APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY	
APPLICATION #:	OSP – 0406-10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Carrier Corporation

Manufacturer's Technical Representative: Anthony Molavi

Mailing Address: 9701 Old Statesville Road, Charlotte, NC 28269

Telephone: (704) 921-3976 Email: Anthony.Molavi@carrier.utc.com

Product Information

Product Name: Carrier Model AquaEdge 23XRV Water Cooled Chiller

Product Type: Water Cooled Chillers

Product Model Number: 23XRV Frame 2, 3, 4, and 5
(List all unique product identification numbers and/or part numbers)

General Description: 23XRV is a water-cooled chiller. Seismic enhancements made to the test units and required to address the anomalies observed during the tests shall be incorporated into the production units.

Mounting Description: Rigid floor mounted or vibration spring isolated with snubbers floor mounted

Applicant Information

Applicant Company Name: Carrier Corporation

Contact Person: Anthony Molavi

Mailing Address: 9701 Old Statesville Road, Charlotte, NC 28269

Telephone: (704) 921-3976 Email: Anthony.Molavi@carrier.utc.com

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

Signature of Applicant: Anthony Molavi Date: 11/30/2016

Title: Engineering Manager Company Name: Carrier Corporation

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

Company Name: Buehler & Buehler Structural Engineers, Inc.

Name: Scott R. Hooker, S.E. California License Number: 3937 / Structural

Mailing Address: 600 Q Street, Sacramento, CA 95811

Telephone: (916) 443-0303 Email: shooker@bbse.com

Supports and Attachments Preapproval

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

☒ Supports and attachments are not preapproved

Certification Method

☐ Testing in accordance with: ☒ ICC-ES AC156

☐ Other (Please Specify): _____

Testing Laboratory

Company Name: University at Buffalo, SEESL

Contact Name: Mark Pitman

Mailing Address: Department of Civil, Structural, and Environmental Engineering, University at Buffalo, State University of New York, Buffalo, NY 14260-4300

Telephone: (716) 645-5400 Email: mpitman@eng.buffalo.edu

Seismic Parameters

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

Design Basis of Equipment or Components (F_p/W_p) = 1.44 for rigid, 4.5 for isolated

S_{DS} (Design spectral response acceleration at short period, g) = 2.00

a_p (In-structure equipment or component amplification factor) = 1.0 for rigid, 2.5 for isolated

R_p (Equipment or component response modification factor) = 2.5 for rigid, 2.0 for isolated

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height factor ratio) = 1.0

Equipment or Component Natural Frequencies (Hz) = See Attachments

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

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

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

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

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

R (Response modification coefficient) =

Ω_0 (System overstrength factor) =

C_d (Deflection amplification factor) =

I_p (Importance factor) = 1.5

Height to Center of Gravity above base =

Equipment or Component Natural Frequencies (Hz) =

Overall dimensions and weight (or range thereof) =

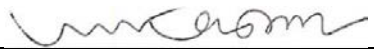
Tank(s) designed in accordance with ASME BPVC, 2015: ☐ Yes ☒ No

List of Attachments Supporting Special Seismic Certification

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

☐ Other(s) (Please Specify):

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

Signature:  Date: 2/6/2017

Print Name: M. R. Karim Title: SHFR

Special Seismic Certification Valid Up to : S_{DS} (g) = 2.0 z/h = 1.0

Condition of Approval (if applicable):

