCHE		2	12	24		30		61			
36	BCHE		2	12	12		42		79			
			2	12	24							
54	BCHE		2	12	20		46		80			
			2	12	24	18		24				
72	BCHE, BCVE		2	12	12		58		99		Interpolated	
			4	12	20							
90	BCHE, BCVE		2	20	20	26	48	30	111			
			2	20	25							
120	BCHE, BCVE		6	20	18		58		131			

[1]Double wall cabinet construction.
[2]All weights and dimensions are nominal and rounded to the nearest whole number.
[3]Add 6" to the height for size 72-120 BCVE units for the mounting legs.
[4]Add 5" to the width for lug stickout.
*Covered by mix box with angle filter UUT's as shown in Table 10. Angle filter box, mix box, and mix box with angle filters have the same cabinet. Mix box with angle filter has all components from other two modules.

Table 9 - Certified BCxE Mix Box

Unit Size	Model	Frame Material	Damper Qty	Damper Size [in]		Frame Size [in]			Max Weight[1] [lb]	MFR	UUT	
				Height	Width	Height[3]	Width[4]	Length			Base Mounted	Suspended
12	BCHE	Galvanized Steel	2	8	14	17	24	24	64	Trane		Interpolated
18	BCHE		2	8	14		28		69			
24	BCHE		2	8	20		30		75			
36	BCHE		2	8	20		42		91			
54	BCHE		2	11	36	18	46	24	113			
72	BCHE, BCVE		2	11	36		58		129		Interpolated	
90	BCHE, BCVE		2	16	38	26	48	30	157			
120	BCHE, BCVE		2	16	38		58		175			

[1]Double wall cabinet construction.
[2]All weights and dimensions are nominal and rounded to the nearest whole number.
[3]Add 6" to the height for size 72-120 BCVE units for the mounting legs.
[4]Add 5" to the width for lug stickout.
*Covered by mix box with angle filter UUT's as shown in Table 10. Angle filter box, mix box, and mix box with angle filters have the same cabinet. Mix box with angle filter has all components from other two modules.

Table 10 - Certified BCxE Mix Box w/Angle Filter Section (2" MERV 8 or 2" MERV 13)

Unit Size	Model	Filter Qty	Nominal Filter Size [in]		Damper Qty	Damper Size [in]		Frame Size[2] [in]			Max Weight[1] [lb]	MFR	UUT	
			Height	Width		Height	Width	Height[4]	Width[5]	Length			Base Mounted	Suspended
12	BCHE	2	12	20	2	8	14	17	24	24	72	Trane		UUT-3
18	BCHE	2	12	24	2	8	14		28		77			Interpolated
24	BCHE	2	12	24	2	8	20		30		84			
36	BCHE	2	12	12	2	8	20		42		104			
		2	12	24										
54	BCHE	2	12	20	2	11	36	18	46	24	126			
		2	12	24										
72	BCHE, BCVE	2	12	12	2	11	36		58		146		UUT-6	
		4	12	20										
90	BCHE, BCVE	2	20	20	2	16	38	26	48	30	175		Interpolated	
		2	20	25										
120	BCHE, BCVE	6	20	18	2	16	38		58		196		UUT-8	UUT-4

[1]Double wall cabinet construction.
[2]Frame material is galvanized steel.
[3]All weights and dimensions are nominal and rounded to the nearest whole number.
[4]Add 6" to the height for size 72-120 BCVE units for the mounting legs.
[5]Add 5" to the width for lug stickout.

Table 11 - Certified BCxE Top or Bottom Filter Access Section (2" MERV 8 or 2" MERV 13)

Unit Size	Model	Frame Material	Filter Qty	Nominal Filter Size [in]		Frame Size [in]			Max Weight[1] [lb]	MFR	UUT	
				Height	Width	Height[3]	Width[4]	Length			Base Mounted	Suspended
12	BCHE	Galvanized Steel	1	12	20	17	24	8	22	Trane		UUT-3
18	BCHE	Galvanized Steel	1	12	24	17	28		24			Interpolated
24	BCHE		1	12	24	17	30		25			Interpolated
36	BCHE		1	12	12	17	42		32			Interpolated
			1	12	24							Interpolated
54	BCHE		1	16	16	18	46		35			Interpolated
			1	16	25							Interpolated
72	BCHE, BCVE	Galvanized Steel	2	16	25	18	58		43		UUT-6	Interpolated
90	BCHE, BCVE	Galvanized Steel	1	24	20	26	48		41		Interpolated	Interpolated
			1	24	24						Interpolated	Interpolated
120	BCHE, BCVE	Galvanized Steel	3	24	18	26	58		46		UUT-8	UUT-4

[1]Double wall cabinet construction.
[2]All weights and dimensions are nominal and rounded to the nearest whole number.
[3]Add 6" to the height for size 72-120 BCVE units for the mounting legs.
[4]Add 5" to the width for lug stickout.

