



DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION
OFFICE OF STATEWIDE HOSPITAL PLANNING AND DEVELOPMENT

APPLICATION FOR HCAI SPECIAL SEISMIC
CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0852

HCAI Special Seismic Certification Preapproval (OSP)

Type: ☒ New ☐ Renewal

Manufacturer Information

Manufacturer: CaptiveAire

Manufacturer's Technical Representative: Christian Galindo

Mailing Address: 1185 Enterprise Road, East Petersburg, PA 17520

Telephone: (717) 327-8091

Email: christian.galindo@captiveaire.com

Product Information

Product Name: CAS-series

Product Model Number(s): CAS-series

Product Category: Air Handling Units

Product Sub-Category: Air Conditioning Units - Packaged

General Description: Roof Top HVAC Units with and without Energy Recovery Modules.

Mounting Description: Rigid Base Mounted, Rigid Roof Curb Mounted

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



**DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION
OFFICE OF STATEWIDE HOSPITAL PLANNING AND DEVELOPMENT**

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: CLARK TESTING LABORATORY, INC.

Contact Person: Scott Jamison

Mailing Address: 1801 Route 51, Jefferson Hills PA 15025

Telephone: (412) 387-1001 Email: sjamison@clarktesting.com

BY: Mohammad Karim

DATE: 07/17/2025



DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION
OFFICE OF STATEWIDE HOSPITAL PLANNING AND DEVELOPMENT

Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) = 4.50 at SDS = 2.0g @ z/h = 1; 1.88 at SDS = 2.5g @ z/h=0

SDS (Design spectral response acceleration at short period, g) = 2.0 @ z/h = 1.0; 2.5 @ z/h=0

a_p (Amplification factor) = 2.5

R_p (Response modification factor) = 2.0 (Internally Isolated Sub-Components)

Ω_0 (System overstrength factor) = See Attachment

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 07/17/2031

Date: 7/17/2025

Name: Mohammad Karim

Title: Supervisor, Health Facilities

Special Seismic Certification Valid Up to: SDS (g) = 2.0

z/h = 1

Condition of Approval (if applicable):

BY: Mohammad Karim

DATE: 07/17/2025

Table 1a - Certified Product Table, DX Packaged

Model	Max Rating [Tons]	Standard Package Dimensions				Installation Method ¹	UUT	Specific Model Number
		Length [in]	Width [in]	Height [in]	Weight [lbs]			
CASRTU1 (Depopulated)	3	77.3	63.3	47.5	1,100	Rigid Base Mount and Roof Curb Mounted	Extrapolated	CAS-HVAC1-X.XXXX-XXXX-XXT
	4	77.3	63.3	47.5	1,100			CAS-HVAC1-X.XXXX-XXXX-XXT
	5	77.3	63.3	47.5	1,100			CAS-HVAC1-X.XXXX-XXXX-XXT
	6	77.3	63.3	47.5	1,100			CAS-HVAC1-X.XXXX-XXXX-XXT
	7.5	77.3	63.3	47.5	1,100			CAS-HVAC1-X.XXXX-XXXX-XXT
	10	77.3	63.3	47.5	1,200			CAS-HVAC1-X.XXXX-XXXX-XXT
CASRTU1 w/ ERV	3	123.5	63.3	47.5	1,400			CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	4	123.5	63.3	47.5	1,400			CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	5	123.5	63.3	47.5	1,400			CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	6	123.5	63.3	47.5	1,400			CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	7.5	123.5	63.3	47.5	1,621			CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	7.5	117.0	68.0	48.0	1,604	Rigid Base Mount	UUT-3	CAS-HVAC1-E.402-18MF-5T-ERV
	10	123.5	63.3	47.5	1,710	Rigid Base Mount and Roof Curb Mounted	Interpolated	CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
CASRTU2 (Depopulated)	8	81.8	80.8	61.0	1,650			CAS-HVAC2-X.XXXX-XXXX-XXT
	10	81.8	80.8	61.0	1,650			CAS-HVAC2-X.XXXX-XXXX-XXT
	13	81.8	80.8	61.0	1,650			CAS-HVAC2-X.XXXX-XXXX-XXT
CASRTU2 w/ ERV	8	133.5	80.8	61.0	2,400			CAS-HVAC2-X.XXXX-XXXX-XXT-XXX
	10	133.5	80.8	61.0	2,400			CAS-HVAC2-X.XXXX-XXXX-XXT-XXX
	13	133.5	80.8	61.0	2,400			CAS-HVAC2-X.XXXX-XXXX-XXT-XXX
CASRTU3 (Depopulated)	12.5	99.0	89.8	68.8	2,400			CAS-HVAC3-X.XXXX-XXXX-XXT
	15	99.0	89.8	68.8	2,400			CAS-HVAC3-X.XXXX-XXXX-XXT
	17.5	99.0	89.8	68.8	2,400			CAS-HVAC3-X.XXXX-XXXX-XXT
	20	99.0	89.8	68.8	2,400			CAS-HVAC3-X.XXXX-XXXX-XXT
	25	99.0	89.8	68.8	2,400			CAS-HVAC3-X.XXXX-XXXX-XXT
	30	99.0	89.8	68.8	2,400			CAS-HVAC3-X.XXXX-XXXX-XXT
								CAS-HVAC3-X.XXXX-XXXX-XXT
CASRTU3 w/ ERV	12.5	156.3	89.8	68.8	3,400			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	15	156.3	89.8	68.8	3,400			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	17.5	156.3	89.8	68.8	3,400			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	20	156.3	89.8	68.8	3,400			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	25	156.3	89.8	68.8	3,400			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	30	156.3	89.8	68.8	3,400			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
								CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
CASRTU4 (Depopulated)	22.5	172.8	89.8	83.4	5,200			CAS-HVAC4-X.XXXX-XXXX-XXT-X
	25	172.8	89.8	83.4	5,200			CAS-HVAC4-X.XXXX-XXXX-XXT-X
	30	172.8	89.8	83.4	5,200			CAS-HVAC4-X.XXXX-XXXX-XXT-X
	40	172.8	89.8	83.4	6,070			CAS-HVAC4-X.XXXX-XXXX-XXT-X
	50	172.8	89.8	83.4	6,070			CAS-HVAC4-X.XXXX-XXXX-XXT-X
	60	172.8	89.8	83.4	6,070			CAS-HVAC4-X.XXXX-XXXX-XXT-X
								CAS-HVAC4-X.XXXX-XXXX-XXT-X
CASRTU4 w/ ERV	22.5	277.5	89.8	83.4	7,900			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	25	277.5	89.8	83.4	7,900			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	30	277.5	89.8	83.4	7,900			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	40	277.5	89.8	83.4	8,770			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	50	277.5	89.8	83.4	8,770			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	60	277.5	89.8	83.4	9,267			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
								CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	60	218.5	86.8	102.4	9,700 (unit), 378 (curb) 10,078 (total)	Roof Curb Mounted	UUT-1 ⁽²⁾	CAS-HVAC4-E.1502-36MF-60T-2- HCERV