Table 1. 30XRV Approved Unit List

Model Number	Frame Size		Nominal Tons	Tested/ Interpolated	Length (in)	Width (in)	Height (in)	Operating Weight (lbs)
23XRVA1	2	A	300	Extrapolated	156.5	46.5	152	14,495
23XRVA2			300	Extrapolated	156.5	46.5	152	14,759
23XRVA3			300	Extrapolated	156.5	46.5	152	15,094
23XRVA4			300	Extrapolated	156.5	46.5	152	15,490
23XRVA5			300	Extrapolated	156.5	46.5	152	15,812
23XRVA6			300	Extrapolated	156.5	46.5	152	16,255
23XRVB1		B	300	Interpolated	177	46.5	152	15,244
23XRVB2			300	Interpolated	177	46.5	152	15,552
23XRVB3			300	Interpolated	177	46.5	152	15,934
23XRVB4			300	Interpolated	177	46.5	152	16,266
23XRVB5			300	Interpolated	177	46.5	152	16,765
23XRVB6			**300**	**UUT-1**	**177**	**46.5**	**152**	**13,370**
23XRVB6			300	Interpolated	177	46.5	152	17,000
23XRV30	3		350	Interpolated	197	79	87	18,247
23XRV31			350	Interpolated	197	79	87	18,776
23XRV32			350	Interpolated	197	79	87	19,321
23XRV35			350	Interpolated	217	79	87	19,636
23XRV36			350	Interpolated	217	79	87	20,238
23XRV37			**350**	**UUT-2**	**217**	**79**	**87**	**20,860**
23XRV40	4		450	Interpolated	196.75	80	90.5	21,402
23XRV41			450	Interpolated	196.75	80	90.5	21,912
23XRV42			450	Interpolated	196.75	80	90.5	22,391
23XRV45			450	Interpolated	195	80	90.5	22,693
23XRV46			450	Interpolated	195	80	90.5	23,277
23XRV47			**450**	**UUT-3**	**195**	**80**	**90.5**	**20,370**
23XRV50	5		550	Interpolated	195	80	90.5	24,170
23XRV51			550	Interpolated	195	80	90.5	24,759
23XRV52			**550**	**UUT-4**	**195**	80	**90.5**	**25,154**

Table 2. Certified Sub-Component List: 23XRV

Compressor

Frame Type	Part #	Weight (lb)	Manufacturer	Material	Interpolated / Tested
P	**1TP3002/3003**	**2759**	**Carrier**	**Carbon Steel**	**UUT-1**
Q	**1TQ3002/3003**	**3488**	**Carrier**	**Carbon Steel**	**UUT-3**
R	**1TR3002/3003**	**4150**	**Carrier**	**Carbon Steel**	**UUT-2 & UUT-4**

Motor

Motor Type	Part #	Weight (lb)	Manufacturer	Material	Interpolated / Tested
J	**5TP0415**	**277**	**Baldor**	**Carbon Steel**	**UUT-1**
H	5TP0415	277	Baldor	Carbon Steel	Interpolated
P	5T8PRQ21	602	Baldor	Carbon Steel	Interpolated
Q	5T8QRQ21	716	Baldor	Carbon Steel	Interpolated
R	**5T8RRQ21**	**716**	**Baldor**	**Carbon Steel**	**UUT-2 & UUT-4**
S	5T8SRQ21	716	Baldor	Carbon Steel	Interpolated
T	5T8TRQ21	716	Baldor	Carbon Steel	Interpolated
U	5T8URQ21	716	Baldor	Carbon Steel	Interpolated
V	**5T8VRQ21**	**716**	**Baldor**	**Carbon Steel**	**UUT-3**

VFD/Control Panel

Part No.	VFD Drive Amperage (A)		Weight (lb)	Manufacturer	Material	Interpolated / Tested
23XR033500FA	**335 in**	**335 out**	**1029**	**Rockwell**	**Carbon Steel**	**UUT-1**
23XR033500FB	230 in	230 out	1029	Rockwell	Carbon Steel	Interpolated
23XR04021301	230 in	230 out	1029	Rockwell	Carbon Steel	Interpolated
23XR04001301	389 in	389 out	1029	Rockwell	Carbon Steel	Interpolated
23XR04001301	445 in	445 out	1029	Rockwell	Carbon Steel	Interpolated
23XR04021303	469 in	469 out	1029	Rockwell	Carbon Steel	Interpolated
23XR04021301	230 in	230 out	1650	Rockwell	Carbon Steel	Interpolated
23XR04001306	389 in	389 out	1650	Rockwell	Carbon Steel	Interpolated
23XR04001304	**440 in**	**442 out**	**1650**	**Rockwell**	**Carbon Steel**	**UUT-2, UUT-3, UUT-4**
23XR04001306	445 in	445 out	1650	Rockwell	Carbon Steel	Interpolated
23XR04001305	520 in	442 out	1650	Rockwell	Carbon Steel	Interpolated
23XR04001307	600 in	600 out	1650	Rockwell	Carbon Steel	Interpolated