Table 12 - Certified BCxE Flat Media Options

Type	Filter Material	MFR	UUT	
			Base Mounted	Suspended
1" Standard Efficiency Throw Away	Fiberglass or Polyester	Clarcor	UUT-7	UUT-2
2" MERV 8	Pleated		UUT-5, UUT-8	UUT-1, UUT-3
2" MERV 13	Pleated		UUT-6, UUT-9	UUT-1, UUT-4

Table 13 - Certified BCxE Attenuators

Unit Size	Model	Location	Frame Material	Frame Size [in]			Max Weight[1] [lb]	MFR	UUT	
				Height[3]	Width[4]	Length			Base Mounted	Suspended
12	BCHE	Return	Galvanized Steel	17	24	14	26	Trane		Extrapolated
		Discharge		17	17	23	29			UUT-2
18		Return		17	28	14	28			Interpolated
		Discharge		17	21	23	31			
24		Return		17	30	14	29			
		Discharge		17	21	23	31			
36		Return		17	42	19	42			
		Discharge		17	31	28	44			
54		Return		18	46	25	54			
		Discharge		18	35	34	60			
72		Return		18	58	31	73			
		Discharge		18	47	40	81			
90		Return		26	48	25	65			
		Discharge		26	37	34	72			
120		Return		26	58	31	84			
		Discharge		26	47	40	93			UUT-4

[1]Return and discharge attenuators are always single wall cabinet construction.

[2]All weights and dimensions are nominal and rounded to the nearest whole number.

[3]Add 6" to the height for size 72-120 BCVE units for the mounting legs.

[4]Add 5" to the width for lug stickout.

Table 14a - Certified BCxE Electric Heat

Model	Unit Size	Stage	Output [kW]	Dimensions [in]			Weight [lb]	MFR	UUT	
				Height	Width	Depth[1]			Base Mounted	Suspended
BCHE	12	1, 2, SCR	1.0 - 5.0	15	18	8	23	Tutco		UUT-3
	18		1.0 - 5.0	15	20	8	25			Interpolated
	24		1.0 - 5.0	15	20	8	25			Interpolated
	36		1.0 - 10.0	18	25	8	30			Interpolated
	54		1.0 - 15.0	19	21	8	28			Interpolated
	72		1.0 - 20.0	19	21	8	28			Interpolated
	90		1.0 - 30.0	19	27	8	32			Interpolated
	120		1.0 - 30.0	19	31	8	34			UUT-1
BCVE	24	1, 2, SCR	1.0 - 5.0	15	25	9	28	Tutco	Interpolated	
	36		1.0 - 10.0	15	25	9	29		Interpolated	
	48		1.0 - 15.0	15	29	9	33		Interpolated	
	60		1.0 - 20.0	15	29	9	35		Interpolated	
	72		1.0 - 20.0	19	21	8	28		UUT-5	
	90		1.0 - 30.0	19	27	8	32		Interpolated	
	120		1.0 - 30.0	19	31	8	34		UUT-7	

[1]Stickout from end of unit. Includes disconnect handle.

[2]All weights and dimensions are nominal and rounded to the nearest whole number.

Table 14b - Certified BCxE Electric Heat

kW	Voltage												UUT	
	115/60/1	208/60/1	220/50/1	230/60/1	240/50/1	277/60/1	208/60/3	230/60/3	380/50/3	415/50/3	460/60/3	575/60/3	Base Mounted	Suspended
1	UUT-3	X	X	X	X	X	X	X	X	X	X	X	Extrapolated	UUT-3
5		X	X	X	X	X	X	X	X	X	X	X	Interpolated	Interpolated
10						UUT-5	X	X	X	X	X	X	UUT-5	Interpolated
15									X	X	X	X	Interpolated	Interpolated
20									X	X	UUT-7	X	UUT-7	Interpolated
24									X	X	X	X	Interpolated	Interpolated
30										X	UUT-1	X	Interpolated	UUT-1

Note: This table is an extension of Table 14a for describing the voltages of the electric heaters. Refer to previous table for manufacturer information.

