APPLICATION FOR HCAI SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0513

HCAI Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Broad USA, Inc.

Manufacturer's Technical Representative: Kevin Fu

Mailing Address: 401 Hackensack Ave. Suite 503, Hackensack, NJ 07601

Telephone: (201) 678-3010 Email: kevin@broadusa.com

Product Information

Product Name: BS Steam Absorption Chillers

Product Model Number(s): BS20 – BS300

Product Category: Chillers

Product Sub-Category: Chillers - Absorption

General Description: BS Series steam absorption chillers.

Mounting Description: Base Mounted Rigid

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: Pre Compliance

Contact Person: Andy Coughlin

Mailing Address: 324 NW Hill St., Bend, OR 97703

Telephone: (541) 241-2310 Email: andy@go-pre.com

Title: Principal Engineer

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

Company Name: PRE COMPLIANCE

Name: Andrew Coughlin California License Number: S6082

Mailing Address: 324 NW Hill St, Bend, OR 97703

Telephone: (415) 635-8461 Email: Andy@go-pre.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@berkeley.edu

Seismic Parameters

Certified Response Spectral Acceleration Factors:(F_p/W_p)

Horizontal	(A Flx-H), g=	3.15	(A Rig-H), g=	2.12
Vertical	(A Flx-V), g=	2.11	(A Rig-V), g=	0.84

S_{DS} (Design spectral response acceleration at short period, g) = 1.97; z/h = 1; 3.16; z/h = 0

Hf (Force amplification height factor) = 1 @ z/h = 0; 3.5 @ z/h = 1

Ru (Structure ductility redution factor) = 1 @ z/h = 0; 1.3 @ z/h = 1

I_p (Importance factor) = 1.5

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

HCAI Approval (For Office Use Only) **- Approval Expires on 09/24/2031**

Date: 9/24/2025

Name: Timothy Piland Title: Senior Structural Engineer

Condition of Approval (if applicable):

SPECIAL SEISMIC CERTIFICATION
CERTIFIED COMPONENTS

Manufacturer: Broad USA, Inc.
Product Type: Chillers – Absorption
Model Line: BS Steam Absorption Chillers

Seismic Parameters		Building Codes
S_{DS} = 1.97g for R_μ=1.3, H_f=3.5 S_{DS} = 3.16g for R_μ=1.0, H_f=1.0	I_p=1.5	CBC 2025

TABLE 1

Mounting Configuration: Base Mounted - Rigid

Construction Summary

Heavy gauge carbon steel construction.

Options Summary

Model Line	Model	Max. Dimensions (in)			Wt. (lb)	Notes	UUT
		D	W	H			
BS Steam Chiller	BS20[1]	117.0	79.5	95.0	15,565		2
	BS30[1]	167.0	80.0	95.0	18,000		Interp.
	BS50[1]	197.0	80.0	95.0	23,000		Interp.
	BS75[1]	221.0	79.0	100.0	28,000		Interp.
	BS100[1]	220.0	88.0	100.0	34,000		Interp.
	BS125[1]	266.0	88.0	101.0	41,000		Interp.
	BS150[1]	257.0	91.5	118.0	45,820		1
	BS200[1]	256.0	113.0	120.0	53,800		Interp.
	BS250[1]	300.0	117.0	120.0	66,900		Interp.
	BS300[1]	303.0	127.0	132.0	79,200		3

Notes:
[1]Includes seismic bracing upgrades between main shell and HTG shell. Weight listed includes solution weight.

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENTS

Manufacturer: Broad USA, Inc.
Product Type: Chillers – Absorption
Model Line: BS Steam Absorption Chillers

Seismic Parameters		Building Codes
S_{DS} = 1.97g for R_μ=1.3, H_f=3.5	I_p=1.5	CBC 2025
S_{DS} = 3.16g for R_μ=1.0, H_f=1.0		

TABLE 2

Table Description: Control Devices

Component (Manufacturer)	Model	Description	Notes	UUT
Inverter (INVT)	GD310-004G-4-UL	HTG Solutions Pump Inverter		1,3
	GD20-1R5G-4-UL	HTG Solutions Pump Inverter		2
	GD20-1R5G-4-UL	LTG Solutions Pump Inverter		1,3
	GD20-0R7G-4-UL	LTG Solution/Refrigerant Pump Inverter		2
Touch Screen (Siemens)	6AV2124-0MC01-0AX0	Cooling water pump inverter touch screen		1,2,3
Controller (Siemens)	S1500	Programmable logic controller		1,2,3
Fan (Sunon)	A2175-HBL	Control Cabinet Fan		1,2,3
Valves (Broad)	DN10	Sampling/Purge/Detecting		1,2,3
	DN15	Drain valve		1,2,3
	DN20	Vacuum vent & manual valve		1,2,3
	DN25	Angle valve		1,2,3
	DN50	Angle valve		1,3
	DN100	Steam angle valve		2
	DN150	Steam angle valve		1,3
Pumps (Teikoku)	NP70-40D/321H2/4-F	HTG Solution Pump		1,2,3
	NP65-40C/122H2/4-B	LTG Solution Pump		1,2,3
	NP40-20A2/121H2/4-B	Refrigerant Pump		1,2,3
	LY-015H4-0103R-A	Air Vent Pump		1,2,3