General Notes: All weights and heights listed without curb, unless otherwise noted.

Footnotes: 1) Maximum tested and permitted curb height is 24".
2) Measured UUT length is for base rail only, height includes curb.

Table 1b - Certified Product Table, Hydronic

Model	Max Rating [Tons]	Standard Package Dimensions				Installation Method ¹	UUT	Specific Model Number
		Length [in]	Width [in]	Height [in]	Weight [lbs]			
CASRTU1	5	77.3	63.3	47.5	750	Rigid Base Mount and Roof Curb	Extrapolated	CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	6	77.3	63.3	47.5	750			CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	7.5	77.3	63.3	47.5	821			CAS-HVAC1-X.XXXX-XXXX-XXT-XXX
	7.5	77.0	47.0	46.0	884	Rigid Base Mount	UUT-4	CAS-HVAC1-16Z
CASRTU2	8	81.8	80.8	61.0	1190	Rigid Base Mount and Roof Curb Mounted	Interpolated	CAS-HVAC2-X.XXXX-XXXX-XXT-XXX
	10	81.8	80.8	61.0	1190			CAS-HVAC2-X.XXXX-XXXX-XXT-XXX
CASRTU3	12.5	99.0	89.8	68.8	1840			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	15	99.0	89.8	68.8	1840			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	20	99.0	89.8	68.8	1840			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
	30	99.0	89.8	68.8	1840			CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
								CAS-HVAC3-X.XXXX-XXXX-XXT-XXX
CASRTU4	22.5	120.0	89.8	73.8	3520			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	25	120.0	89.8	73.8	3520			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	30	120.0	89.8	73.8	3520			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	40	120.0	89.8	73.8	3520			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	50	120.0	89.8	73.8	3520			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	60	120.0	89.8	73.8	3333			CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
								CAS-HVAC4-X.XXXX-XXXX-XXT-X-XXXXXX
	60	118.0	87.0	72.0	3,190 (unit), 320 (curb) 3,510 (total)	Roof Curb Mounted	UUT-2	CAS-HVAC4-28Z

General Notes: All weights and heights listed without curb, unless otherwise noted.

Footnotes: 1) Maximum tested and permitted curb height is 24".