Table 15 - Certified BCxE Control Panel

Controller	Dimensions [in]			MFR	Weight [lb]	UUT	
	Height	Width	Depth			Base Mounted	Suspended
Thermostat	13	7	4	Trane	< 7	UUT-9	UUT-2
CSTI						UUT-5, UUT-7, UUT-8	UUT-3, UUT-4
UC400B						UUT-6	UUT-1
Symbio 400B						Interpolated	Interpolated

[1]All weights and dimensions are nominal and rounded to the nearest whole number.

Table 16 - Certified BCxE Dampers

Unit Size	Model	Height [in]	Width [in]	Qty	MFR	UUT	
						Base Mounted	Suspended
12	BCHE	8	14	2	Ruskin		UUT-3
18	BCHE	8	14				Interpolated
24	BCHE	8	20				Interpolated
36	BCHE	8	20				Interpolated
54	BCHE	11	36				Interpolated
72	BCHE, BCVE	11	36			UUT-6	Interpolated
90	BCHE, BCVE	16	38			Interpolated	Interpolated
120	BCHE, BCVE	16	38			UUT-8	UUT-4

[1]All weights and dimensions are nominal and rounded to the nearest whole number.

Damper Material		Blade Orientation	MFR	UUT
Frame	Blades			
Galvanized Steel	Galvanized Steel	Parallel	Ruskin	UUT-3, UUT-4, UUT-6, UUT-8

Actuator Type	MFR	UUT
Modulating NO/NC Spring Return	Belimo	UUT-3, UUT-4, UUT-6, UUT-8

Note: This table is an extension of Table 16 for describing the blade and actuator information. Refer to previous table for manufacturer information.

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-1

Test Report: 19561-2201; UUT-01

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCHE120GAA0A1J05033000AD0C000000000B0000S (BCHE 120 A)	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

DX Coil: Trane; Fan Motor: Broad Ocean Motor Company; Fan: Lau; Filter Rack: Trane; Flat Media Options: Clarcor; Electric Heat: Tutco; Control Panel: Trane;

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
440	65.0	58.0	26.0	N/A	N/A	N/A

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.27	1.0	1.5	3.63	2.72	1.51	0.61
		-	-	-	-	-	-	-

Test Mounting Details

UUT-1 was ceiling-supspended using (4) VMC HRSP-1D-175 isolators, 5/8" diameter Grade 5 threaded hanger rods, and 1/4" galvanized wire rope sections. Each hangar rod featured (6) Grade 5 and (3) Grade 8 5/8" nuts, (1) 2" diameter, 1/8" thick Grade 5 5/8" flat washer, (1) 3" diameter, 1/4" thick Grade 5 5/8" flat washer, (5) 1.75" diameter, 1/4" thick Grade 5 5/8" flat washers, (1) 2"x2"x1/4" carbon steel plate washer, and (1) VMC SB-250 seismic cable bracket which connects the 1/4" galvanized wire rope to the ceiling fixture. Each VMC HRSP-1D-175 isolator was attached to the ceiling frame with (1) Grade 5 5/8" threaded rod, (2) Grade 8 nuts, (1) 2" diameter, 1/8" thick Grade 5 flat washer, (1) 2.5" diameter, 1/4" thick flat washer, (1) 1.75" diameter, 1/8" thick Grade 5 flat washer, (1) 3"x3"x1/4" carbon steel plate washer, and (1) grade 5 channel nut. There was a 1/8" operating gap between the 2.5" diameter flat washer on top of the isolator and the top-most Grade 8 nut for each isolator. The 1/4" galvanized wire rope was attached to the ceiling fixture using another SB-250 cable bracket and (1) Grade 5 1/2" bolt, flat washer, and channel nut. For the wire used to support the furthest corner rods, (1) 1/2" grade 5 bolt, flat washer, 2"x2"x1/4" carbon steel washer, and channel nut was placed on the inside next to SB-250 bracket. The ceiling fixture was attached to the shake table using M12 threaded rods, 3"x3"x1/4" carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-2

Test Report: 19561-2201; UUT-02

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCHE012GAA0A1AB40000000AEGH00G0000000B00S (BCHE 12 I)	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

