



OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD SPECIAL SEISMIC
CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0364-10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: New Renewal

Manufacturer Information

Manufacturer: Tecogen, Inc.

Manufacturer's Technical Representative: Jean P. Roy, Manager of Engineering

Mailing Address: 45 First Avenue, Waltham, MA 02451

Telephone: (781) 466-6431

Email: jean.roy@tecogen.com

Product Information

Product Name: TECOCHILL water-cooled natural gas engine driven chillers

Product Type: Mechanical Equipment

Product Model Number: SEE ATTACHMENT

(List all unique product identification numbers and/or part numbers)

General Description: The certified units are from the STx and DTx series, and include compressors, heat exchangers, natural gas engine, pressure vessel, control cabinet, expansion valve, coolant pump and acoustic enclosure. Seismic enhancement made to the test units and modifications required to address the anomalies observed during the tests shall be incorporated into the production units.

Mounting Description:

The units are certified for a flexible base mount condition, mounted to neoprene or spring isolators, to cover both installation conditions.

Applicant Information

Applicant Company Name: DYNAMIC CERTIFICATION LABORATORIES

Contact Person: JOSEPH L. LA BRIE, S.E., MANAGING PARTNER

Mailing Address: 1315 GREG STREET, SUITE 109, SPARKS, NV 89431

Telephone: (775) 358-5085

Email: LABRIE@MAKEITRIGHT.NET

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

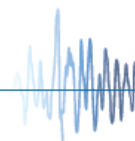
Signature of Applicant:

Date: 10/14/13

Title: MANAGING PARTNER

Company Name: DYNAMIC CERTIFICATION LABORATORIES

"Access to Safe. Quality Healthcare Environments that Meet California's Diverse and Dvnamic Needs"





**OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION**

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

Company Name: DYNAMIC CERTIFICATION LABORATORIES

Name: DR. AHMAD ITANI, S.E. California License Number: SE-5220

Mailing Address: 1315 GREG STREET, SUITE 109, SPARKS, NV 89431

Telephone: (775) 358-5085 Email: ITANI@SHAKETEST.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): _____
- _____
- _____

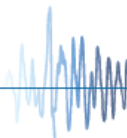
Testing Laboratory

Company Name: DYNAMIC CERTIFICATION LABORATORIES

Contact Name: AUSTIN BROWN, P.E., LABORATORY MANAGER

Mailing Address: 1315 GREG STREET, SUITE 109, SPARKS, NV 89431

Telephone: (775) 358-5085 Email: AUSTIN@SHAKETEST.COM





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Seismic Parameters

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

Design Basis of Equipment or Components (F_p/W_p) = 3.6 (using neoprene isolators); 4.5 (using spring isolators)

S_{DS} (Design spectral response acceleration at short period, g) = 2.0

a_p (In-structure equipment or component amplification factor) = 2.5

R_p (Equipment or component response modification factor) = 2.5 (neoprene isolators); 2.0 (spring isolators)

Ω_0 (System overstrength factor) = 2.5

I_p (Importance factor) = 1.5

z/h (Height factor ratio) = 1.0

Equipment or Component Natural Frequencies (Hz) = SEE ATTACHMENT

Overall dimensions and weight (or range thereof) = SEE ATTACHMENT

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, 2010: Yes No

List of Attachments Supporting Special Seismic Certification

Test Report(s) Drawings Calculations Manufacturer's Catalog

Other(s) (Please Specify): _____

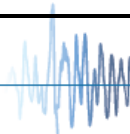
OSHPD Approval (For Office Use Only) – Approval Expires on December 31, 2019

Signature:  Date: 11/5/2013

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): _____



Special Seismic Certification Tested Units



Manufacturer: Tecogen

Product Line: *TECOHILL Natural Gas Engine Driven Chillers (Water Cooled Models)*

Tested Product Construction:
Carbon steel vessels and support structure, Cast iron engine block and compressor

