APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY	
APPLICATION #:	OSP – 0391 – 10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☒ New ☐ Renewal

Manufacturer Information

Manufacturer: Daikin Applied

Manufacturer's Technical Representative: Zach Morris, Development Engineer, Chillers

Mailing Address: 207 Laurel Hill Road, Verona, VA 24482

Telephone: (540) 248-9516 Email: zach.morris@daikinapplied.com

Product Information

Product Name: Air-cooled scroll compressor chillers

Product Type: Mechanical Equipment

Product Model Number: See Attachment
(List all unique product identification numbers and/or part numbers)

General Description: Each unit contains controllers, condenser fans and motors, condenser coils, scroll compressors, evaporators and expansion valves. Seismic enhancements made to the test units and modifications required to address anomalies observed during the tests shall be incorporated into the production units.

Mounting Description: Neoprene and vibration isolated base mounted

Applicant Information

Applicant Company Name: Dynamic Certification Laboratories

Contact Person: Joseph L. LaBrie, 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: 4/7/14

Title: Managing Partner Company Name: Dynamic Certification Laboratories

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

Company Name: UC Berkeley – PEER Lab

Contact Name: Wesley Neighbour, Laboratory Manager

Mailing Address: 1301 S. 46th Street, Building 420, Richmond, CA 94084

Telephone: (510) 665-3409 Email: wdn@berkeley.edu

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 (neoprene); 4.5 (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); 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 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, 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: 4/9/2014

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
Certified Components

((●)) DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Certified Product Construction:

Powder-coated carbon steel base and frame

Certified Options:

208-230V or 460V, controller, condenser fans, motors, condenser coils, hermetic scroll compressors and evaporator

Certified Mounting Description:

Flexible base mount (neoprene pads or spring isolators)

Product Line	Model Number	Dimensions (in)			Maximum Operating Weight (lb)	Mount	Sds (g), z/h=1	Unit
		Length	Width	Height				
Air-Cooled Scroll Compressor Chillers	AGZ030	94.4	88	100.4	2,880	Flexible base mount (neoprene pads or spring isolators)	2.0	UUT1a, UUT1b
	AGZ035	94.4	88	100.4	2,962			Interpolated
	AGZ040	94.4	88	100.4	2,964			Interpolated
	AGZ045	94.4	88	100.4	3,112			Interpolated
	AGZ050	94.4	88	100.4	3,114			Interpolated
	AGZ055	94.4	88	100.4	3,128			Interpolated
	AGZ060	94.4	88	100.4	3,155			Interpolated
	AGZ065	94.4	88	100.4	3,155			Interpolated
	AGZ070	94.4	88	100.4	3,300			UUT2a, UUT2b
	AGZ075	134.9	88	100.4	5,350			Interpolated
	AGZ080	134.9	88	100.4	5,385			Interpolated
	AGZ090	134.9	88	100.4	5,420			Interpolated
	AGZ100	134.9	88	100.4	5,675			Interpolated
	AGZ110	173.1	88	100.4	6,340			Interpolated
	AGZ125	173.1	88	100.4	6,475			Interpolated
	AGZ130	173.1	88	100.4	6,520			UUT3a, UUT3b

Special Seismic Certification
Certified Subcomponent List

DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Subcomponents: Controllers, condenser fan blades, condenser fan motors

Controllers

Mfr. Model No.	Component Mfr.	Description	Construction Material	Dimensions (in)	NEMA Rating	Unit
POL687.70/MCQ	Siemens	MicroTech III	Painted galvanized carbon steel enclosure	W(72) H(40) D(10)	Type 1	UUT1a, UUT1b UUT2a, UUT2b UUT3a, UUT3b

Condenser Fan Blades

Mfr. Model No.	Component Mfr.	Description	Number of blades	Fan Dia. (in)	Weight (lb)	Material	Unit
HAP-9001174	Hess Air	28 Deg Pitch	4	30	5	Aluminum Blade / Stainless Steel Hub	UUT1a, UUT1b
HAP-9001132	Hess Air	33 Deg Pitch	4	30	5		UUT2a, UUT2b UUT3a, UUT3b

Condenser Fan Motors

Mfr. Model No.	Component Mfr.	Description	Certified Voltage	Tested Voltage	Output	Unit
5K49ZN6302S	Marathon	3-Phase	208-460	208-230	1.5 HP	UUT1a, UUT1b
5K49ZN6301S	Marathon	3-Phase		460	2 HP	UUT2a, UUT2b
5K49ZN6270BS	Marathon	3-Phase		460	2 HP	UUT3a, UUT3b