Hydronic Coils: Trane; Fan Motor: Broad Ocean Motor Company; Fan: Lau; Filter Rack: Trane; Flat Media Options: Clarcor; Attenuator: Trane; Control Panel: Trane;

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
230	57.0	37.0	18.0	N/A	N/A	N/A

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.27	1.0	1.5	3.63	2.72	1.51	0.61
		-	-	-	-	-	-	-

Test Mounting Details

UUT-2 was ceiling-supspended using (6) VMC HRSP-1D-175 isolators, 5/8" diameter Grade 5 threaded hanger rods, and 1/4" galvanized wire rope sections. Each hangar rod featured (6) Grade 5 and (3) Grade 8 5/8" nuts, (1) 2" diameter, 1/8" thick Grade 5 5/8" flat washer, (1) 3" diameter, 1/4" thick Grade 5 5/8" flat washer, (5) 1.75" diameter, 1/4" thick Grade 5 5/8" flat washers, (1) 2"x2"x1/4" carbon steel plate washer, and (1) VMC SB-250 seismic cable bracket which connects the 1/4" galvanized wire rope to the ceiling fixture. Each VMC HRSP-1D-175 isolator was attached to the ceiling frame with (1) Grade 5 5/8" threaded rod, (2) Grade 8 nuts, (1) 2" diameter, 1/8" thick Grade 5 flat washer, (1) 2.5" diameter, 1/4" thick flat washer, (1) 1.75" diameter, 1/8" thick Grade 5 flat washer, (1) 3"x3"x1/4" carbon steel plate washer, and (1) grade 5 channel nut. There was a 1/8" operating gap between the 2.5" diameter flat washer on top of the isolator and the top-most Grade 8 nut for each isolator. The 1/4" galvanized wire rope was attached to the ceiling fixture using another SB-250 cable bracket and (1) Grade 5 1/2" bolt, flat washer, and channel nut. For the wire used to support the furthest corner rods, (1) 1/2" grade 5 bolt, flat washer, 2"x2"x1/4" carbon steel washer, and channel nut was placed on the inside next to SB-250 bracket. The ceiling fixture was attached to the shake table using M12 threaded rods, 3"x3"x1/4" carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-3

Test Report: 19561-2201; UUT-03

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCHE012ABA0A4G02010100ABDB00000002000000S (BCHE 12 F')	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

DX Coil: Trane; Fan Motor: Headline; Fan: Morrision; Mix Box w/ Angle Filter: Trane; Top/Bottom Filter Access Section: Trane; Flat Media Options: Clarcor;Electric Heat: Tutco; Control Panel: Trane; Damper: Ruskin

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
320	69.0	31.0	17.0	N/A	N/A	N/A

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.27	1.0	1.5	3.63	2.72	1.51	0.61
		-	-	-	-	-	-	-

Test Mounting Details

UUT-3 was ceiling-supspended using (6) VMC HRSP-1D-175 isolators, 5/8" diameter Grade 8 threaded hanger rods, and 1/4" galvanized wire rope sections. Each hangar rod featured (6) Grade 5 and (3) Grade 8 5/8" nuts, (1) 2" diameter, 1/8" thick Grade 5 5/8" flat washer, (1) 3" diameter, 1/4" thick Grade 5 5/8" flat washer, (5) 1.75" diameter, 1/4" thick Grade 5 5/8" flat washers, (1) 2"x2"x1/4" carbon steel plate washer, and (1) VMC SB-250 seismic cable bracket which connects the 1/4" galvanized wire rope to the ceiling fixture. Each VMC HRSP-1D-175 isolator was attached to the ceiling frame with (1) Grade 5 5/8" threaded rod, (2) Grade 8 nuts, (1) 2" diameter, 1/8" thick Grade 5 flat washer, (1) 2.5" diameter, 1/4" thick flat washer, (1) 1.75" diameter, 1/8" thick Grade 5 flat washer, (1) 3"x3"x1/4" carbon steel plate washer, and (1) grade 5 channel nut. There was a 1/8" operating gap between the 2.5" diameter flat washer on top of the isolator and the top-most Grade 8 nut for each isolator. The 1/4" galvanized wire rope was attached to the ceiling fixture using another SB-250 cable bracket and (1) Grade 5 1/2" bolt, flat washer, and channel nut. For the wire used to support the furthest corner rods, (1) 1/2" grade 5 bolt, flat washer, 2"x2"x1/4" carbon steel washer, and channel nut was placed on the inside next to SB-250 bracket. The ceiling fixture was attached to the shake table using M12 threaded rods, 3"x3"x1/4" carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-4