Table 2 - Air Blowers

Manufacturer	Size	Voltage (Phase)	Model	Diameter (in)	Width (in)	Blades	Weight (lbs)	Material	UUT
Ziehl Abegg	16Z	277 (1)	162772/A01-ECM-60-277-16	16	5.7	7	49	Aluminum	Extrapolated
		240 (3)	162773/A01-ECM-60-240-16	16	5.7	7	55	Aluminum	UUT-4
		480 (3)	162774/A01-ECM-60-480-16	16	5.7	7	49	Aluminum	Interpolated
	18Z	277 (1)	162775/A01-ECM-60-277-18	18	6.4	7	53	Aluminum	Interpolated
		240 (3)	162778/A01-ECM-60-240-18	18	6.7	7	75	Aluminum	Interpolated
		480 (3)	162779/A01-ECM-60-480-18	18	6.7	7	75	Aluminum	Interpolated
	22Z	240 (3)	163902/A01-ECM-60-240-22	22	8.5	7	102	Aluminum	Interpolated
		480 (3)	163903/A01-ECM-60-480-22	22	8.5	7	102	Aluminum	Interpolated
	25Z	240 (3)	163904/A01-ECM-60-240-25	25	9.4	7	119	Aluminum	Interpolated
		480 (3)	163905/A01-ECM-60-480-25	25	9.4	7	119	Aluminum	Interpolated
CaptiveAire	28Z	240 (3)	114112/A01-ECM-60-240-28	28	10.5	7	163	Aluminum	Interpolated
		480 (3)	114110/A01-ECM-60-480-28	28	10.5	7	163	Aluminum	UUT-2
	11	See Table 3 for Motors	F8010011USBIDD58	11	6.3	8	7	Aluminum	Interpolated
	13		F8010013USBIDD58	13	6.8	9	8	Aluminum	Interpolated
	15		F8010015USBIDD58	15	7.6	9	10	Aluminum	Interpolated
	18		F8010018USBIDD58	18	8.6	10	15	Aluminum	Interpolated
	18MF		F8010018P1-B-MF	18	8.7	10	22	Aluminum	UUT-3
	20		F8010020USBIDD58	20	9.2	10	17	Aluminum	Interpolated
	24		F8010024DUDR	24	10.1	10	23	Aluminum	Interpolated
	20MF		F8010020P1-T	20	9.8	9	18	Aluminum	Interpolated
	24MF		F8010024P1-T-MF	24	10.1	10	29	Aluminum	Interpolated
	30		F8010030DUDR	30	11.9	12	33	Aluminum	Interpolated
	30MF		F8010030Q1-T-MF	30	11.9	12	63	Aluminum	Interpolated
	36MF		F8010036Q1-T-MF	36	15.2	10	82	Aluminum	UUT-1

Table 3 - Air Blower Motors

Type	Phase	Rating [HP]	Voltage Rating	Tested Voltage	Weight [lb]	Manufacturer	UUT
Variable Speed Motor	3 Phase	1	208~480	N/A	34	Teco	Extrapolated
		1.5	208~480		42		Extrapolated
		2	208~480	208	39		UUT-3
		3	208~480	N/A	66		Interpolated
		5	208~480		55		Interpolated
		1.5	208~480		42		Interpolated
		2	208~480		39		Interpolated
		3	208~480		66		Interpolated
		5	208~480		55		Interpolated
		7.5	208~480		116		Interpolated
		10	208~480		214		Interpolated
		15	208~480		337		Interpolated
		20	208~480	208	383		UUT-1
ECM	1 Phase	1.75	208~277	N/A	49	Ziehl Abegg	Interpolated
		1.7	208~277		53		Interpolated
	3 Phase	2.5	208~240	208	55		UUT-4
		3.4	460~480	N/A	49		Interpolated
		4.7	208~240/460~480		163		Interpolated
		4.8	208~240/460~480		101		Interpolated
		5	208~240/460~480	480	163		UUT-2