Special Seismic Certification
Certified Subcomponent List

DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Subcomponents: Condenser coils and scroll compressors

Condenser Coils

Mfr. Model No.	Component Mfr.	Description	Case Material	Weight (lb)	Construction Material	Unit
X1470023	Sanhua	Microchannel	Painted galvanized carbon steel	78	Aluminum	UUT1a, UUT1b UUT2a, UUT2b
020889500200C2R01	Daikin	Tube and fin	Galvanized carbon steel	160	Copper Tubes/Al Fin	UUT1a, UUT1b
022021000100C1R01	Daikin	Tube and fin	Galvanized carbon steel	314	Copper Tubes/Al Fin	UUT3a, UUT3b

Scroll Compressor

Mfr. Model No.	Component Mfr.	Description	HP	Configuration Certified*	Configuration Tested	Construction Material	Unit
ZP90KCE	Copeland	Scroll	7.5 HP	Tandem (2) or Trio (3)	Tandem	Rolled carbon steel shell	UUT1a, UUT1b
ZP104KCE	Copeland	Scroll	9 HP		N/A		Interpolated
ZP122KCE	Copeland	Scroll	10 HP		N/A		Interpolated
ZP137KCE	Copeland	Scroll	12 HP		N/A		Interpolated
ZP154KCE	Copeland	Scroll	13 HP		N/A		Interpolated
ZP182KCE	Copeland	Scroll	15 HP		Tandem		UUT2a, UUT2b
ZP236KCE	Copeland	Scroll	20 HP		Tandem		UUT2a, UUT2b
ZP296KCE	Copeland	Scroll	25 HP		Trio		UUT3a, UUT3b
ZP385KCE	Copeland	Scroll	30 HP		N/A		Extrapolated

*Compressors are offered in a tandem or trio configuration

Special Seismic Certification
Certified Subcomponent List

DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Subcomponents: Evaporators and expansion valves

Evaporators

Mfr. Model No.	Component Mfr.	Description	Weight (lbs)	Construction Material	Test in UUT
ACH230-78DQ	Alfa Laval	Heat exchanger	84	Stainless steel plate brazed with copper	UUT1a, UUT1b
ACH230-86DQ	Alfa Laval	Heat exchanger	91	Stainless steel plate brazed with copper	Interpolated
ACH230-94DQ	Alfa Laval	Heat exchanger	98	Stainless steel plate brazed with copper	Interpolated
ACH230-110DQ	Alfa Laval	Heat exchanger	112	Stainless steel plate brazed with copper	Interpolated
ACH230-126DQ	Alfa Laval	Heat exchanger	126	Stainless steel plate brazed with copper	Interpolated
ACH230-134DQ	Alfa Laval	Heat exchanger	133	Stainless steel plate brazed with copper	Interpolated
ACH230-154DQ	Alfa Laval	Heat exchanger	150	Stainless steel plate brazed with copper	UUT2a, UUT2b
ACH500-94DQ	Alfa Laval	Heat exchanger	207	Stainless steel plate brazed with copper	Interpolated
ACH500-106DQ	Alfa Laval	Heat exchanger	230	Stainless steel plate brazed with copper	Interpolated
ACH500-114DQ	Alfa Laval	Heat exchanger	244	Stainless steel plate brazed with copper	Interpolated
ACH500-134DQ	Alfa Laval	Heat exchanger	281	Stainless steel plate brazed with copper	Interpolated
ACH500-142DQ	Alfa Laval	Heat exchanger	296	Stainless steel plate brazed with copper	Interpolated
ACH500-162DQ	Alfa Laval	Heat exchanger	333	Stainless steel plate brazed with copper	Interpolated
ACH500-182DQ	Alfa Laval	Heat exchanger	370	Stainless steel plate brazed with copper	UUT3a, UUT3b

Expansion Valves

Mfr. Model No.	Component Mfr.	Nom. Tonnage	Construction Material	Test in UUT
OZE-20-N-BP15	Sporlan	20	Brass bar machined body with copper tubing	UUT1a, UUT1b
OZE-25-N-BP15	Sporlan	25		Interpolated
OZE-35-N-BP15	Sporlan	35		UUT2a, UUT2b
OZE-50-N-BP15	Sporlan	50		Interpolated
OZE-60-N-BP15	Sporlan	60		UUT3a, UUT3b