* Whitepath manufactures low-voltage components. Rockwell manufactures high-voltage components.
* Control box assembled by Whitepath and VFD manufactured by Rockwell

Oil Vaporizer & Sump

Model #	Weight (lb)	Model #	Manufacturer	Material	Interpolated / Tested
23XR04018301	**693**	**TP**	**Carrier**	**Carbon Steel**	**UUT-1**
23XR04010601	693	TQ	Carrier	Carbon Steel	Interpolated
23XR04010601	**693**	**TR**	**Carrier**	**Carbon Steel**	**UUT-2, UUT-3 & UUT-4**

Oil Pump

Part Number	Capacity (GPH)	Weight (lb)	Manufacturer	Material	Interpolated / Tested
23XR05003201	**0.05**	**7**	**Tuthill**	**Carbon Steel**	**UUT-1, UUT-2, UUT-3, UUT-4**

Muffler (including discharge pipe)

Part Number	Capacity	Weight (lb)	Manufacturer	Material	Interpolated / Tested
23XR14006301	**N/A**	**584**	**Carrier**	**Carbon Steel**	**UUT-1**
23XR34006901	**N/A**	**597**	**Carrier**	**Carbon Steel**	**UUT-3**
23XR54009301	**N/A**	**747**	**Carrier**	**Carbon Steel**	**UUT-2, UUT-4**

Economizer

Part Number	Capacity	Weight (lb)	Manufacturer	Material	Interpolated / Tested
23XR24002101	**N/A**	**174**	**Carrier**	**Carbon Steel**	**UUT-1**
23XR54002101	**N/A**	**542**	**Carrier**	**Carbon Steel**	**UUT-2, UUT-3, UUT-4**

Table 2. Certified Sub-Component List: 23XRV cont

Heat Exchanger (Cooler) and Heat Exchanger (Condenser)						
Frame	*Size*	*Weight (lb)*		*Manufacturer*	*Material*	*Interpolated / Tested*
		Cooler	*Condenser*			
2	A1	3904	5068	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	A2	4009	5237	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	A3	4182	5391	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	A4	4315	5652	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	A5	4520	5769	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	A6	4725	6007	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	B1	4236	5485	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	B2	4352	5677	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	B3	4558	5853	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	B4	4706	6037	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	B5	4946	6296	Carrier	Carbon Steel Shell / Cooper Tubes	Extrapolated
	B6	**5117**	**6558**	**Carrier**	**Carbon Steel Shell / Cooper Tubes**	**UUT-1**
3	30	5012	4481	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	31	5261	4761	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	32	5523	5044	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	35	5385	5497	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	36	5669	5815	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	37	**5967**	**6139**	**Carrier**	**Carbon Steel Shell / Cooper Tubes**	**UUT-2**
4	40	6321	6327	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	41	6558	6600	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	42	6766	6871	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	45	6909	7031	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	46	7181	7343	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	47	**7421**	**7654**	**Carrier**	**Carbon Steel Shell / Cooper Tubes**	**UUT-3**
5	50	7553	7863	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	51	7870	8135	Carrier	Carbon Steel Shell / Cooper Tubes	Interpolated
	52	**8069**	**8391**	**Carrier**	**Carbon Steel Shell / Cooper Tubes**	**UUT-4**

Waterbox (Cooler / Condenser)					
Frame	*Waterbox Type*		*Manufacturer*	*Material*	*Interpolated / Tested*
	Nozzle In Head (NIH) Weight (lb)	*Marine Water Box (MWB) Weight (lb)*			
2	**265**	**-**	**Macor**	**Carbon Steel**	**UUT-1**
	-	812	Macor	Carbon Steel	Interpolated
3	636	860	Macor	Carbon Steel	Interpolated
4	**1007**	**-**	**Macor**	**Carbon Steel**	**UUT-3**
	-	2162	Macor	Carbon Steel	Interpolated
5	1316	-	Macor	Carbon Steel	Interpolated
	-	**2655**	**Macor**	**Carbon Steel**	**UUT-4**