Table 4a - DX Coils: Dimensions

Configuration & Manufacturer	Size	Part Number (Type)	Depth	Width (in)	Height (in)	Weight (lbs)	UUT
DX (SRC) DX w/ Heat Pump (SRC)	3/4/5 Ton	VA1028215 (Evap)	4 rows	29	29	71	UUT-3
		VA1028218 (Cond)	2 rows	70	28	75	UUT-3
		VA1028225 (Reheat)	1 row	29	29	18.2	UUT-3
	6 Ton	VA1028253 (Evap)	4 rows	29	31	70	Interpolated
		VA1028258 (Cond)	3 rows	70	31	101	Interpolated
		VA1028255 (Reheat)	1 row	29	31	28	Interpolated
	7.5 Ton	VA1028242 (Evap)	5 rows	29	31	80	Interpolated
		VA1028258 (Cond)	3 rows	70	31	101	Interpolated
		VA1028255 (Reheat)	1 row	29	31	28	Interpolated
	10 Ton	VA1042994 (Evap)	6 rows	29	31	89	Interpolated
		VA1042040 (Cond)	4 rows	70	31	127	Interpolated
		VA1041035 (Reheat)	1 row	29	31	35	Interpolated
DX (SRC) DX w/ Heat Pump (SRC)	8 Ton	VA1028096 (Evap)	5 rows	35	30	98	Interpolated
		VA1028112 (Cond)	3 rows	74	43	146	Interpolated
		VA1028095 (Reheat)	1 row	35	30	31	Interpolated
	10 Ton	VA1028183 (Evap)	5 rows	35	30	114	Interpolated
		VA1028112 (Cond)	3 rows	74	43	146	Interpolated
		VA1028095 (Reheat)	1 row	35	30	31	Interpolated
	13 Ton	VA1042935 (Evap)	7 rows	33.5	31	95	Interpolated
		VA1042041 (Cond)	5 rows	73	43	142	Interpolated
		VA1042067 (Reheat)	2 rows	33.5	31	41	Interpolated
DX (SRC) DX w/ Heat Pump (SRC)	12.5 Ton	VA1028189 (Evap)	6 rows	44	39	145	Interpolated
		VA1028213 (Cond)	2 rows	91	50	144	Interpolated
		VA1026991 (Reheat)	1 row	44	39	44	Interpolated
	15 Ton	VA1026993 (Evap)	6 rows	44	39	161	Interpolated
		VA1026992 (Cond)	3 rows	91	50	228	Interpolated
		VA1026991 (Reheat)	1 row	44	39	44	Interpolated
	17.5/20 Ton	VA1028098 (Evap)	7 rows	44	39	213	Interpolated
		VA1028094 (Cond)	3 rows	91	50	202	Interpolated
		VA1028087 (Reheat)	1 row	44	39	42	Interpolated
	25/30 Ton	VA1036002 (Evap)	7 rows	44	42	250	Interpolated
		VA1037219 (Cond)	2 rows	44	41.25	241	Interpolated
		VA1037218 (Reheat)	6 row	88.5	49.5	95	Interpolated
DX (SRC) DX w/ Heat Pump (SRC)	22 Ton	VA1039853 (Evap)	4 rows	73	50	328	Interpolated
		VA1028185 (Cond)	3 rows	78	68	289	Interpolated
		VA1039874 (Reheat)	1 row	70	50	87	Interpolated
	25 Ton	VA1039853 (Evap)	4 rows	73	50	328	Interpolated
		VA1028185 (Cond)	3 rows	78	68	289	Interpolated
		VA1039874 (Reheat)	1 row	70	50	87	Interpolated
	30 Ton	VA1039853 (Evap)	4 rows	73	50	328	Interpolated
		VA1028185 (Cond)	3 rows	78	68	289	Interpolated
		VA1039874 (Reheat)	1 row	70	50	87	Interpolated
	40 Ton	VA1039943 (Evap)	4 rows	73.5	55	387	Interpolated
		VA1034672 (Cond)	6 rows	78	78	357	Interpolated
		VA1037054 (Reheat)	2 rows	71	55	284	Interpolated
	50 Ton	VA1037052 (Evap)	8 rows	73.5	55	640	Interpolated
		VA1037053 (Cond)	10 rows	78	78	535	Interpolated
		VA1037054 (Reheat)	2 rows	71	55	284	Interpolated
	60 Ton	VA1037052 (Evap)	8 rows	73.5	55	640	UUT-1
		VA1037053 (Cond)	10 rows	78	78	535	UUT-1
		VA1037054 (Reheat)	2 rows	71	55	284	UUT-1

Table 4b - DX Coils: Construction

Parameter	Value	UUT
Casing Material	16 Gauge Galv Steel	UUT-3
	14 Gauge Galv Steel	UUT-1
Tube Material	Copper	UUT-1 & UUT-3
Tube Outer Diameter	0.197	UUT-1
	0.313	UUT-3
	0.375	UUT-3
	0.5	UUT-1
Tube Wall Thickness	0.010	UUT-1
	0.014	UUT-3
	0.015	UUT-3
	0.016	UUT-1
	0.019	UUT-1
	0.020	UUT-1
Permitted Fin	Aluminum	UUT-1 & UUT-3
Permitted Fin Pitch	7	UUT-1
	9	Interpolated
	10	Interpolated
	11	Interpolated
	12	UUT-1
	13	UUT-3
	14	Interpolated
	15	Interpolated
	16	UUT-1
Permitted Tube Rows	17	UUT-3
	1	UUT-3
	2	UUT-1
	3	UUT-3
	4	Interpolated
	5	UUT-3
	6	Interpolated
	7	Interpolated
	8	UUT-1
Header Type	10	UUT-1
	Copper	UUT-1 & UUT-3

Table 5 - Hydronic Cooling Coils: Dimensions

Manufacturer	Size	Part Number (Type)	Depth	Width (in)	Height (in)	Weight (lbs)	Materials	UUT
Modine	7.5 Ton	30x28 - 4R - 0.5/156	4 rows	28	30	85	Copper Tube, Aluminum Fin	UUT-4
	10 Ton	30x34 - 4R - 0.5/144	4 rows	34	30	96		Interpolated
	20 Ton	37.5x43 - 5R - 0.5/132	5 rows	43	37.5	187		Interpolated
	60 Ton	55x73 - 5R - 0.5/132	5 rows	73	55	445		UUT-2

