APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0367

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Trane Commercial Systems

Manufacturer's Technical Representative: Wyatt Martinez

Mailing Address: 101 William White Boulevard, Pueblo, CO 81001

Telephone: (719) 585-4374 Email: wyatt.martinez@trane.com

Product Information

Product Name: Chillers

Product Type: Chillers - Air Cooled

Product Model Number: RTAC 140-500 Ton

General Description: Hermetic rotary refrigeration machines which provide chilled water for water cooling systems.

Mounting Description: Base mounted on seismic elastomeric isolators or base mounted on seismic spring isolators.

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.

REVIEWED FOR CODE COMPLIANCE OSHPD OSP-0367 DATE: 07/28/2021 CALIFORNIA BUILDING CODE, 2019

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: UNIVERSITY OF CALIFORNIA, BERKELEY (PEER)

Contact Person: Wesley Neighbour

Mailing Address: 1301 S. 46th Street, Building 420, Richmond CA 94804

Telephone: (510) 665-3409 Email: peer_center@berkeley.edu

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Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) = 1.37 for Neoprene, 1.71 for Spring Isolated

S_{DS} (Design spectral response acceleration at short period, g) = 2.28

a_p (Amplification factor) = 2.5

R_p (Response modification factor) = 2.5 (for Neoprene); 2.0 (for Spring Isolated)

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height ratio factor) = 0

Natural frequencies (Hz) = See attachment

Overall dimensions and weight = See attachment

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OSHPD Approval (For Office Use Only) - Approval Expires on 12/31/2025

Date: 7/28/2021

Name: Mohammad Karim Title: Supervisor, Health Facilities

Special Seismic Certification Valid Up to: S_{DS} (g) = 2.28 z/h = 0

Condition of Approval (if applicable):

Table 1- RTAC Chiller Matrix

Model	Nominal Capacity [Tons]	Type[1]	Freq [Hz]	Measured Weight Without Operating Content [lbs]	Max Operating Weight [lbs]	Dimensions [in]			S_{DS} [g] Elastomeric & Spring Isolators	z/h	UUT[2]
						Length	Width	Height			
RTAC 140 SE	140	Standard	60	N/A	11,077	196	89	98	2.28	0.0	Extrapolated
RTAC 140 HIGH	140	High	60		11,140	196	89	98	2.28	0.0	Extrapolated
RTAC 155 SE	155	Standard	60	10,300	11,116	196	89	98	2.28	0.0	UUT-01A, -01B
RTAC 170 SE	170	Standard	60		11,211	196	89	98	2.28	0.0	Interpolated
RTAC 155 HIGH	155	High	60		12,417	232	89	98	2.28	0.0	Interpolated
RTAC 170 HIGH	170	High	60		12,563	232	89	98	2.28	0.0	Interpolated
RTAC 140 XE	140	XE	60		12,557	232	89	98	2.28	0.0	Interpolated
RTAC 185 SE	185	Standard	60		12,884	232	89	98	2.28	0.0	Interpolated
RTAC 200 SE	200	Standard	60		13,186	232	89	98	2.28	0.0	Interpolated
RTAC 185 HIGH	185	High	60		14,298	268	89	98	2.28	0.0	Interpolated
RTAC 155 XE	155	XE	60		14,306	268	89	98	2.28	0.0	Interpolated
RTAC 200 HIGH	200	High	60		14,676	268	89	98	2.28	0.0	Interpolated
RTAC 170 XE	170	XE	60		14,698	268	89	98	2.28	0.0	Interpolated
RTAC 225 SE	225	Standard	60	N/A	14,671	268	89	98	2.28	0.0	Interpolated
RTAC 250 SE	250	Standard	60		14,937	268	89	98	2.28	0.0	Interpolated
RTAC 275 SE	275	Standard	60		19,613	360	89	98	2.28	0.0	Interpolated
RTAC 225 HIGH	225	High	60		16,392	362	89	98	2.28	0.0	Interpolated
RTAC 185 XE	185	XE	60		16,382	362	89	98	2.28	0.0	Interpolated
RTAC 250 HIGH	250	High	60		16,392	362	89	98	2.28	0.0	Interpolated
RTAC 200 XE	200	XE	60		16,351	362	89	98	2.28	0.0	Interpolated
RTAC 275 HIGH	275	High	60		21,023	432	89	98	2.28	0.0	Interpolated
RTAC 250 XE	250	XE	60		20,558	432	89	98	2.28	0.0	Interpolated
RTAC 300 SE	300	Standard	60		21,181	432	89	98	2.28	0.0	Interpolated
RTAC 350 SE 500-T Evaporator	Modified 350	Standard	60	22,000	25,984	432	89	98	2.28	0.0	UUT-02A, -02B