Tested Options:
Compressors, heat exchangers, natural gas engine, pressure vessel, control cabinet, expansion valve, coolant pump and acoustic enclosure

Tested Mounting Description:
Flexible (neoprene pads or spring isolators)

Tested Units

Product Line	Model Number	Dimensions			Operating Weight (lb)	Mount	Sds (g), z/h=1	Unit
		Depth	Width	Height				
TECOHILL	CH-150x	4' 4"	13' 10"	7' 1"	11,750	Base Mounted (Neoprene)	2.0	UUT1a
						Base Mounted (Spring Isolators)		UUT1b
	CH-400x	6' 11"	14' 3"	7' 10.5"	23,650	Base Mounted (Neoprene)	2.0	UUT2a
						Base Mounted (Spring Isolators)		UUT2b

Special Seismic Certification Certified Units



Manufacturer: Tecogen

Product Line: *TECOHILL Natural Gas Engine Driven Chillers (Water Cooled Models)*

Certified Product Construction:

Carbon steel vessels and support structure, Cast iron engine block and compressor

Certified Options:

Compressors, heat exchangers, natural gas engine, pressure vessel, control cabinet, expansion valve, coolant pump and acoustic enclosure

Certified Mounting Description:

Flexible (neoprene pads or spring isolators)

Certified Units

Product Line	Model Number	Dimensions			Maximum Operating Weight (lb)	Mount	Sds (g), z/h=1	Unit
		Depth	Width	Height				
TECOHILL	CH-150x	4' 4"	13' 10"	7' 1"	11,750	Base Mounted (Neoprene and Spring Isolators)	2.0	UUT1a, UUT1b
	CH-200x							Interpolated
	CH-300x	6' 11"	14' 3"	7' 10.5"	23,650			Interpolated
	CH-350x							Interpolated
	CH-400x							UUT2a, UUT2b

Special Seismic Certification Certified Component List



Manufacturer: Tecogen, Inc.

Product Line: TECOCHILL Natural Gas Engine Driven Chiller (Water-Cooled Models)

Components: Compressors, Heat Exchangers and Natural Gas Engines

Compressors

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
HS 2024 GED	J&E Hall	Compressor	N/A	Cast iron	UUT1a, UUT1b, UUT2a, UUT2b

Heat Exchangers

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
FF-18144-200	Henry Technologies	Evaporator	Smallest	Carbon Steel	UUT1a, UUT1b
FF-30144-200			Largest	Carbon Steel	UUT2a, UUT2b
CC-18144-200	Henry Technologies	Condenser	Smallest	Carbon Steel	UUT1a, UUT1b
CC-24144-200			Largest	Carbon Steel	UUT2a, UUT2b
B-1205-80380	Thermal Transfer	Engine Dump Heat Exchanger	Smallest	Carbon Steel	UUT1a, UUT1b
B-1604-90280			Largest	Carbon Steel	UUT2a, UUT2b
9.6 x 13.88	Tecogen	Exhaust Heat Exchanger	N/A	Stainless Steel	UUT1a, UUT1b, UUT2a, UUT2b

Natural Gas Engine

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
TecoDrive 7400 LE	Tecogen	Natural Gas Engine	N/A	Cast Iron	UUT1a, UUT1b, UUT2a, UUT2b

Special Seismic Certification Certified Component List



Manufacturer: Tecogen, Inc.