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENTS

Manufacturer: Broad USA, Inc.
Product Type: Chillers – Absorption
Model Line: BS Steam Absorption Chillers

Seismic Parameters		Building Codes
S_{DS} = 1.97g for R_μ=1.3, H_f=3.5	I_p=1.5	CBC 2025
S_{DS} = 3.16g for R_μ=1.0, H_f=1.0		

TABLE 3

Table Description: Control Devices

Component (Manufacturer)	Model	Description	Notes	UUT
Gauge (Beijing Brighty)	01~0.3MPA	Compound Gauge		1,2,3
Temperature Sensor (Therncway)	ST02-145E3L100-60	Inlet/outlet temperature sensor		1,2,3
	ST02-145E3L100-100	Inlet/outlet temperature sensor		1,3
	ST02-145E3M100A-60	HTG temperature sensor		1,2,3
Flow Switch (Broad)	LKB-01BbYD	Chilled/cooling water flow switch		1,2,3
Pressure Control (Danfoss)	KP135	Pressure Control		1,2,3
Probes (Broad)	BROADKY1	HTG solution probe		1,2,3
	BROADKY2	Refrigerant level probe		1,2,3
	BROADKY4	Auto vent probe		1,2,3
	BROADKY5	LTG solution level probe		1,2,3
	BROADKY6	Absorber solution probe		1,2,3

SPECIAL SEISMIC CERTIFICATION TESTING SUMMARY

UUT	Model	Test Report	Test Laboratory	S_{DS}	R_{μ}	H_f	I_p
1	BS150 Absorption Chiller (Base mounted - Rigid)	16059-TR-001, rev01 (UUT 1)	Pacific Earthquake Engineering Research Center (PEER)	2.0 3.2	1.3 1.0	3.5 1.0	1.5
2	BS20 Absorption Chiller (Base mounted - Rigid)	16059-TR-001, rev01 (UUT 2)	Pacific Earthquake Engineering Research Center (PEER)	2.0 3.2	1.3 1.0	3.5 1.0	1.5
3	BS300 Absorption Chiller (Base mounted - Rigid)	TR251712-01-R0 (UUT 1)	Pacific Earthquake Engineering Research Center (PEER)	1.97 3.16	1.3 1.0	3.5 1.0	1.5

Notes:

SPECIAL SEISMIC CERTIFICATION UUT SUMMARY

UUT 1

Test Report# 16059-TR-001, rev01

Manufacturer: Broad USA, Inc.
Model Line: BS Steam Absorption Chillers
Model Number: BS136XI0.79-35/27.8-5.6/13.3-150
Serial Number: 16120021

Highest Passed Test Level

S_{DS}	R_μ	H_f	I_p	A_{flx-h}	A_{rig-h}	A_{flx-v}	A_{rig-v}
2.00	1.3	3.5	1.5	3.20	2.15	2.13	0.85
3.20	1.0	1.0					

Dimensions/Weights

Depth (in)	Width (in)	Height (in)	Weight (lbs.)
257.0	91.5	118.0	45,820

Lowest Natural Frequency (Hz)

Front-Back	Side-Side	Vertical
13.63	9.74	19.72

Building Codes

CBC 2025

Test Criteria

ICC-ES AC156

Construction/Option Summary

Heavy gauge carbon steel construction.
Includes seismic bracing upgrades between main shell and HTG shell.

UUT Mounting Details:

UUT was base mounted - rigid using 2" long 1/4" fillet welds every 12" along four (4) base channels.
Unit maintained structural integrity and remained operational per manufacturer requirement following shake table test. All contents were included in the unit per operating conditions.

List of Included Subcomponents

Inverter: INVT (GD310-004G-4-UL, GD20-1R5G-4-UL); **Touch Screen**: Siemens (6AV2124-0MC01-0AX0); **Controller**: Siemens (S1500); **Fan**: Sunon (A2175-HBL); **Valves**: Broad (DN10, DN15, DN20, DN25, DN50, DN150); **Pumps**: Teikoku (NP70-40D/321H2/4-F, NP65-40C/122H2/4-B, NP40-20A2/121H2/4-B, LY-015H4-0103R-A); **Gauge**: Beijing Brighty (01~0.3MPA); **Flow Switch**: Broad (LKB-01BbYD); **Pressure Control**: Danfoss (KP135); **Temperature Sensor**: Therncway (ST02-145E3L100-60, ST02-145E3L100-100, ST02-145E3M100A-60); **Probes**: Broad (BROADKY1, BROADKY2, BROADKY4, BROADKY5, BROADKY6)