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Notes:

1. High and XE units use identical components and structure as standard units, just different combinations or quantities of the same interpolated sub-components.
2. UUT-02A & 02B were RTAC 350 SE structures that were tested with the 500 Ton Evaporator

Table 2a - Control Panel Construction

Description	Manufacturer	W x H x D	Input Voltage [VAC]	Enclosure Material	UUT
Top Box (all models)	Trane	30" x 25" x 9"	230/380/460	0.072" Galvanized Carbon Steel Enclosure; 0.0785" Galvanized Carbon Steel Door; 0.108" Galvanized Carbon Steel Backpanel	UUT-01A, -01B, -02A, -02B
Bottom Box (all models)		88" x 34" x 10.5"			UUT-01A, -01B, -02A, -02B

Table 2b - Control Panel Components

Description	Manufacturer	Input Voltage [VAC]	Output Rating [RLA]	UUT
Operator Interface	Dynaview	240	N/A	UUT-01A, -01B, -02A, -02B
VFD	Danfoss TR1	200/230/380/460	200/230/380/460	UUT-01A, -01B, -02A, -02B
Transformer	Eaton/Cutler Hammer or	230/380/460	120/240	UUT-01A, -01B, -02A, -02B
X-Line Starter	Trane	200/230/380/460	200/230/380/460	UUT-02A, -02B
Y-Delta Starter	Trane	230/380/460	200/230/380/460	UUT-01A, -01B
Motor Starter	Trane	230/380/460	200/230/380/460	UUT-01A, -01B, -02A, -02B
Disconnect	Schneider PowerPact	230/380/460	200/230/380/460	UUT-01A, -01B, -02A, -02B
Terminal Block	Marathon	230/380/460	200/230/380/460	UUT-01A, -01B, -02A, -02B
Circuit Breaker	Schneider PowerPact	230/380/460	200/230/380/460	UUT-01A, -01B, -02A, -02B

Table 3 - Compressors

Description	Manufacturer	Type	Input Voltage [VAC]	Output Rating [RLA]	UUT
M3	Trane	Rotary	200 - 460	275X/300H/350S	UUT-01A, -01B
M4				139 - 320	UUT-01A, -01B
N3				168 - 386	UUT-02A, -02B
N4				350H/300X	UUT-02A, -02B

Table 4 - Condenser Coils

Manufacturer	Length	Height x Depth	Fin Material	Tube Material & Diameter	# Rows	UUT
Trane	9' (shortest)	42"x5"	0.0042" Thick Aluminum	Copper, 3/8" OD	3	UUT-01A, -01B
	21' (longest)					UUT-02A, -02B

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Table 5 - Evaporators

Description	MFR	Arrangement	Shell Diameter & Wall Dimensions [in]	Tons/Eff	UUT
M1	Trane	2 or 3 pass	17.5 / 0.23	0.072" Galvanized Carbon Steel Enclosure; 0.0785" Galvanized Carbon Steel Door; 0.108" Galvanized Carbon Steel Backpanel	Extrapolated
M2	Trane	2 or 3 pass	17.5 / 0.23	130H/**155S**	UUT-01A, -01B
N1	Trane	2 or 3 pass	17.5 / 0.23	140G/170S	Interpolated
N2	Trane	2 or 3 pass	17.5 / 0.23	155H	Interpolated
N3	Trane	2 or 3 pass	17.5 / 0.23	170H/140X	Interpolated
N4	Trane	2 or 3 pass	17.5 / 0.23	185S	Interpolated
N5	Trane	2 or 3 pass	17.5 / 0.23	200S	Interpolated
N6	Trane	2 or 3 pass	17.5 / 0.23	185H/155X	Interpolated
Y-Delta Starter	Trane	2 or 3 pass	17.5 / 0.23	225S	Interpolated
N8	Trane	2 or 3 pass	17.5 / 0.23	200H/170X/185X /225H/250S/250H	Interpolated
R1	Trane	2 or 3 pass	23 / 0.23	250S	Interpolated
R2	Trane	2 or 3 pass	23 / 0.23	275S	Interpolated
R3	Trane	2 or 3 pass	23 / 0.23	250H/200X	Interpolated
R4	Trane	2 or 3 pass	23 / 0.23	300S	Interpolated
R5	Trane	2 or 3 pass	23 / 0.23	275H/250X	Interpolated
R6	Trane	2 or 3 pass	23 / 0.23	275X/300H/350S	Interpolated
T1	Trane	2 or 3 pass	26.5 / 0.23	350S	Interpolated
T2	Trane	2 or 3 pass	26.5 / 0.23	375S	Interpolated
T3	Trane	2 or 3 pass	26.5 / 0.23	350H/300X	Interpolated
T4	Trane	2 or 3 pass	26.5 / 0.23	400S	Interpolated
T5	Trane	2 or 3 pass	26.5 / 0.23	375H	Interpolated
T6	Trane	2 or 3 pass	26.5 / 0.23	450S	Interpolated
T7	Trane	2 or 3 pass	26.5 / 0.23	350X/400H/450H/**500S**	UUT-02A, -02B