UUT-1 Test Summary

Testing Lab: University at Buffalo
Testing Report: No. UB CSEE/SEESL-2014-12 dated July 2, 2014
Testing Unit Num: UUT-1

Model Number	*Tonnage*	*Operating Weight (lbs)*	*Mounting*	*Excitation Direction*	*Frequency* (Hz)*	*Length (in)*	*Width (in)*	*Height (in)*
23XRVB6B6EPJR35_	300	13,770	Rigid Mount at Base	X	15.0	181.75	46.4	89
				Y	8.8			
				Z	21.0			

* Frequencies are for units prior to ICC ES AC-156 testing.
Model Number is based on nomenclautre from the 2014 Catalog

Identification No. 23XRVB6B6EPJR35
Attachment Method Hard mount
(4) 3/4" Ø Grade 8 bolts per leg (4 total legs)

Seismic Parameters

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2016	AC 156	2.00	1.0	3.2g	2.4g	1.33g	0.54g

Figure 1: Unit on the shake table

Notes: The UUTs were full of contents during the test.
After the test, the UUT was functional and the structural integrity of the compenent attachment and force-resisting systems was maintained.

UUT-1 Summary Sub-Component List Tested

Sub-Component	*Part Number*	*Manufacturer*	*Material*
Compressor	1TP3002/3003	Carrier	Carbon Steel
Cooler	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Condenser	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Motor	5TP0415	Baldor	Carbon Steel
VFD/Control Box	23XR033500FA	Rockwell	Carbon Steel
Oil Vaporizer & Sump	23XR04018301	Carrier	Carbon Steel
Oil Pump	23XR05003201	Tuthill	Carbon Steel
Muffler	23XR1400	Carrier	Carbon Steel
Economizer	23XR2400	Carrier	Carbon Steel
Waterbox - NIH	See Nomenclature	Macor	Carbon Steel
Seismic Strap / Bracket	19XB45002301 / 23XR05011801-01	Carrier	Carbon Steel

UUT-2 Test Summary

Testing Lab: University at Buffalo
Testing Report: No. UB CSEE/SEESL-2010-11 dated November 18, 2010
Testing Unit Num: UUT-2

Model Number	*Tonnage*	*Operating Weight (lbs)*	*Mounting*	*Excitation Direction*	*Frequency* (Hz)*	*Length (in)*	*Width (in)*	*Height (in)*
23XRV3737NRVAA5_	400	20,223	Base with Isolators	X	2.7	184.75	76	86.625
				Y	2.0			
				Z	2.8			

* Frequencies are for units prior to ICC ES AC-156 testing.
Model Number is based on nomenclautre from the 2009 Catalog

Identification No.	23XRV3737NRVAA5
Attachment Method	Vibration spring isolatd with snubbers
	(4) 1" Ø bolts per leg (4 total legs)
	(4) Spring Isolator and (8) Seismic Snubbers

Seismic Parameters							
Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2016	AC 156	2.00	1.0	3.2g	2.4g	1.33g	0.54g

Figure 1: Unit on the shake table

Notes: The UUTs were full of contents during the test.
After the test, the UUT was functional and the structural integrity of the compenent attachment and force-resisting systems was maintained.

UUT-2 Summary Sub-Component List Tested

Sub-Component	*Part Number*	*Manufacturer*	*Material*
Compressor	1TR3002/3003	Carrier	Carbon Steel
Cooler	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Condenser	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Motor	5T8RRQ21	Baldor	Carbon Steel
VFD/Control Box	23XR04001304	Rockwell	Carbon Steel
Oil Vaporizer & Sump	23XR04010601	Carrier	Carbon Steel
Oil Pump	23XR05003201	Tuthill	Carbon Steel
Muffler	23XR54009301	Carrier	Carbon Steel
Economizer	23XR54002101	Carrier	Carbon Steel
Waterbox - NIH	See Nomenclature	Macor	Carbon Steel
Seismic Strap / Bracket	19XB45002301 / 23XR05011801-01	Carrier	Carbon Steel
Spring Isolator	SLF-4-8400	Mason	Carbon Steel
Seismic Snubber	Z1011-25000	Mason	Carbon Steel