SPECIAL SEISMIC CERTIFICATION UUT SUMMARY

UUT 2

Test Report# 16059-TR-001, rev01

Manufacturer: Broad USA, Inc.
Model Line: BS Steam Absorption Chillers
Model Number: BS20xl0.8-36.4/29.4-6.7/13.7-Fa-Ma
Serial Number: 6120022

Highest Passed Test Level

S_{DS}	R_μ	H_f	I_p	$A_{flx\text{-}h}$	$A_{rig\text{-}h}$	$A_{flx\text{-}v}$	$A_{rig\text{-}v}$
2.00	1.3	3.5	1.5	3.20	2.15	2.13	0.85
3.20	1.0	1.0					

Dimensions/Weights

Depth (in)	Width (in)	Height (in)	Weight (lbs.)
117.0	79.5	95.0	15,565

Lowest Natural Frequency (Hz)

Front-Back	Side-Side	Vertical
6.76	7.02	17.70

Building Codes

CBC 2025

Test Criteria

ICC-ES AC156

Construction/Option Summary

Heavy gauge carbon steel construction.
Includes seismic bracing upgrades between main shell and HTG shell.

UUT Mounting Details:

UUT was base mounted - rigid using 2" long 1/4" fillet welds every 12" along two (2) base channels.
Unit maintained structural integrity and remained operational per manufacturer requirement following shake table test. All contents were included in the unit per operating conditions.

List of Included Subcomponents

Inverter: INVT (GD20-1R5G-4-UL, GD20-0R7G-4-UL); **Touch Screen**: Siemens (6AV2124-0MC01-0AX0); **Controller**: Siemens (S1500); **Fan**: Sunon (A2175-HBL); **Valves**: Broad (DN10, DN15, DN20, DN25, DN100); **Pumps**: Teikoku (NP70-40D/321H2/4-F, NP65-40C/122H2/4-B, NP40-20A2/121H2/4-B, LY-015H4-0103R-A); **Gauge**: Beijing Brighty (01~0.3MPA); **Flow Switch**: Broad (LKB-01BbYD); **Pressure Control**: Danfoss (KP135); **Temperature Sensor**: Therncway (ST02-145E3L100-60, ST02-145E3M100A-60); **Probes**: Broad (BROADKY1, BROADKY2, BROADKY4, BROADKY5, BROADKY6)

SPECIAL SEISMIC CERTIFICATION UUT SUMMARY

UUT 3

Test Report# TR251712-01-R0

Manufacturer: Broad USA, Inc.
Model Line: BS Steam Absorption Chillers
Model Number: BS300
Serial Number: 25041801

Highest Passed Test Level

S_{DS}	R_μ	H_f	I_p	$A_{flx\text{-}h}$	$A_{rig\text{-}h}$	$A_{flx\text{-}v}$	$A_{rig\text{-}v}$
1.97	1.3	3.5	1.5	3.16	2.12	2.11	0.85
3.16	1.0	1.0					

Dimensions/Weights

Depth (in)	Width (in)	Height (in)	Weight (lbs.)
303.0	127.0	132.0	79,200

Lowest Natural Frequency (Hz)

Front-Back	Side-Side	Vertical
6.7	6.7	25.7

Building Codes

CBC 2025

Test Criteria

ICC-ES AC156

Construction/Option Summary

Heavy gauge carbon steel construction.
Includes seismic bracing upgrades between main shell and HTG shell.

UUT Mounting Details:

UUT was base mounted - rigid using 5" long 1/4" fillet welds every 3' along four (4) base channels.
Unit maintained structural integrity and remained operational per manufacturer requirement following shake table test. All contents were included in the unit per operating conditions.

List of Included Subcomponents

Inverter: INVT (GD310-004G-4-UL, GD20-1R5G-4-UL); **Touch Screen**: Siemens (6AV2124-0MC01-0AX0); **Controller**: Siemens (S1500); **Fan**: Sunon (A2175-HBL); **Valves**: Broad (DN10, DN15, DN20, DN25, DN50, DN150); **Pumps**: Teikoku (NP70-40D/321H2/4-F, NP65-40C/122H2/4-B, NP40-20A2/121H2/4-B, LY-015H4-0103R-A); **Gauge**: Beijing Brighty (01~0.3MPA); **Flow Switch**: Broad (LKB-01BbYD); **Pressure Control**: Danfoss (KP135); **Temperature Sensor**: Therncway (ST02-145E3L100-60, ST02-145E3L100-100, ST02-145E3M100A-60); **Probes**: Broad (BROADKY1, BROADKY2, BROADKY4, BROADKY5, BROADKY6)