Note: All tubes are 1" Copper with 0.025" Wall

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Table 6a - Fans

Description	MFR	# Blades	Blade Material	UUT
Standard	Revcor	3	Aluminum	UUT-01A, -01B, -02A, -02B
Low Noise	Kenco	9	Plastic	UUT-01A, -01B, -02A, -02B

Table 6b - Fan Motors

Model Number	MFR	Output Rating	Input Voltage [VAC]	Type	UUT
P56C75A05	AO Smith Corp.	1.5 HP	200 - 230	TEAO	UUT-01A,-01B
P56C76A05	AO Smith Corp.	1.5 HP	380	TEAO	Interpolated
P56C77A05	AO Smith Corp.	1.5 HP	460	TEAO	UUT-02A, -02B
P56AD62A05	AO Smith Corp.	1.5 HP	200 - 230	TEAO Inverter Duty	UUT-01A, -01B
P56AD64A05	AO Smith Corp.	1.5 HP	380 - 460	TEAO Inverter Duty	UUT-02A, -02B

UNIT UNDER TEST (UUT)
Summary Sheet

UUT-01A
(Neoprene Isolated)

PEER STI 2013-15

Model Line	Model Number	Manufacturer
RTAC Air-Cooled Chillers	RTAC 155 SE	Trane (Ingersoll Rand)

Product Construction Summary

Galvanized carbon steel, mounted on a welded structural carbon steel base

Options / Subcomponent Summary

Control Panels, Compressors, Condenser Coils, Evaporators, Fans, Fan Motors, Input Voltage 200-460VAC

UUT Properties

Measured Weight Without Operating Content [lbs.]	Max Operating Weight [lbs.]	Dimensions [in.]			Lowest Nat. Freq. [Hz]		
		Length	Width	Height	F-B	S-S	V
10,300	11,116	195	89	98	6.4	5.8	11.2

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 2019	ICC-ES AC156	2.28	0	1.50	2.28	0.91	1.52	0.61

Test Mounting Details

UUT-01A was bolted to the test fixture beams through 3/4"- thick VMC Group Shear Flex Elastomeric Neoprene Isolators using (8) 5/8" UNC Grade 8 Bolts. The distance between the first set of bolts was 46" on center length-wise while the remaining bolts were spaced 53" on center length-wise. The bolts were spaced 86" on center width-wise.

The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems were maintained.

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UNIT UNDER TEST (UUT)
Summary Sheet

UUT-01B
(Spring Isolated)

PEER STI 2013-15

Model Line	Model Number	Manufacturer
RTAC Air-Cooled Chillers	RTAC 155 SE	Trane (Ingersoll Rand)

Product Construction Summary

Galvanized carbon steel, mounted on a welded structural carbon steel base

Options / Subcomponent Summary

Control Panels, Compressors, Condenser Coils, Evaporators, Fans, Fan Motors, Input Voltage 200-460VAC