Product Line: TECOCHILL Natural Gas Engine Driven Chiller (Water-Cooled Models)

Components: Pressure Vessels, Control Cabinets, Expansion Valves, Coolant Pumps and Acoustic Enclosure

Pressure Vessel

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
C-TEC-OF-24055	Henry Technologies	Oil Separator	Smallest	Carbon Steel	UUT1a, UUT1b
COS-26105-500			Largest	Carbon Steel	UUT2a, UUT2b

Control Cabinet

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
79351	Tecogen	TecoNet Control Panel	Smallest	Steel	UUT1a, UUT1b
79352			Largest	Steel	UUT2a, UUT2b

Expansion Valve

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
027H4012NA	Danfoss	Expansion Valve	Smallest	Cast Iron	UUT1a, UUT1b
027H5010NA			Largest	Cast Iron	UUT2a, UUT2b

Coolant Pump

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
15G5-1 1/4, 1 1/2 HP	Burkes	Coolant Pump	Smallest	Cast Iron	UUT1a, UUT1b
20G5-1 1/4, 1 1/2 HP			Largest	Cast Iron	UUT2a, UUT2b

Acoustic Enclosure

Manufacturer Model Number	Component Manufacturer	Description	Size	Construction Material	Test in UUT
n/a	Fiberglass Specialties	Acoustic Enclosure	70.5"Lx46"Wx40"H	Epoxy-glass	UUT1a, UUT1b, UUT2a, UUT2b

UUT1a



UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Tecogen

Product Line: TECOCHILL Natural Gas Engine Driven Chillers (Water Cooled Models)

Model Number: CH-150x

Product Construction Summary:

Carbon steel vessels and support structure; cast iron engine block and compressor

Options / Component Summary:

Base mounted using neoprene pads. Unit contained a compressor, heat exchangers, natural gas engine, pressure vessel, control cabinet, expansion valve, coolant pump and acoustic enclosure

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

UUT Properties

Operating Weight (lb)	Dimensions			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
11,750	4' 4"	13' 10"	7' 1"	13.8	16.0	29.8

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
CBC 2013	2012 ICC-ES AC156	2.0	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:



Unit 1a: Flexible Base Mount with Neoprene - The unit was mounted to the shake table interface frame with 8- 3/4" grade 5 bolts on neoprene pads. The neoprene pads were Mason Industries "Super W Pads". Four neoprene pads were used in total, one under each foot. The bolts were torqued to 270 ft*lbs. The shake table interface frame was mounted to the shake table using 20- 1 1/4" threaded rod.

UUT1b



UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Tecogen

Product Line: TECOCHILL Natural Gas Engine Driven Chillers (Water Cooled Models)

Model Number: CH-150x

Product Construction Summary:

Carbon steel vessels and support structure; cast iron engine block and compressor

Options / Component Summary:

Base mounted using spring isolators. Unit contained a compressor, heat exchangers, natural gas engine, pressure vessel, control cabinet, expansion valve, coolant pump and acoustic enclosure

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

UUT Properties

Operating Weight (lb)	Dimensions			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
11,750	4' 4"	13' 10"	7' 1"	2.8	2.3	4.5

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
CBC 2013	2012 ICC-ES AC156	2.0	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:



Unit 1b: Flexible Base Mount with Spring Isolators - Four Mason Industries Seismic Spring Mounts (two SLFADA 109's and two SLFADA 107's) were mounted to the shake table interface frame using 4- 3/4" grade 5 bolts for each isolator. A riser HSS tube (10x4x5/8") was bolted to the two isolators situated under each respective side of the unit. The connection to the riser HSS tube from the isolators was 2- 3/4" grade 5 bolts. The UUT was then bolted to the riser HSS tube using 2 -3/4" grade 5 bolts. The shake table interface frame was mounted to the shake table using 20- 1 1/4" threaded rod. (Note: acoustic enclosure cover was removed for the photograph.)