Table 6 - Hydronic Heating Coils: Dimensions

Manufacturer	Part Number (Type)	Depth	Width (in)	Height (in)	Weight (lbs)	Materials	UUT
Modine	25x19.5 - 2R - 0.5/120	2 rows	19.5	25	41	Copper Tube, Aluminum Fin	UUT-4
	35x20.5 - 2R - 0.5/144	2 rows	20.5	35	54		Interpolated
	45x27.5 - 2R - 0.5/132	2 rows	27.5	45	77		Interpolated
	42x44.5 - 2R - 0.625/108	2 rows	44.5	42	118		UUT-2

Table 7 - Hydronic Coils: Construction

Parameter	Value	UUT
Casing Material	16 Gauge Galv Steel	UUT-4
	14 Gauge Galv Steel	UUT-2
Tube Material	Copper	UUT-2 & UUT-4
Tube Outer Diameter	0.375	Extrapolated
	0.5	UUT-2 & UUT-4
	0.625	UUT-4
Tube Wall Thickness	0.014	Extrapolated
	0.015	Extrapolated
	0.019	Interpolated
	0.020	UUT-4
Permitted Fin Material	Aluminum	UUT-2 & UUT-4
Permitted Fin Pitch	9	UUT-4
	10	Interpolated
	11	UUT-2
	13	UUT-4
	14	Extrapolated
	15	Extrapolated
Permitted Tube Rows	2	UUT-2 & UUT-4
	4	UUT-4
	5	Interpolated
	6	UUT-2
Header Type	Copper	UUT-2 & UUT-4

Notes: The greatest fin pitch is not used on the largest coils, the largest coil is being tested and has a fan pitch of 11.

Table 8 - DX Compressors

Manufacturer	Part Number	Depth (in)	Width (in)	Height (in)	Weight (lbs)	Rating (Btu/h)	Voltage	UUT
Danfoss	VZH028	9.5	9.5	16	66	50,000	240/480/600	UUT-3
	VZH035	9.5	9.5	16	66	63,000		Interpolated
	VZH044	9.5	9.5	16	66	81,000		Interpolated
	VZH052	9.5	9.5	17.9	83.8	94,000		Interpolated
	VZH065	9.5	9.5	17.9	83.8	116,000		Interpolated
	VZH088	9.1	9.1	19.1	150	157,000		Interpolated
	VZH117	9.1	9.1	21.3	168	211,000		Interpolated
	VZH170	13.6	14.6	27	247	320,000		UUT-1

Table 9 - Electric Heaters

Manufacturer & Phase	Size	Depth (in)	Width (in)	Height (in)	Weight (lbs)	Material & Stages	UUT
1P Elec (Neptronic)	10 kW 208/277V Size 1	8.5	22.08	18.38	85	NiCr 60 Coil, 1 Stage	Extrapolated
	15 kW 208/277V Size 1	8.5	22.08	18.38	85	NiCr 60 Coil, 1 Stage	Extrapolated
	20 kW 208/277V Size 1	8.5	22.08	18.38	95	NiCr 60 Coil, 1 Stage	Extrapolated
	10 kW 208/277V Size 2/3	8.5	22.08	18.38	85	NiCr 60 Coil, 1 Stage	Extrapolated
	15 kW 208/277V Size 2/3	4	26	22	85	NiCr 60 Coil, 1 Stage	Extrapolated
	30 kW 208/277V Size 2/3	5	26	22	95	NiCr 60 Coil, 2 Stages	Extrapolated
	15 kW 208/277V Size 2/3	4	26	22	85	NiCr 60 Coil, 1 Stage	Extrapolated
	30 kW 208/277V Size 2/3	5	26	22	95	NiCr 60 Coil, 2 Stages	Extrapolated
3P Elec (Neptronic)	10 kW 240/480/600V Size 1	8.5	22.08	18.38	85	NiCr 60 Coil, 1 Stage	Extrapolated
	15 kW 240/480/600V Size 1	8.5	22.08	18.38	85	NiCr 60 Coil, 1 Stage	Extrapolated
	30 kW 240/480/600V Size 1	8.5	22.08	18.38	95	NiCr 60 Coil, 2 Stages	Extrapolated
	40 kW 240/480/600V Size 1	8.5	22.08	18.38	100	NiCr 60 Coil, 2 Stages	UUT-3
	45 kW 240/480/600V Size 1	8.5	22.08	18.38	95	NiCr 60 Coil, 2 Stages	Interpolated
	60 kW 240/480/600V Size 1	8.5	27.56	18.38	100	NiCr 60 Coil, 4 Stages	Interpolated
	15 kW 240/480/600V Size 2/3	4	26	22	85	NiCr 60 Coil, 1 Stage	Interpolated
	30 kW 240/480/600V Size 2/3	5	26	22	95	NiCr 60 Coil, 2 Stages	Interpolated
	38 kW 240V Size 2/3	5	26	22	110	NiCr 60 Coil, 2 Stages	Interpolated
	45 kW 240/480/600V Size 2/3	6	26	22	100	NiCr 60 Coil, 2 Stages	Interpolated
	60 kW 240/480/600V Size 2/3	9	26	22	110	NiCr 60 Coil, 2 Stages	Interpolated
	15 kW 240/480/600V Size 2/3	4	26	22	85	NiCr 60 Coil, 1 Stage	Interpolated
	30 kW 240/480/600V Size 2/3	5	26	22	95	NiCr 60 Coil, 2 Stages	Interpolated
	45 kW 240/480/600V Size 2/3	6	26	22	100	NiCr 60 Coil, 2 Stages	Interpolated
	60 kW 240/480/600V Size 2/3	9	26	22	110	NiCr 60 Coil, 2 Stages	Interpolated
	90 kW 240/480/600V Size 2/3	7	26	40	140	NiCr 60 Coil, 3/5 Stages	Interpolated
	100 kW 240/480/600V Size 2/3	10	26	40	145	NiCr 60 Coil, 3/5 Stages	Interpolated
	30 kW 240/480/600V Size 4	7	51.5	42.63	200	NiCr 60 Coil, 2 Stages	Interpolated
	45 kW 240/480/600V Size 4	7	51.5	42.63	200	NiCr 60 Coil, 2 Stages	Interpolated
	60 kW 240/480/600V Size 4	7	51.5	42.63	200	NiCr 60 Coil, 4 Stages	Interpolated
	90 kW 240/480/600V Size 4	9	51.5	42.63	215	NiCr 60 Coil, 2/4/5 Stages	Interpolated
	120 kW 240/480/600V Size 4	10	51.5	42.63	220	NiCr 60 Coil, 3/4 Stages	Interpolated
	150 kW 240/480/600V Size 4	12	51.5	42.63	250	NiCr 60 Coil, 4/6 Stages	Interpolated
	180 kW 480/600V Size 4	12	51.5	42.63	250	NiCr 60 Coil, 5/6 Stages	Interpolated
	210 kW 480/600V Size 4	12	51.5	42.63	250	NiCr 60 Coil, 6/7 Stages	Interpolated
	240 kW 480/600V Size 4	12	51.5	42.63	250	NiCr 60 Coil, 6/7 Stages	UUT-1

