# APPLICATION FOR HCAI SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

**APPLICATION #: OSP-0823**

## HCAI Special Seismic Certification Preapproval (OSP)

**Type:** [X] New [ ] Renewal

## Manufacturer Information

Manufacturer: Trane

Manufacturer's Technical Representative: Wyatt Martinez

Mailing Address: 101 William White Blvd., Pueblo, CO 81001

Telephone: (719) 585-4374 Email: Wyatt.Martinez@trane.com

## Product Information

Product Name: CGAM

Product Model Number(s): Size 20 Ton to 130 Ton

Product Category: Chillers

Product Sub-Category: Chillers - Air Cooled

General Description: Catalogued chillers from 20-130 Ton

Mounting Description: Base Mounted Neoprene Vibration Isolated -

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: UNIVERSITY OF CALIFORNIA, BERKELEY (PEER)

Contact Person: Amarnath Kasalanati

Mailing Address: 325 Davis Hall, Berkeley CA 94720-1729

Telephone: (510) 642-3437 Email: amarnath1@berkley.edu

Company Name: QUALTECH/CURTISS WRIGHT/TRENTEC

Contact Person: Timothy Geers

Mailing Address: 4600 East Tech Drive, Cincinnati OH 45245

Telephone: (513) 528-7900 Email: nuclear@curtisswright.com

Company Name: UNIVERSITY OF NEVADA, RENO (UNR)

Contact Person: Patrick Laplace

Mailing Address: 1664 N. Virginia Street, Reno NV 89557

Telephone: (775) 784-8080 Email: plaplace@unr.edu

## Seismic Parameters

Design Basis of Equipment or Components ($F_p/W_p$) = 3.33

$S_{DS}$ (Design spectral response acceleration at short period, g) = 1.85

$a_p$ (Amplification factor) = 2.5

$R_p$ (Response modification factor) = 2.5 (Isolated using Neoprene Elements)

$\Omega_0$ (System overstrength factor) = 2.0

$I_p$ (Importance factor) = 1.5

z/h (Height ratio factor) = 1

Natural frequencies (Hz) = See Attachment

Overall dimensions and weight = See Attachment



## HCAI Approval (For Office Use Only) - Approval Expires on 10/29/2030

Date: 10/29/2024

Name: Mohammad Karim Title: Supervisor, Health Facilities

Special Seismic Certification Valid Up to: $S_{DS}$ (g) = 1.85 z/h = 1

Condition of Approval (if applicable):

# Table 1 - Certified Air Cooled Chillers

| Model | Nominal Capacity [ ton ] | Frequency [Hz] | Efficiency | Coil Design Style | Vertical Support Legs Along Chiller Length | Max. Dimensions | | | Max. Operating Weight [ lb ] | Installation Method[1] | UUT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Length [ in ] | Width [ in ] | Height [ in ] | | | |
| CGAM020 | 020 | 60 | XE | Slant config | None | 113.8 | 50.4 | 84.7 | 2208 | Neoprene Pad | Extrapolated |
| CGAM026 | 026 | | | | | 114.0 | 50.6 | 84.7 | 2111 | Spring Isolators | UUT-01 |
| CGAM026 | 026 | | | | | 113.8 | 50.4 | 84.7 | 2278 | Neoprene pad | Interpolated |
| CGAM030 | 030 | | | | 1 | 149.8 | 50.4 | 84.7 | 2880 | | |
| CGAM035 | 035 | | | | | 149.8 | 50.4 | 84.7 | 2920 | | |
| CGAM040 | 040 | | | V config | None | 113.8 | 88.4 | 84.8 | 3697 | | |
| CGAM052 | 052 | | | | | 117.0 | 89.0 | 84.0 | 3520 | Neoprene Pad | UUT-03 |
| CGAM052 | 052 | | | | | 113.8 | 88.4 | 84.8 | 3806 | Neoprene Pad | Interpolated |
| CGAM060 | 060 | | | | 1 | 149.8 | 88.4 | 84.8 | 5033 | | |
| CGAM070 | 070 | | | | | 149.8 | 88.4 | 84.8 | 5121 | | |
| CGAM080 | 080 | | High | W config | 1 | 143.1 | 88.2 | 92.6 | 5692 | | |
| CGAM090 | 090 | | | | | 143.1 | 88.2 | 92.6 | 5961 | | |
| CGAM100 | 100 | | | | | 165.9 | 88.2 | 92.5 | 6759 | | |
| CGAM110 | 110 | | | | | 165.9 | 88.2 | 92.5 | 6845 | | |
| CGAM120 | 120 | | | | | 146.9 | 88.0 | 85.2 | 6500 | Spring Isolators | UUT-02 |
| CGAM120 | 120 | | | | | 165.9 | 88.2 | 92.5 | 6884 | Neoprene Pad | Interpolated |
| CGAM130 | 130 | | | | 2 | 201.9 | 88.2 | 92.5 | 7530 | Neoprene Pad | UUT-04 |

**Notes:**

1) Trane currently only offers units to be installed on neoprene pads. Original test units UUT-1 and UUT-2 were tested on spring isolators.