Special Seismic Certification
Tested Units

DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Tested Product Construction:

Powder-coated carbon steel base and frame

Tested Options:

208-230V and 460V, controller, condenser fans, motors, condenser coils, hermetic scroll compressors and evaporator

Tested Mounting Description:

Flexible base mount (neoprene pads or spring isolators)

Product Line	Model Number	Dimensions (in)			Operating Weight (lb)	Mount	Sds (g), z/h=1	Unit
		Length	Width	Height				
Air-Cooled Scroll Compressor Chillers	AGZ030	94.4	88	100.4	2,880	Base Mounted (Neoprene)	2.0	UUT1a
						Base Mounted (Spring Isolators)		UUT1b
	AGZ070	94.4	88	100.4	3,300	Base Mounted (Neoprene)	2.0	UUT2a
						Base Mounted (Spring Isolators)		UUT2b
	AGZ130	173.1	88	100.4	6,520	Base Mounted (Neoprene)	2.0	UUT3a
						Base Mounted (Spring Isolators)		UUT3b

UUT1a

UNIT UNDER TEST (UUT) Summary Sheet

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Model Number: AGZ030

Product Construction Summary:

Powder coated structural carbon steel skid and frame

Options / Component Summary:

208V, flexible base mount (neoprene), controller, condenser fans and motors, condenser coil, scroll compressors, evaporator and expansion valves.

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

UUT Properties

Operating Weight (lb)	Dimensions (in)				Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
2,880	UUT1a	94.4	88.0	100.4	4.8	4.8	5.8

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	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT1a was base mounted to the shake table interface plate through the skid using neoprene pads and four 3/4"-diameter Grade 5 bolts.

UUT1b

UNIT UNDER TEST (UUT) Summary Sheet

DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Model Number: AGZ030

Product Construction Summary:

Powder coated structural carbon steel skid and frame

Options / Component Summary:

208V, flexible base mount (spring isolators), controller, condenser fans and motors, condenser coil, scroll compressors, evaporator and expansion valves.

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

UUT Properties

Operating Weight (lb)	Dimensions (in)				Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
2,880	UUT1b	94.4	88.0	100.4	2.5	2.3	4.8

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	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT1b was base mounted to the shake table interface plate through the skid using four spring isolators: three VMC Model 1200, and one VMC Model 825. The unit was attached to each spring isolator with one 3/4"-diameter Grade 8 bolt. Each spring isolator was then attached to the shake table interface plate using four 3/4"-diameter Grade 5 bolts.

UUT2a

UNIT UNDER TEST (UUT) Summary Sheet

DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Model Number: AGZ070

Product Construction Summary:

Powder coated structural carbon steel skid and frame

Options / Component Summary:

460V, flexible base mount (neoprene), controller, condenser fans and motors, condenser coil, scroll compressors, evaporator and expansion valves.

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

UUT Properties

Operating Weight (lb)	Dimensions (in)				Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
3,300	UUT2a	94.4	88.0	100.4	3.0	3.0	7.3

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	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT2a was base mounted to the shake table interface plate through the skid using neoprene pads and four 3/4"-diameter Grade 5 bolts.

UUT2b

UNIT UNDER TEST (UUT) Summary Sheet

((●)) DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Model Number: AGZ070

Product Construction Summary:

Powder coated structural carbon steel skid and frame

Options / Component Summary:

460V, flexible base mount (spring isolators), controller, condenser fans and motors, condenser coil, scroll compressors, evaporator and expansion valves.

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

UUT Properties

Operating Weight (lb)	Dimensions (in)				Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
3,300	UUT2b	94.4	88.0	100.4	2.0	1.8	4.3

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	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT2b was base mounted to the shake table interface plate through the skid using four spring isolators: one VMC Model 825N, two VMC Model 1200N, and one VMC Model 1400. The unit was attached to each spring isolator with one 3/4"-diameter Grade 8 bolt. Each spring isolator was then attached to the shake table interface plate using four 3/4"-diameter Grade 5 bolts.