Table 10 - Energy Recovery Wheels

Manufacturer	Model Number	Depth (in)	Width (in)	Height (in)	Weight (lbs)	Material	UUT
AirXchange	ERC-3019C	5.61	34.00	34.00	61	Galv Steel Casing, Polymer Wheel	UUT-3
	ERC-3628C	6.98	39.82	39.82	118		Interpolated
	ERC-4136C	7.52	44.00	44.00	170		Interpolated
	ERC-5262C	7.62	56.19	56.19	220		Interpolated
	ERC-74122C	11.17	78.00	78.00	454		UUT-1

Table 11 - Integrated Fans & Motors for DX Condenser Coils

Manufacturer	Voltage & Phase	Model	Blades	Width (in)	Weight (lbs)	Material	Diameter (in)	UUT
Ziehl Abegg	1ph 200-277V	161748/ZN050-ZIH.DC.V7P2	7	8.3	29	Composite	20	Extrapolated
	3ph 200-240V (208V Tested)	161734/ZN050-ZIH.DC.V7P2	7	8.3	29	Composite	20	UUT-3
	3ph 380-480V	161720/ZN050-ZIH.DC.V7P2	7	8.3	29	Composite	20	Interpolated
	3ph 200-240V	163340/ZN063-ZIL.DG.V7P2	7	9.5	44	Composite	25	Interpolated
	3ph 380-480V (480V Tested)	163322/ZN063-ZIL.DG.V7P2	7	9.5	44	Composite	25	UUT-1
	3ph 200-240V (208V Tested)	164338/ZN063-ZIL.GL.V7P3	7	9.5	81	Aluminum	25	
	3ph 380-480V (480V Tested)	164320/ZN063-ZIL.GL.V7P3	7	9.5	81	Aluminum	25	

Table 12 - VFDs for DX Compressors

Manufacturer	Voltage	Part Number	Depth (in)	Width (in)	Height (in)	Weight (lbs)	UUT
Danfoss	VZH028 230V	134N4260	9.5	5.3	14.1	17.5	Extrapolated
	VZH028 480V	134N4262	8.1	3.9	12.9	9.9	UUT-3
	VZH035 230V	134N4261	9.5	5.3	14.1	17.5	Interpolated
	VZH035 480V	134N4263	8.1	3.9	12.9	9.9	Interpolated
	VZH044 230V	134L9470	10	5.9	15.8	20.9	Interpolated
	VZH044 480V	134L9473	9.5	5.3	14.1	17.5	Interpolated
	VZH052 230V	135X3360	9.5	9.1	23.4	50.7	Interpolated
	VZH052 480V	135X3298	9.8	6.5	16.5	26.5	Interpolated
	VZH065 230V	135X3360	9.5	9.1	23.4	50.7	Interpolated
	VZH065 480V	135X1998	9.8	6.5	16.5	26.5	Interpolated
	VZH088 230V	134F9361	9.5	9.1	23.4	51	Interpolated
	VZH088 480V	134F9366	9.8	6.5	16.5	26	Interpolated
	VZH117 230V	134F9363	13.2	12.1	24.8	110	Interpolated
	VZH117 480V	134F9368	9.5	9.1	23.4	51	Interpolated
	VZH170 230V	134F9365	13.2	12.1	24.8	110	UUT-1
	VZH170 480V	134F9371	9.5	9.1	23.4	51	UUT-1