Test Report: 19561-2201; UUT-04

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCHE120GBA0A4FCA0000000CHBJ00J0002000000S (BCHE 120 N')	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

Hydronic Coils: Trane; Fan Motor: Broad Ocean Motor Company; Fan: Lau; Mix Box w/ Angle Filter: Trane; Top/Bottom Filter Access Section: Trane; Flat Media Options: Clarcor; Attenuator: Trane; Control Panel: Trane; Damper: Ruskin

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
920	120.0	70.0	26.0	N/A	N/A	N/A

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.27	1.0	1.5	3.63	2.72	1.51	0.61
		-	-	-	-	-	-	-

Test Mounting Details

UUT-4 was ceiling-supspended using (8) VMC HRSP-1D-175 isolators, 5/8" diameter Grade 8 threaded hanger rods, and 1/4" galvanized wire rope sections. Each hangar rod featured (6) Grade 5 and (3) Grade 8 5/8" nuts, (1) 2" diameter, 1/8" thick Grade 5 5/8" flat washer, (1) 3" diameter, 1/4" thick Grade 5 5/8" flat washer, (5) 1.75" diameter, 1/4" thick Grade 5 5/8" flat washers, (1) 2"x2"x1/4" carbon steel plate washer, and (1) VMC SB-250 seismic cable bracket which connects the 1/4" galvanized wire rope to the ceiling fixture. Each VMC HRSP-1D-175 isolator was attached to the ceiling frame with (1) Grade 5 5/8" threaded rod, (2) Grade 8 nuts, (1) 2" diameter, 1/8" thick Grade 5 flat washer, (1) 2.5" diameter, 1/4" thick flat washer, (1) 1.75" diameter, 1/8" thick Grade 5 flat washer, (1) 3"x3"x1/4" carbon steel plate washer, and (1) grade 5 channel nut. There was a 1/8" operating gap between the 2.5" diameter flat washer on top of the isolator and the top-most Grade 8 nut for each isolator. The 1/4" galvanized wire rope was attached to the ceiling fixture using another SB-250 cable bracket and (1) Grade 5 1/2" bolt, flat washer, and channel nut. For the wire used to support the furthest corner rods, (1) 1/2" grade 5 bolt, flat washer, 2"x2"x1/4" carbon steel washer, and channel nut was placed on the inside next to SB-250 bracket. The ceiling fixture was attached to the shake table using M12 threaded rods, 3"x3"x1/4" carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-5

Test Report: 19561-2201; UUT-05

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCVE072DAA0A1G04011000AB0B00000000000000S (BCVE 72 A)	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

DX Coil: Trane; Fan Motor: Headline; Fan: Lau; Filter Rack: Trane; Flat Media Options: Clarcor; Electric Heat: Tutco; Control Panel: Trane;

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
320	34.0	65.0	69.0	11.5	17.5	>33.3

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	-	-
		2.27	0.0	1.5	-	-	1.51	0.61

Test Mounting Details

UUT-5 was rigidly mounted to the shake table using two I-beams attached to the shake table interface plate. The I-beams were attached using Grade 5 1/2" bolts. The unit was attached to the I-beams using (4) manufacturer-provided 0.124" 10 gage carbon steel legs, (16) 5/16" diameter Grade 8 bolts, nuts, and (24) Grade 5 flat washers.The unit was attached to the legs using (8) #10 screws per leg. The shake table interface plate was attached to the shake table using M12 threaded rods, 3”x3”x1/4” carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-6

Test Report: 19561-2201; UUT-06

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCVE072GBA0A4N070000000CHCJ00000020B0000S (BCVE 72 N')	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

Hydronic Coils: Trane; Fan Motor: Broad Ocean Motor Company; Fan: Lau; Mix Box w/ Angle Filter: Trane; Top/Bottom Filter Access Section: Trane; Flat Media Options: Clarcor; Control Panel: Trane; Damper: Ruskin

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
720	63.0	68.0	68.0	10.5	17.5	>33.3

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	-	-
		2.27	0.0	1.5	-	-	1.51	0.61