## Table 2 - Certified Compressors

| Model/Part Number | Size | MFR | Type | Voltage | Weight [ lb ] | UUT |
|---|---|---|---|---|---|---|
| CSHE117 | 10T LC | Trane | Scroll (Refrigerant Type 454B) | 200 to 575 | 141 | Interpolated |
| CSHE152 | 13T LC | Trane | | 200 to 575 | 150 | UUT-3 |
| CSHE177 | 15T LC | Trane | | 200 to 575 | 161 | Interpolated |
| CSHP234 | 20T | Trane | | 200 to 575 | 236 | UUT-4 |
| CSHP297 | 25T | Trane | | 200 to 575 | 337 | UUT-4 |
| CSHP346 | 30T | Trane | | 200 to 575 | 362 | Extrapolated |
| CSH374 | 30T | Trane | Scroll (Refrigerant Type 410A) | 200 to 575 | 360 | UUT-2 |

## Table 3a - Certified Control Panels

| Unit Size | MFR | Dimensions [ mm ] | | | Material | Weight [ lb ] | UUT |
|---|---|---|---|---|---|---|---|
| | | L | W | H | | | |
| 20-35T | Trane | 948 | 213 | 1090 | 2mm Steel enclosure and doors | 274 | UUT-3 |
| 40-70T | Trane | 1905 | 213 | 830 | | 346 | Interpolated |
| 80-130T | Trane | 2254 | 284 | 829 | | 518 | UUT-4 |

## Table 3b - Certified Control Panel Subcomponents

| Model/Part Number | Description | Manufacturer | Input Voltage | Output [ Voltage /Current/Power ] | Weight [ lb ] | UUT |
|---|---|---|---|---|---|---|
| X13651678 | Operator Interface (Main Controller) | Symbio 800 | 24 VDC | N/A | <5 | UUT-3, UUT-4 |
| X13550019 | Transformer | Precision, Inc | 200/230/380/400/ 460/575 VAC | 115/24 VAC 60hz | ~5 | UUT-3, UUT-4 |
| X1305102, X1305110 | Circuit Breaker | ABB | 200/230/380/400 /460/575 VAC | 200/230/380/ 400/460/575 | ~10 | UUT-3, UUT-4 |
| X13651698 | Remote Interface Modules | BacNet, LonTalk, Tracer | 24 VDC | N/A | <5 | UUT-3, UUT-4 |
| X13170817080,120,130 | Fan VFD | Trane/ Danfoss | 200/230/380/400/ 460/575 VAC | 200/230/380/400/ 460/575 VAC | 11 | UUT-3 |
| X13170817150,160 | Fan VFD | Trane/ Danfoss | 200/230/380/400/ 460/575 VAC | 200/230/380/400/ 460/575 VAC | 15 | Inteprolated |
| X13170817170 | Fan VFD | Trane/ Danfoss | 200/230/380/400/ 460/575 VAC | 200/230/380/400/ 460/575 VAC | 51 | UUT-4 |
| X13170817140,180,190 | Fan VFD | Trane/ Danfoss | 200/230/380/400/ 460/575 VAC | 200/230/380/400/ 460/575 VAC | 27 | Inteprolated |
| X1306087, X1306089 | Compressor Contactors | ABB | 200/230/380/400/ 460/575 VAC | 200/230/380/400/ 460/575 VAC | <5 | UUT-3, UUT-4 |

## Table 4 - Certified Evaporators

| Model | MFR | Style | Max # of plates | Tons/ Efficiency | Plate and Connection Material | Max Weight [ lb ] | UUT |
|---|---|---|---|---|---|---|---|
| P80 | Swep | Brazed plate heat exchanger | 96 | 20-130 | Stainless Steel | 46 | UUT-1 |
| DP120 | | | 88 | 26, 30 | | 82 | Inteprolated |
| DP121 | | | 88 | 35 | | 101 | Inteprolated |
| DP400 | | | 206 | 52 | | 132 | UUT-3 |
| | | | 206 | 20-130 | | 321 | Interpolated |
| | | | 206 | 120,130 | | 321 | UUT-4 |