Table 13 - Air Filters

Flat Filter Rack	Manufacturer	Frame Material	Filter Qty (1)	Nominal Filter Size [in]		Maximum Frame Size [in]			Max Weight [lb]	UUT
				Height	Width	Height	Width	Length		
Size 1	CaptiveAire	Galvanized Steel	4	16	16	16.5	32.5	4	5	UUT-3 & UUT-4
Size 1 ERV			2	16	20	16.5	40.5	4	3	UUT-3
Size 2			4	16	20	16.5	40.5	4	5	Interpolated
Size 2 ERV			2	20	20	20.5	40.5	4	3	Interpolated
Size 3			4	20	25	20.5	50.5	4	5	Interpolated
Size 3 ERV			4	16	25	16.5	50.5	4	5	Interpolated
Size 4			12	20	20	20.5	40.5	4	15	UUT-1 & UUT-2
Size 4 ERV			8	16	20	16.5	40.5	4	8	UUT-1

Notes: Filter Quantity is doubled for 2" MERV 8 and 2" MERV 13 combination filter rack.

Angle Filter Rack	Manufacturer	Frame Material	Filter Qty	Nominal Filter Size [in]		Maximum Frame Size [in]			Max Weight [lb]	UUT
				Height	Width	Height	Width	Length		
Size 1 ERV	CaptiveAire	Galvanized Steel	4	16	16	16.5	32.5	2	5	UUT-3
Size 2 ERV			4	16	20	16.5	40.5	2	5	Interpolated
Size 3 ERV			4	16	25	16.5	50.5	2	5	Interpolated
Size 4 ERV			8	16	20	16.5	40.5	2	8	UUT-1

Damper Integrated Filter Rack	Manufacturer	Frame Material	Filter Qty (1)	Nominal Filter Size [in]		Maximum Frame Size [in]			Max Weight [lb]	UUT
				Height	Width	Height	Width	Length		
Size 1	CaptiveAire	Galvanized Steel	2	16	20	20.5	32.5	2	4	UUT-3 & UUT-4
Size 1 ERV			4	16	16	16.5	32.5	2	8	UUT-3
Size 2			2	20	25	25.5	40.5	2	4	Interpolated
Size 2 ERV			4	16	20	16.5	40.5	2	8	Interpolated
Size 3			4	16	25	25.5	32.5	2	8	Interpolated
Size 3 ERV			4	16	25	16.5	50.5	2	8	Interpolated
Size 4			8	20	20	20.5	40.5	2	16	UUT-1 & UUT-2
Size 4 ERV			8	16	20	16.5	40.5	2	16	UUT-1

Filter Type	Manufacturer	Frame Material	Filter Media	Nominal Filter Size [in]		Max Weight	UUT
				Height	Width		
MERV 4	Research Products	Galvanized Steel	Metal Mesh	Varies	Varies	3	UUT-1
MERV 8		Beverage Board	Synthetic Media	Varies	Varies	2	UUT-2 & UUT-4
MERV 13				Varies	Varies	2	UUT-1
MERV 15				Varies	Varies	3	UUT-1 & UUT-3
HEPA		Galvanized Steel	Glass Fiber Media	Varies	Varies	12	UUT-1

Table 14 - Control Panels

Manufacturer: CaptiveAire	Dimensions [in]			Weight [lb]	UUT
	Height	Width	Depth		
Size 1	20	36	12	20	UUT-3 & UUT-4
Size 2	20	40	12	20	Interpolated
Size 3	16	48	8	30	Interpolated
Size 4	26	36	8	40	UUT-1 & UUT-2

Table 15 - Air Dampers

Size	Height [in]	Width [in]	Manufacturer	UUT
Size 1	33.5	32	Enginia	UUT-3 & UUT-4
Size 2	38.5	40		Interpolated
Size 3	46	50		Interpolated
Size 4	59.5	80		UUT-1 & UUT-2