Test Mounting Details

UUT-6 was rigidly mounted to the shake table using two I-beams attached to the shake table interface plate. The I-beams were attached using Grade 5 1/2" bolts. The unit was attached to the I-beams using (6) manufacturer-provided 0.124" 10 gage carbon steel legs, (24) 5/16" diameter Grade 8 bolts, nuts, and (36) Grade 5 flat washers. The unit was attached to the legs using (8) #10 screws per leg. The shake table interface plate was attached to the shake table using M12 threaded rods, 3"x3"x1/4" carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-7

Test Report: 19561-2201; UUT-07

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCVE120GAA0A1B05022000BA0BJ0000000000000S (BCVE 120 I)	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

Hydronic Coils: Trane; Fan Motor: Broad Ocean Motor Company; Fan: Lau; Filter Rack: Trane; Flat Media Options: Clarcor; Electric Heat: Tutco; Control Panel: Trane;

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
410	34.0	69.0	80.0	8.5	11.0	23.5

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	-	-
		2.27	0.0	1.5	-	-	1.51	0.61

Test Mounting Details

UUT-7 was isolated using (4) VMC Group 334007 shear-flex elastomeric pads rated for 50 PSI and two I-beams attached to the shake table interface plate. The I-beams were attached using Grade 5 1/2" bolts. The unit was attached to the I-beams using (4) manufacturer-provided 0.124" 10 gage carbon steel legs, (16) 5/16" diameter Grade 8 bolts, nuts, and (24) Grade 5 flat washers. The unit was attached to the legs using (8) #10 screws per leg. The isolator pads were placed in between the I-beams and the base of the leg. The shake table interface plate was attached to the shake table using M12 threaded rods, 3”x3”x1/4” carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-8

Test Report: 19561-2201; UUT-08

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCVE120EBA0A4JFA0000000BHB00000002000000S (BCVE 120 F')	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

Hydronic Coils: Trane; DX Coil: Trane; Fan Motor: Broad Ocean Motor Company; Fan: Lau; Mix Box w/ Angle Filter: Trane; Top/Bottom Filter Access Section: Trane; Flat Media Options: Clarcor; Control Panel: Trane; Damper: Ruskin

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
930	72.0	68.0	80.0	6.5	11.0	18.5

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	-	-
		2.27	0.0	1.5	-	-	1.51	0.61

Test Mounting Details

UUT-8 was isolated using (6) VMC Group 334007 shear-flex elastomeric pads rated for 50 PSI and two I-beams attached to the shake table interface plate. The I-beams were attached using Grade 5 1/2" bolts. The unit was attached to the I-beams using (6) manufacturer-provided 0.124" 10 gage carbon steel legs, (24) 5/16" diameter Grade 8 bolts, nuts, and (36) Grade 5 flat washers. The unit was attached to the legs using (8) #10 screws per leg. The isolator pads were placed in between the I-beams and the base of the leg. The shake table interface plate was attached to the shake table using M12 threaded rods, 3"x3"x1/4" carbon steel washers, flat washers, and nuts.

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

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-9

Test Report: 19561-2201; UUT-09

Model Line	Model Number	Manufacturer
BCxE Blower Coil Air Handlers	BCVE060NBA0C6JF80000000CNG000G0000000B00S (BCVE 60 R)	Trane

Product Construction Summary

22 Gauge Galv CS

Options / Subcomponent Summary

Hydronic Coils: Trane; DX Coil: Trane; Fan Motor: Broad Ocean Motor Company; Fan: Morrison; Filter Rack: Trane; Flat Media Options: Clarcor; Control Panel: Trane;

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
450	35.0	35.0	72.0	10.5	13.5	>33.3

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS}	z/h	I_P	A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2022	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	-	-
		2.27	0.0	1.5	-	-	1.51	0.61

Test Mounting Details

UUT-9 was isolated using (4) VMC Group 334007 shear-flex elastomeric pads rated for 50 PSI. The unit was attached to the shake table interface plate using (4) manufacturer-provided 0.124" 10 gage carbon steel legs, (15) 1/4" diameter Grade 8 bolts, nuts, and Grade 5 flat washers. The unit was attached to the legs (8) #10 screws per leg. The isolator pads were placed in between the shake table interface plate and the base of the leg. One bolt head was sheared off during test setup and the unit was tested with one less bolt. The shake table interface plate was attached to the shake table using M12 threaded rods, 3”x3”x1/4” carbon steel washers, flat washers, and nuts.

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