## Table 5a - Certified Fans

| Description | Manufacturer | # of Blades | Blade Material | Weight [ lb ] | UUT |
|---|---|---|---|---|---|
| Skinny IV Fan | King's Eco Plastics | 11 | Plastic | ~10 | UUT-3, UUT-4 |

## Table 5b - Certified Fan Motors

| Model Number | MFR | Input Voltage [ VAC ] | Output Rating [ HP ] | Type | Weight [ lb ] | UUT |
|---|---|---|---|---|---|---|
| P56AE86A05R | Regal Beloit | 400-480VAC | 1.3 | TEAO | 50 | UUT-1, UUT-2 |
| P56AE86A05 | | 200-230 VAC | 1.3 | TEAO | 50 | Interpolated |
| P56AK26A05 | | 575VAC | 1.3 | TEAO | 48 | Interpolated |
| P56AK29AD5 | | 400-480VAC | 1.3 | TEAO | 48 | Interpolated |
| P56AK25A05 | | 400-480VAC | 1.3 | TEAO | 50 | UUT-3, UUT-4 |
| P56AK24AD5 | | 380 VAC | 1.3 | TEAO | 52 | Extrapolated |
| P56AK27AD5 | | 200-230 VAC | 1.3 | TEAO 2 Speed | 55 | Extrapolated |
| P56AK28AD5 | | 400-480VAC | 1.3 | TEAO 2 Speed | 54 | Extrapolated |

## Table 6 - Certified Condenser Coils

| Unit Size | MFR | Coil Dimension [ in ] | | | # of Rows | Weight [ lb ] | UUT |
|---|---|---|---|---|---|---|---|
| | | Length | Depth | Height | | | |
| 20T, 26T | Trane | 91 | 4.5 | 68 | 3 | 288 | Extrapolated |
| 30T, 35T | Trane | 127 | 4.5 | 68 | 3 | 392 | |
| 40T, 52T | Trane | 91 | 4.5 | 68 | 3 | 288 | UUT-3 |
| 60T, 70T | Trane | 127 | 4.5 | 68 | 3 | 392 | Interpolated |
| 80T, 90T | Trane | 121 | 4.5 | 42 | 3 | 297 | |
| 100T,110T,120T | Trane | 144 | 4.5 | 42 | 3 | 346 | |
| 130T | Trane | 180 | 4.5 | 42 | 3 | 423 | UUT-4 |

# UNIT UNDER TEST (UUT)
## Summary Sheet

**UUT-1**

Test Report: PEER–STI/2010-10

| Model Line | Model Number | Manufacturer |
|---|---|---|
| CGAM | 26 | Trane |

**Product Construction Summary**

Carbon Steel Base Frame, Carbon Steel Panels

**Options / Subcomponent Summary**

Compressor: Trane ; Control Panel: Trane ; Evaporator: Swep ; Fan: King's Eco Plastics ; Fan Motor: Regal Beloit ; Coil: Trane

**UUT Properties**

| Weight [ lbs ] | Dimensions [ in ] | | | Lowest Nat. Freq. [ Hz ] | | |
|---|---|---|---|---|---|---|
| | Length | Width | Height | F-B | S-S | V |
| 2,111 | 114.0 | 50.6 | 84.7 | 2.2 | 1.7 | 3.8 |

**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 | 1.85 | 1.0 | 1.5 | 2.96 | 2.22 | 1.23 | 0.49 |

**Test Mounting Details**

UUT-1 base mounted to (4) VMC MSSH-1E Spring Vibration Isolators. Isolators bolted to shake table using (16) 5/8" Dia. Grade 8 Bolts.

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: Trentec Q9019.0; UUT-1

| Model Line | Model Number | Manufacturer |
|---|---|---|
| CGAM | 120 | Trane |

**Product Construction Summary**

Carbon Steel Base Frame, Carbon Steel Panels

**Options / Subcomponent Summary**

Compressor: Trane ; Control Panel: Trane ; Evaporator: Swep ; Fan: King's Eco Plastics ; Fan Motor: Regal Beloit ; Coil: Trane