Table 16 - Curbs

Manufacturer: CaptiveAire	Dimensions [in]			Weight [lb]	UUT
	Height	Width	Depth		
CRB41x71	24" Max	41	71	113	Extrapolated
CRB49.5x75	24" Max	49.5	75	121	Extrapolated
CRB59.5x91	24" Max	59.5	91	142	Extrapolated
CRB80x111	24" Max	80	111	174	UUT-2
CRB41x111	24" Max	41	111	143	Interpolated
CRB49.5x120	24" Max	49.5	120	166	Interpolated
CRB59.5x142.5	24" Max	59.5	142.5	193	Interpolated
CRB80x169.5	24" Max	80	169.5	282	Interpolated
CRB80x210	24" Max	80	210	378	UUT-1



UNIT UNDER TEST (UUT) Summary Sheet

UUT-1

Test Report: DCL-26549-2501 (Report by DCL, Tested at Clark Testing)

Model Line	Model Number	Manufacturer
CAS RTU	CAS-HVAC4-E.1502-36MF-60T-2-HCERV	CaptiveAire

Product Construction Summary

Carbon Steel Curb and Carbon Steel Enclosure. Listed length is of the base rail, and listed height includes curb height.

Options / Subcomponent Summary

Air Blower: CaptiveAire; Electric Heaters: 3P Elec (Neptronic); Energy Recovery Wheels: AirXchange; VFDs: Danfoss; Air Blower Motors: Teco; DX Coils: SRC; DX Compressors: Danfoss; Integrated Fans and Motors for DX Coils: Ziehl Abegg; Air Filters: CaptiveAire, Research Products; Air Damper: Enginia; Control Panels: CaptiveAire; Curb: CaptiveAire

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
10,078	218.5	86.8	102.3	11.0	23.0	5.0

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	2.00	1.0	1.5	3.20	2.40	-	-
		2.50	0.0	1.5	-	-	1.68	0.68

Test Mounting Details

UUT-1 was rigidly mounted to the manufacturer supplied 24" high curb using (42) 1/2" Grade 8 bolts. The curb was rigidly mounted to the shake table using (68) 1/2" Grade 5 bolts with 3"x3"x1/4" square washers.



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: JID 24-00026

Model Line	Model Number	Manufacturer
CAS RTU	CAS-HVAC 4-28	CaptiveAire

Product Construction Summary

Carbon Steel Curb and Carbon Steel Enclosure

Options / Subcomponent Summary

Hydronic Coils: Modine; Air Blower: Ziehl Abegg; Energy Recovery Wheels: AirXchange; Air Blower Motors: ECM; Air Filters: CaptiveAire, Research Products; Air Damper: Enginia; Control Panels: CaptiveAire; Curb: CaptiveAire

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
3,510	118.0	87.0	72.0	11.6	8.1	14.2

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	-	-
		2.50	0.0	1.5	-	-	1.68	0.68

Test Mounting Details

UUT-2 was rigidly mounted to the manufacturer supplied 24" high curb using (52) 1/4"x2-1/2" stainless zip screws. The curb was rigidly mounted to the shake table using (32) 1/2" Grade 5 bolts with 3"x3"x1/4" square washers.



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: JID 24-00026

Model Line	Model Number	Manufacturer
CAS RTU	CAS RTU 1-E.402-18-5T-ERV	CaptiveAire

Product Construction Summary

Carbon Steel Curb and Carbon Steel Enclosure

Options / Subcomponent Summary

Air Blower: CaptiveAire; Electric Heaters: 3P Elec (Neptronic); Energy Recovery Wheels: AirXchange; VFDs: Danfoss; Air Blower Motors: Variable Speed Motor; DX Coils: SRC; DX Compressors: Danfoss; Integrated Fans and Motors for DX Coils: Ziehl Abegg; Air Filters: CaptiveAire, Research Products; Air Damper: Enginia; Control Panels: CaptiveAire; Curb: CaptiveAire

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
1,604	117.0	68.0	48.0	12.0	11.1	19.5

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	-	-
		2.50	0.0	1.5	-	-	1.68	0.68

Test Mounting Details

UUT-3 was rigidly mounted to the shake table using (14) 1/2" diameter 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-4

Test Report: JID 24-00026

Model Line	Model Number	Manufacturer
CAS RTU	CAS-HVAC 1-16	CaptiveAire

Product Construction Summary

Carbon Steel Curb and Carbon Steel Enclosure

Options / Subcomponent Summary

Hydronic Coils: Modine; Air Blower: Ziehl Abegg; Energy Recovery Wheels: AirXchange; Air Blower Motors: ECM; Air Filters: CaptiveAire, Research Products; Air Damper: Enginia; Control Panels: CaptiveAire; Curb: CaptiveAire

UUT Properties

Weight [lbs]	Dimensions [in]			Lowest Nat. Freq. [Hz]		
	Length	Width	Height	F-B	S-S	V
884	77.0	47.0	46.0	17.2	21.5	22.1

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	-	-
		2.50	0.0	1.5	-	-	1.68	0.68

Test Mounting Details

UUT-4 was rigidly mounted to the shake table using (12) 1/2" diameter Grade 5 bolts.



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