UUT-3 Test Summary

Testing Lab: University at Buffalo
Testing Report: No. UB CSEE/SEESL-2014-12 dated July 2, 2014
Testing Unit Num: UUT-3

Model Number	*Tonnage*	*Operating Weight (lbs)*	*Mounting*	*Excitation Direction*	*Frequency* (Hz)*	*Length (in)*	*Width (in)*	*Height (in)*
23XRV4747ERVAA50	550	20,370	Rigid Mount at Base	X	6.8	175.25	83.75	90.75
				Y	10.8			
				Z	22.4			

* Frequencies are for units prior to ICC ES AC-156 testing.
Model Number is based on nomenclautre from the 2014 Catalog

Identification No. 23XRV4747ERVAA50
Attachment Method Hard mount
(4) 3/4"Ø Grade 8 bolts per leg (4 total legs)

Seismic Parameters

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2016	AC 156	2.00	1.0	3.2g	2.4g	1.33g	0.54g

Figure 1: Unit on the shake table

Notes: The UUTs were full of contents during the test.
After the test, the UUT was functional and the structural integrity of the compenent attachment and force-resisting systems was maintained.

UUT-3 Summary Sub-Component List Tested

Sub-Component	*Part Number*	*Manufacturer*	*Material*
Compressor	1TQ3002/3003	Carrier	Carbon Steel
Cooler	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Condenser	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Motor	5T8VRQ21	Baldor	Carbon Steel
VFD/Control Box	23XR04001304	Rockwell	Carbon Steel
Oil Vaporizer & Sump	23XR04010601	Carrier	Carbon Steel
Oil Pump	23XR05003201	Tuthill	Carbon Steel
Muffler	23XR34006901	Carrier	Carbon Steel
Economizer	23XR54002101	Carrier	Carbon Steel
Waterbox - NIH	See Nomenclature	Macor	Carbon Steel
Seismic Strap / Bracket	19XB45002301 / 23XR05011801-01	Carrier	Carbon Steel

UUT-4 Test Summary

Testing Lab: University at Buffalo
Testing Report: No. UB CSEE/SEESL-2010-11 dated November 18, 2010
Testing Unit Num: UUT-4

Model Number	*Tonnage*	*Operating Weight (lbs)*	*Mounting*	*Excitation Direction*	*Frequency* (Hz)*	*Length (in)*	*Width (in)*	*Height (in)*
23XRV5252NRVAA3	550	25,093	Base with Isolators	X	4.5	172.5	83.75	90.75
				Y	4.0			
				Z	6.9			

* Frequencies are for units prior to ICC ES AC-156 testing.
Model Number is based on nomenclautre from the 2009 Catalog

Identification No.	23XRV5252NRVAA3
Attachment Method	Vibration spring isolatd with snubbers
	(4) 1" Ø bolts per leg (4 total legs)
	(4) Spring Isolator and (8) Seismic Snubbers

Seismic Parameters							
Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
CBC 2016	AC 156	2.00	1.0	3.2g	2.4g	1.33g	0.54g

Figure 1: Unit on the shake table

Notes: The UUTs were full of contents during the test.
After the test, the UUT was functional and the structural integrity of the compenent attachment and force-resisting systems was maintained.

UUT-4 Summary Sub-Component List Tested

Sub-Component	*Part Number*	*Manufacturer*	*Material*
Compressor	1TR3002/3003	Carrier	Carbon Steel
Cooler	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Condenser	See Nomenclature	Carrier	Carbon Steel Shell / Cooper Tubes
Motor	5T8RRQ21	Baldor	Carbon Steel
VFD/Control Box	23XR04001304	Rockwell	Carbon Steel
Oil Vaporizer & Sump	23XR04010601	Carrier	Carbon Steel
Oil Pump	23XR05003201	Tuthill	Carbon Steel
Muffler	23XR54009301	Carrier	Carbon Steel
Economizer	23XR54002101	Carrier	Carbon Steel
Waterbox - MWB	See Nomenclature	Macor	Carbon Steel
Seismic Strap / Bracket	19XB45002301 / 23XR05011801-01	Carrier	Carbon Steel
Spring Isolator	SLF-4-9540	Mason	Carbon Steel
Seismic Snubber	Z1011-25000	Mason	Carbon Steel