Fig 1.a


Fig 1.b

1. Figures 1.a and 1.b show neoprene support blocks added to the interior of the coil sections of UUT2a-b, used to prevent excessive displacement during an earthquake but still allow the coil to expand and contract during normal operation

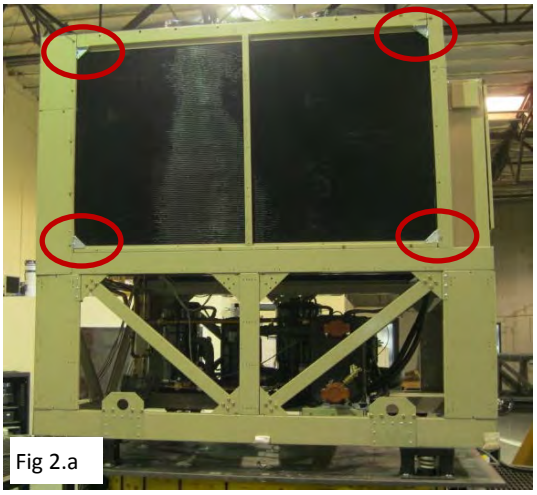


Fig 2.a

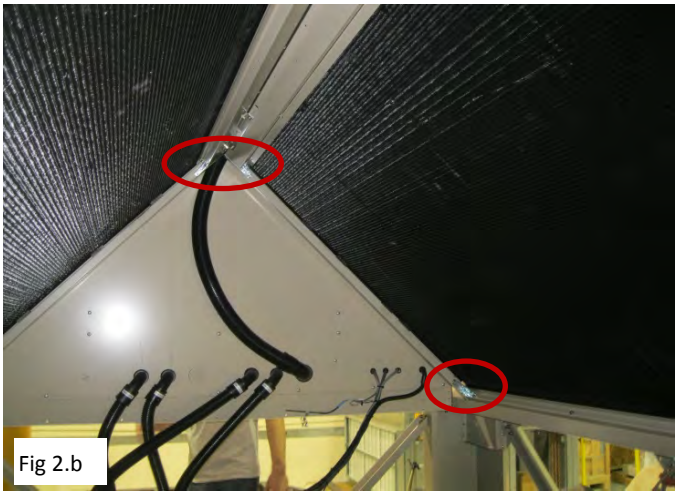


Fig 2.b

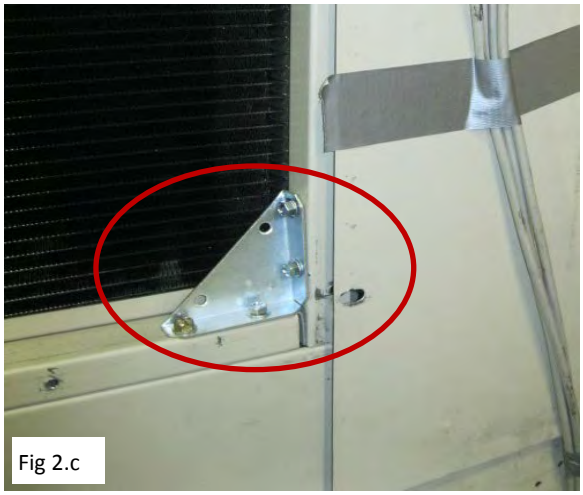


Fig 2.c

2. Figures 2.a through 2.c show corner braces installed on each coil, on the exterior and interior face (16 corner braces total). Brackets were Everbilt 3" heavy duty corner braces, Model 15444, 0.06" thick zinc plated carbon steel with 0.87" flange height.

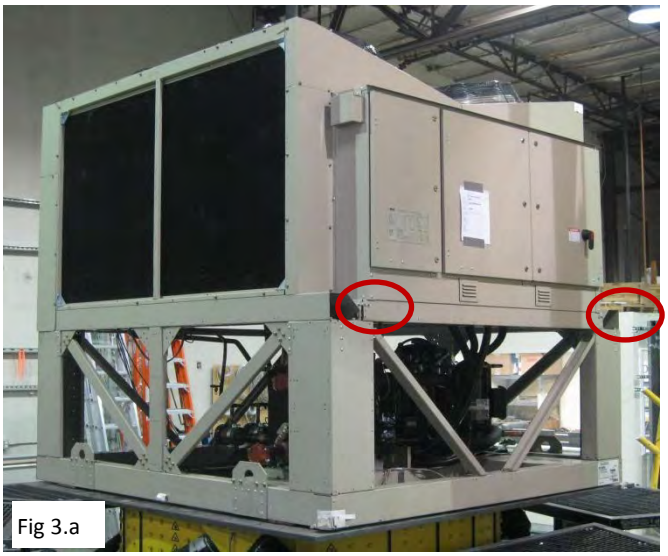


Fig 3.a


Fig 3.b

3. Figures 3.a and 3.b show support channel angle brackets added prior to the shake test (one bracket on each corner). Brackets were Everbilt 2" corner braces, Model 15267, 12 gage galvanized carbon steel, 0.62" wide.