UUT2a



UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Tecogen

Product Line: TECOCHILL Natural Gas Engine Driven Chillers (Water Cooled Models)

Model Number: CH-400x

Product Construction Summary:

Carbon steel vessels and support structure; cast iron engine block and compressor

Options / Component Summary:

Base mounted using neoprene pads. Unit contained a compressor, heat exchangers, natural gas engine, pressure vessel, control cabinet, expansion valve, coolant pump and acoustic enclosure

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

UUT Properties

Operating Weight (lb)	Dimensions			Lowest Natural Frequency (Hz)			
		Depth	Width	Height	Front-Back	Side-Side	Vertical
23,650	UUT2a	6' 11"	14' 3"	7' 10.5"	12.8	9.5	16.8

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
CBC 2013	2012 ICC-ES AC156	2.0	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:



Unit 2a: Flexible Base Mount with Neoprene - The unit was mounted to the shake table interface frame with 8- 7/8" grade 5 bolts on neoprene pads. The neoprene pads were Mason Industries "Super W Pads". Neoprene pads were used the full length of each foot. The bolts were torqued to 430 ft*lbs. The shake table interface frame was mounted to the shake table using 20- 1 1/4" threaded rod.

UUT2b



UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Tecogen

Product Line: TECOCHILL Natural Gas Engine Driven Chillers (Water Cooled Models)

Model Number: CH-400x

Product Construction Summary:

Carbon steel vessels and support structure; cast iron engine block and compressor

Options / Component Summary:

Base mounted using spring isolators. Unit contained a compressor, heat exchangers, natural gas engine, pressure vessel, control cabinet, expansion valve, coolant pump and acoustic enclosure

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

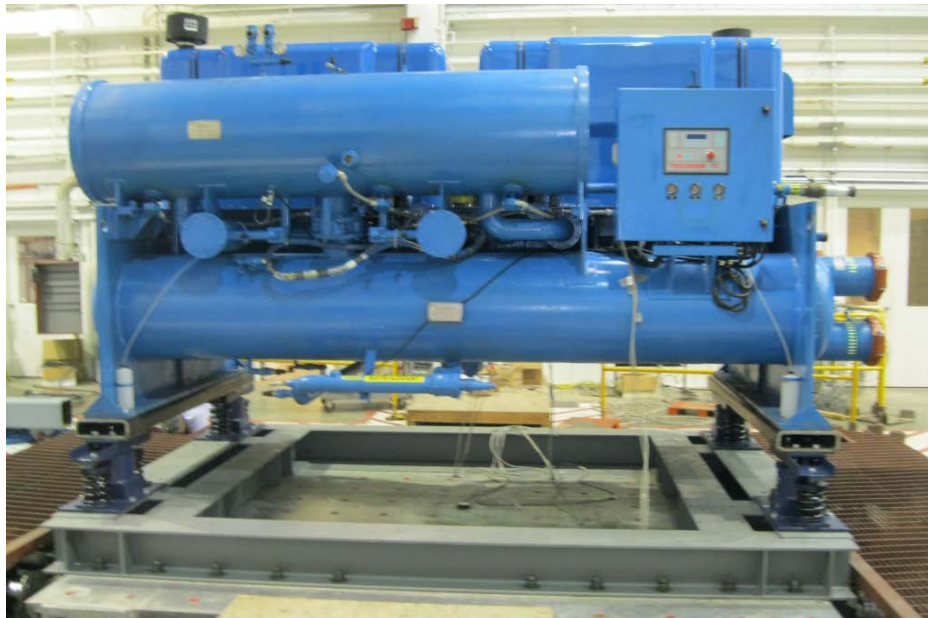
UUT Properties

Operating Weight (lb)	Dimensions			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
23,650	6' 11"	14' 3"	7' 10.5"	3.0	2.5	4.5

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
CBC 2013	2012 ICC-ES AC156	2.0	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:



Unit 2b: Flexible Base Mount with Spring Isolators - Four Mason Industries Seismic Spring Mount SLFADA 112's were mounted to the shake table interface frame using 4- 3/4" grade 5 bolts for each isolator. A riser HSS tube (12x4x5/8") was bolted to the two isolators situated under each respective side of the unit. The connection to the riser HSS tube from the isolators was 4- 3/4" grade 5 bolts. The UUT was then bolted to the riser HSS tube using 2 - 7/8" grade 5 bolts. The shake table interface frame was mounted to the shake table using 20- 1 1/4" threaded rod.