**UUT Properties**

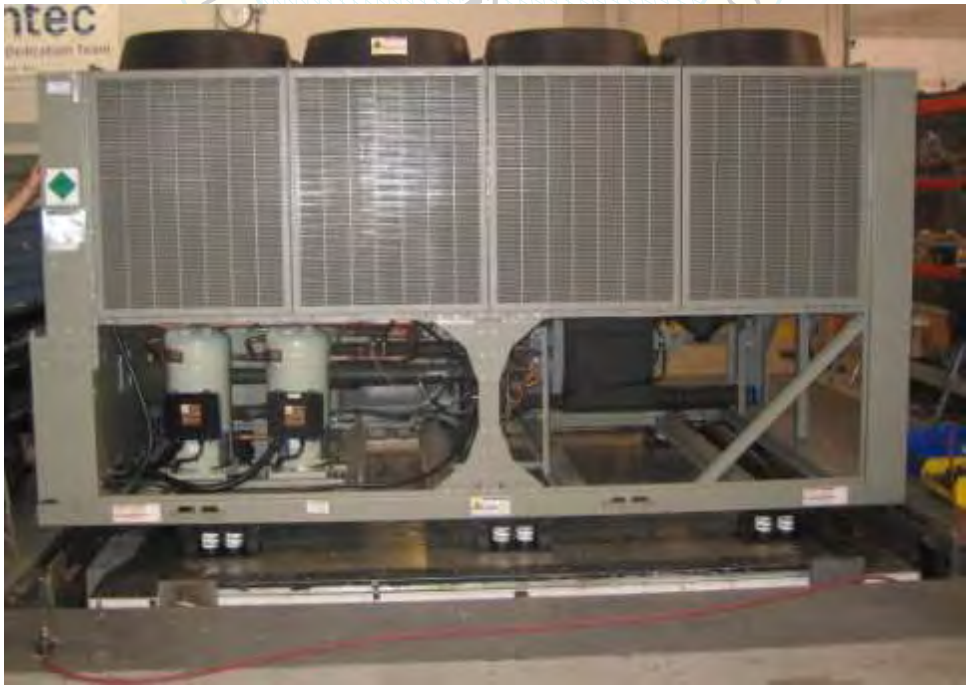
| Weight [ lbs ] | Dimensions [ in ] | | | Lowest Nat. Freq. [ Hz ] | | |
|---|---|---|---|---|---|---|
| | Length | Width | Height | F-B | S-S | V |
| 6,500 | 146.9 | 88.0 | 85.2 | 2.4 | 1.3 | 4.7 |

**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 | 1.85 | 1.0 | 1.5 | 2.96 | 2.22 | 1.23 | 0.49 |

**Test Mounting Details**

UUT-2 base mounted to (6) VMC M2SS-1E Spring Vibration Isolators. Isolators bolted to shake table using (24) 5/8" Dia. Grade 5 bolts.



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: DCL-24408-2401-AC156-Rev0

| Model Line | Model Number | Manufacturer |
|---|---|---|
| CGAM | 52 | Trane |

**Product Construction Summary**

Carbon Steel Base Frame, Carbon Steel Panels

**Options / Subcomponent Summary**

Compressor: Trane ; Control Panel: Trane ; Evaporator: Swep ; Fan: King's Eco Plastics ; Fan Motor: Regal Beloit ; Coil: Trane

**UUT Properties**

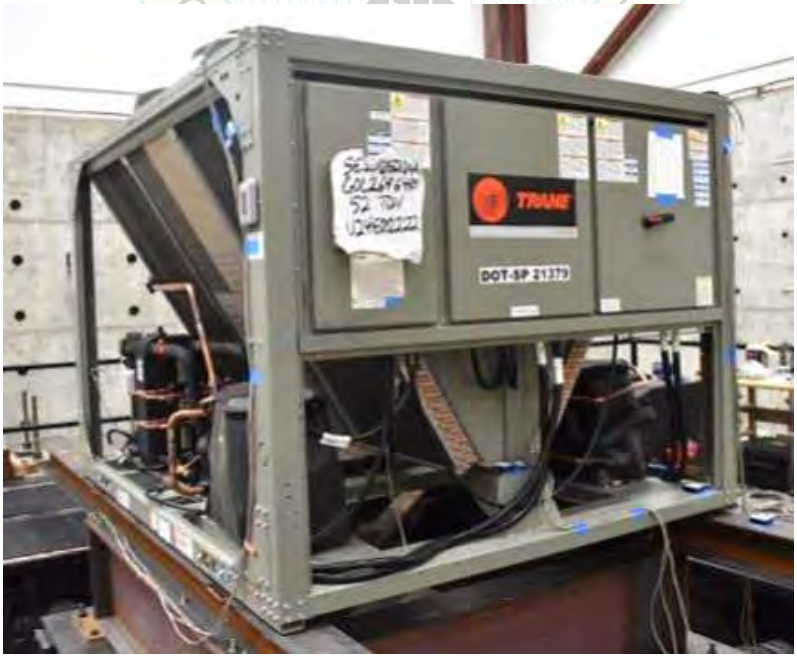
| Weight [ lbs ] | Dimensions [ in ] | | | Lowest Nat. Freq. [ Hz ] | | |
|---|---|---|---|---|---|---|
| | Length | Width | Height | F-B | S-S | V |
| 3,520 | 117.0 | 89.0 | 84.0 | 6.5 | 6.0 | 13.5 |