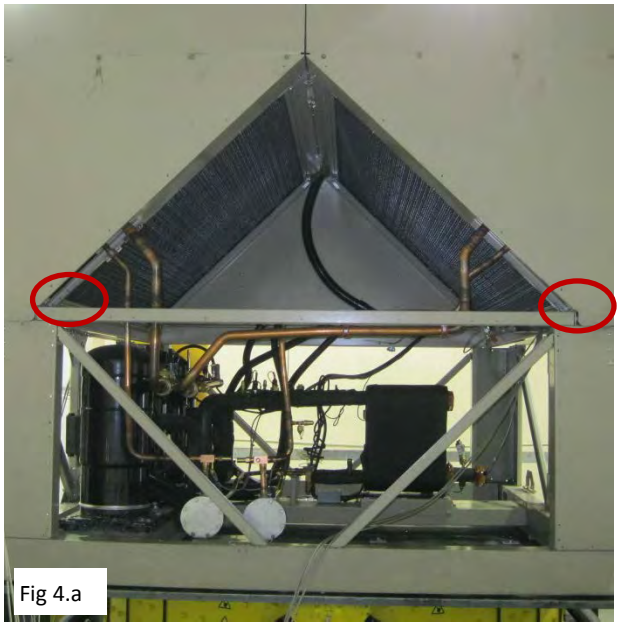


Fig 4.a


Fig 4.b

4. Figures 4.a and 4.b show angle brackets that were installed at each corner of the coil pair, connecting the coil frame to the coil rail (8 brackets total). Brackets were Everbilt 2" corner braces, Model 15267, 12 gage galvanized carbon steel, 0.62" wide.

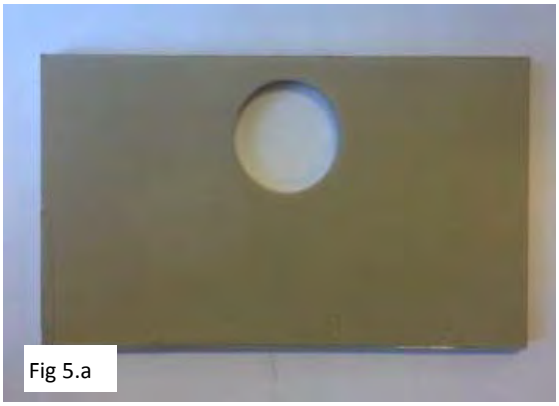


Fig 5.a

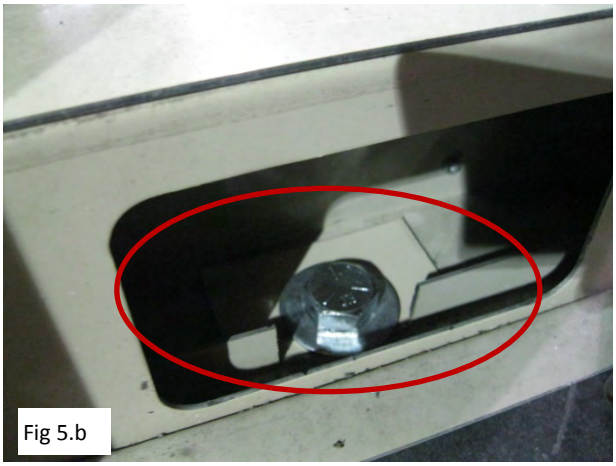


Fig 5.b

5. Figures 5.a and 5.b show the stiffener plates added to the base channel at each mounting bolt location. Each stiffener plate was 4"x2.25" with a .875" diameter hole. Each plate was made of pre-painted G60, 10 gauge steel with a nominal thickness of 0.138".

UUT3a

UNIT UNDER TEST (UUT) Summary Sheet

DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Model Number: AGZ130

Product Construction Summary:

Powder coated structural carbon steel skid and frame

Options / Component Summary:

460V, flexible base mount (neoprene), controller, condenser fans and motors, condenser coil, scroll compressors, evaporator and expansion valves.