UUT Properties

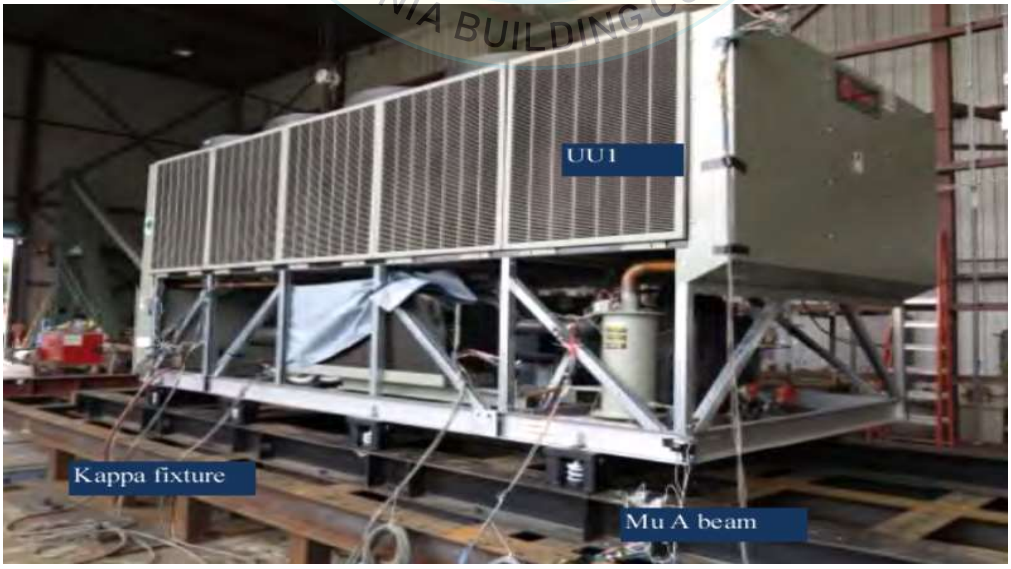
Measured Weight Without Operating Content [lbs.]	Max Operating Weight [lbs.]	Dimensions [in.]			Lowest Nat. Freq. [Hz]		
		Length	Width	Height	F-B	S-S	V
10,300	11,116	195	89	98	3.1	3.2	6.1

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 2019	ICC-ES AC156	2.28	0	1.50	2.28	0.91	1.52	0.61

Test Mounting Details

UUT-01b was bolted to eight MSSH-1E spring isolators using (8) 5/8" Grade 2 Rod. The spring isolators were bolted to the test fixture beams using (16) 5/8" UNC Grade 8 bolts (4 per isolator). The distance between the first set of isolators was 46" on center length-wise while the remaining distances between the isolators were 53" on center length-wise. The isolators were spaced 86" on center width-wise.



The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems were maintained.

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UNIT UNDER TEST (UUT)
Summary Sheet

UUT-02A
(Neoprene Isolated)

PEER STI 2013-15

Model Line	Model Number	Manufacturer
RTAC Air-Cooled Chillers	RTAC 350 SE 500-T Evaporator	Trane (Ingersoll Rand)

Product Construction Summary

Galvanized carbon steel, mounted on a welded structural carbon steel base

Options / Subcomponent Summary

Control Panels, Compressors, Condenser Coils, Evaporators, Fans, Fan Motors, Input Voltage 200-460VAC

UUT Properties

Measured Weight Without Operating Content [lbs.]	Max Operating Weight [lbs.]	Dimensions [in.]			Lowest Nat. Freq. [Hz]		
		Length	Width	Height	F-B	S-S	V
22,000	25,984	435	89	98	4.9	4.9	8.9

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 2019	ICC-ES AC156	2.28	0	1.50	2.28	0.91	1.52	0.61

Test Mounting Details

UUT-02a was bolted to the test fixture beams through 3/4"- thick VMC Group Shear Flex Elastomeric Neoprene Isolators using (12) 5/8" UNC Grade 8 Bolts. The bolts were spaced 140", 100", 90", and 71" apart on center length-wise, and 86" apart on center width-wise.

The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems were maintained.

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UNIT UNDER TEST (UUT)
Summary Sheet

UUT-02B
(Spring Isolated)

PEER STI 2013-15

Model Line	Model Number	Manufacturer
RTAC Air-Cooled Chillers	RTAC 350 SE 500-T Evaporator	Trane (Ingersoll Rand)

Product Construction Summary

Galvanized carbon steel, mounted on a welded structural carbon steel base

Options / Subcomponent Summary

Control Panels, Compressors, Condenser Coils, Evaporators, Fans, Fan Motors, Input Voltage 200-460VAC

UUT Properties

Measured Weight Without Operating Content [lbs.]	Max Operating Weight [lbs.]	Dimensions [in.]			Lowest Nat. Freq. [Hz]		
		Length	Width	Height	F-B	S-S	V
22,000	25,984	435	89	98	2.8	3.0	4.9

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 2019	ICC-ES AC156	2.28	0	1.50	2.28	0.91	1.52	0.61

Test Mounting Details

UUT-02b was bolted to twelve MSSH-1E spring isolators using (12) 5/8" Grade 2 Rod. The spring isolators were bolted to the test fixture beams using (48) 5/8" UNC Grade 8 bolts (4 per isolator). The bolts were spaced 140", 100", 90", and 71" apart on center length-wise, and 86" apart on center width-wise.

The UUT was operational before and after shaking and was full of operating content during the tests. The structural integrity of the component and attachment system and force-resisting systems was maintained.

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