**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 | 1.85 | 1.0 | 1.5 | 2.96 | 2.22 | 1.23 | 0.49 |

**Test Mounting Details**

UUT-3 was base mounted to the shake table using (4) 5/8" Dia. Grade 8 Bolts and (4) VMC Shear-Flex red 0.6" thick isolator pads.




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: DCL-24408-2401-AC156-Rev0

| Model Line | Model Number | Manufacturer |
|---|---|---|
| CGAM | 130 | Trane |

**Product Construction Summary**

Carbon Steel Base Frame, Carbon Steel Panels

**Options / Subcomponent Summary**

Compressor: Trane ; Control Panel: Trane ; Evaporator: Swep ; Fan: King's Eco Plastics ; Fan Motor: Regal Beloit ; Coil: Trane

**UUT Properties**

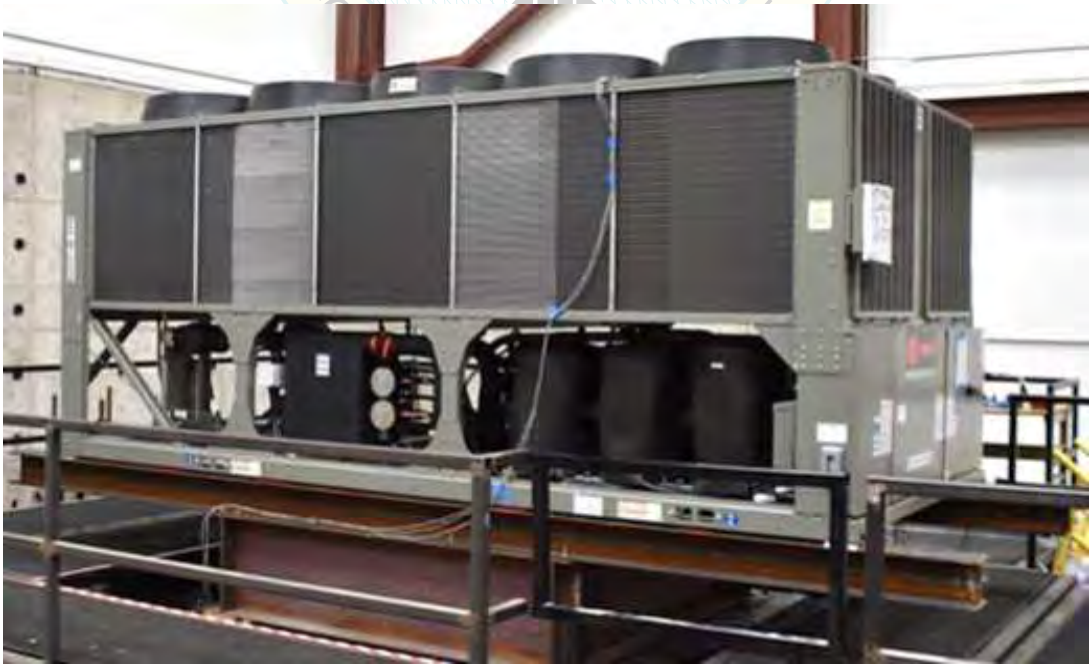
| Weight [ lbs ] | Dimensions [ in ] | | | Lowest Nat. Freq. [ Hz ] | | |
|---|---|---|---|---|---|---|
| | Length | Width | Height | F-B | S-S | V |
| 7,530 | 203.0 | 89.0 | 92.0 | 4.5 | 4.0 | 10.0 |

**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 | 1.85 | 1.0 | 1.5 | 2.96 | 2.22 | 1.23 | 0.49 |

**Test Mounting Details**

UUT-4 base mounted using (8) 5/8" Dia. Grade 8 Bolts and (8) VMC Shear-Flex red 0.6" thick isolator pads.



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