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

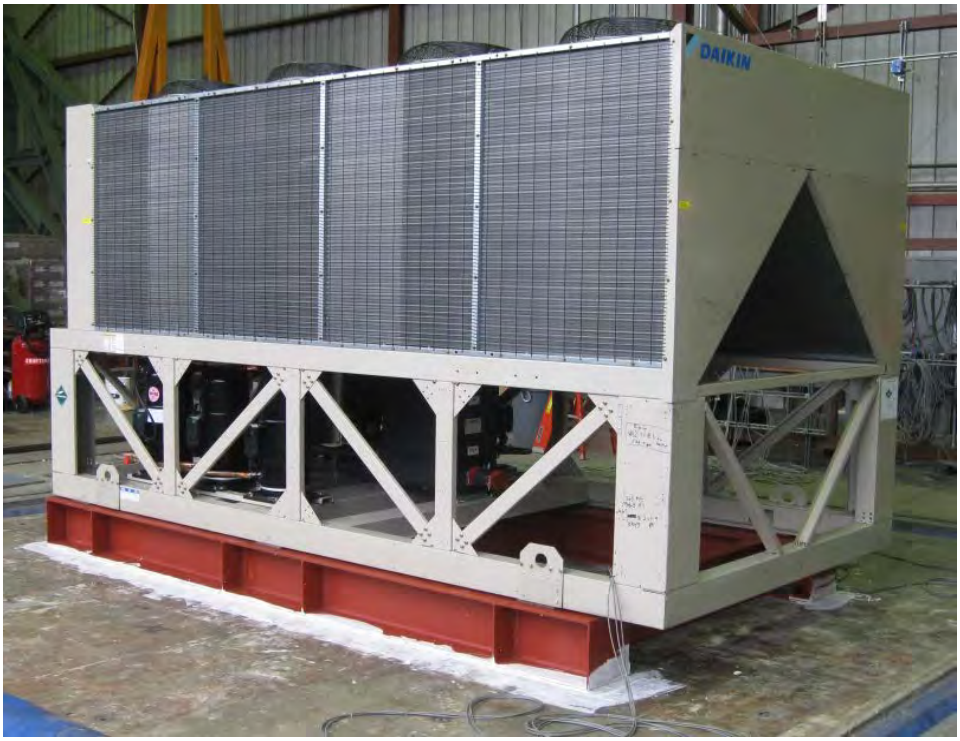
UUT Properties

Operating Weight (lb)	Dimensions (in)				Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
6,520	UUT3a	173.1	88.0	100.4	5.8	4.0	10.8

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	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:



UUT3a was base mounted to the shake table interface frame through the skid using neoprene pads and six 3/4"-diameter Grade 5 bolts

UUT3b

UNIT UNDER TEST (UUT) Summary Sheet

((●)) DCL Dynamic Certification Laboratories

Manufacturer: Daikin Applied

Product Line: Air-Cooled Scroll Compressor Chillers

Model Number: AGZ130

Product Construction Summary:

Powder coated structural carbon steel skid and frame

Options / Component Summary:

460V, flexible base mount (spring isolators), controller, condenser fans and motors, condenser coil, scroll compressors, evaporator and expansion valves.

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

UUT Properties

Operating Weight (lb)	Dimensions (in)				Lowest Natural Frequency (Hz)		
		Length	Width	Height	Front-Back	Side-Side	Vertical
6,520	UUT3b	173.1	88.0	100.4	2.8	2.0	4.3

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	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:

UUT3b was base mounted to the shake table interface plate through the skid using six spring isolators: two VMC Model 1200N, two VMC Model 1700N, and two VMC Model 2000. The unit was attached to each spring isolator with one 3/4"-diameter Grade 8 bolt. Each spring isolator was then attached to the shake table interface frame using four 3/4"-diameter Grade 5 bolts.

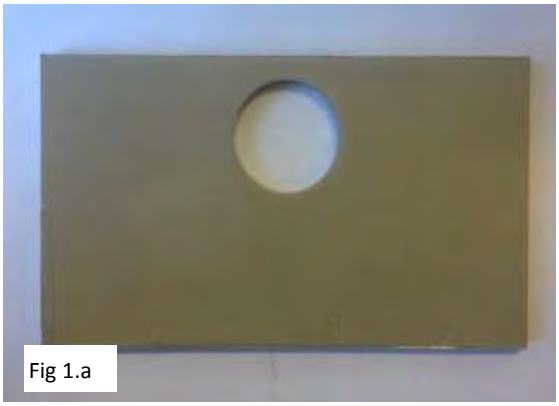


Fig 1.a


Fig 1.b

5. Figures 1.a and 1.b show the stiffener plates added to the base channel at each mounting bolt location. Each stiffener plate was 4"x2.25" with a .875" diameter hole. Each plate was made of pre-painted G60, 10 gauge steel with a nominal thickness of 0.138".