



OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD SPECIAL SEISMIC
CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP – 0204 – 10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: New Renewal

Manufacturer Information

Manufacturer: Multistack

Manufacturer's Technical Representative: Rachel Bible

Mailing Address: 1065 Maple Avenue, P.O. Box 510

Telephone: (608) 366-2400 Email: RBible@multistack.com

Product Information

Product Name: MS_F MagLev Flooded Chiller Line

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 water cooled flooded chiller modules ranging from 90 to 600 nominal ton capacity. The tested units contained compressors, condensers, evaporators, economizers and controllers. 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: Generation 1 units are certified for a rigid base mount condition. Generation 2 units are certified for a flexible base mount condition, mounted to neoprene.

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: 11/4/13

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
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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: CONSTRUCTION ENGINEERING RESEARCH LABORATORY

Contact Name: JAMES WILCOSKI, LAB MANAGER

Mailing Address: 2902 NEWMARK DRIVE, CHAMPAIGN, IL 61822

Telephone: (217) 373-6763 Email: JAMES.WILCOSKI@USACE.ARMY.MIL

Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs





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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) = 1.39 (Gen I, rigid base mount);
3.60 (Gen II, flexible base mount with neoprene)

S_{DS} (Design spectral response acceleration at short period, g) = 1.93 (Gen I); 2.00 (Gen II)

a_p (In-structure equipment or component amplification factor) = 1.0 (Gen I); 2.5 (Gen II)

R_p (Equipment or component response modification factor) = 2.5

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): _____

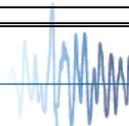
OSHPD Approval (For Office Use Only) – Approval Expires on December 31, 2019

Signature: Date: 1/28/2013

Print Name: M. R. Karim Title: SHFR

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

Condition of Approval (if applicable): _____



Special Seismic Certification Certified Units



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 1

Certified Product Construction:

Painted shell (carbon steel) and tube (copper) heat exchanger

Certified Options:

460V, 1 to 4 compressors, condensers and evaporators, control panel

Certified Mounting Description:

Rigid base mounted

Product Line	Old Model Number	New Model Number	Dimensions (inches)			Estimated Operating Weight (lb)	Size	Sds (g), z/h=1	Unit
			Depth	Width	Height				
MagLev Flooded Chillers	n/a	MS0060FC1S	91	40 1/2	83	5,250	Smallest 	1.93	Interpolated
	n/a	MS0075FC1S	91	40 1/2	83	5,250			Interpolated
	MS0901FS	MS0090FC1S	91	40 1/2	83	5,250*			UUT4
	MS1201FS	MS0120FC1S	84 3/16	50	95	10,350			Interpolated
	MS1201FL	MS0120FC1L	165 3/16	39	80	9,900			Interpolated
	MS1202FL	MS0120FC2L	165 3/16	39	82	9,900			Interpolated
	MS1204FL	MS0120FC4L	165 3/16	39	82	9,900			Interpolated
	MS1501FS	MS0150FC1S	84 3/16	50	95	10,650			Interpolated
	MS1501FL	MS0150FC1L	165 3/16	39	82	9,900			Interpolated
	MS1502FL	MS0150FC2L	165 3/16	39	82	9,900			Interpolated
	MS1801FS	MS0180FC1S	84 3/16	50	95	10,350			Interpolated
	MS1801FL	MS0180FC1L	165 3/16	39	82	9,900			Interpolated
	MS1802FL	MS0180FC2L	165 3/16	39	82	9,900			Interpolated
	MS1803FL	MS0180FC3L	165 3/16	39	82	9,900			Interpolated
	MS1804FL	MS0180FC4L	165 3/16	39	82	9,900			Interpolated
	MS2101FL	MS0210FC1L	166 3/16	44 1/4	93	12,100			Interpolated
	MS2103FL	MS0210FC3L	166 3/16	44 1/4	93	12,100			Interpolated
	MS2104FL	MS0210FC4L	166 3/16	44 1/4	93	12,100			Interpolated
	MS2401FL	MS0240FC1L	166 3/16	44 1/4	93	12,100			Interpolated
	MS2403FL	MS0240FC3L	166 3/16	44 1/4	93	12,100			Interpolated
	MS2404FL	MS0240FC4L	166 3/16	44 1/4	93	12,100			Interpolated
	MS2701FL	MS0270FC1L	168 5/16	45 1/16	97	14,125			Interpolated
	MS2702FL	MS0270FC2L	168 5/16	45 1/16	97	14,125			Interpolated
	MS2703FL	MS0270FC3L	168 5/16	45 1/16	97	14,125			Interpolated
	MS2704FL	MS0270FC4L	168 5/16	45 1/16	97	14,125			Interpolated
	MS3001FL	MS0300FC1L	168 5/16	45 1/16	97	14,125			Interpolated
	MS3002FL	MS0300FC2L	168 5/16	45 1/16	97	14,125			Interpolated
	MS3003FL	MS0300FC3L	168 5/16	45 1/16	97	14,125			Interpolated
	MS3004FL	MS0300FC4L	168 5/16	45 1/16	97	14,125			Interpolated
	MS3301FL	MS0330FC1L	170 5/16	49 1/5	102	18,225			Interpolated

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Old Model Numbers: MS = Series, 090-600 = Module Nominal capacity, 1-4 = Frame Style, F = Flooded, L/S = Shell Length

New Model Numbers: MS = Series, 060-0600 = Module Nominal Capacity, F = Flooded, C = AHRI Certified, 1-4 = Frame Style, L/S = shell Length. The C may be replaced by N, meaning Not AHRI Certified.

*Note: Actual operating weight.

Special Seismic Certification Certified Units



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 1

Certified Product Construction:

Painted shell (carbon steel) and tube (copper) heat exchanger

Certified Options:

460V, 1 to 4 compressors, condensers and evaporators, control panel

Certified Mounting Description:

Rigid base mounted

Product Line	Old Model Number	New Model Number	Dimensions (inches)			Weight (lb)	Size	Sds (g), z/h=1	Unit
			Depth	Width	Height				
Continued from Previous Page									
MagLev Flooded Chillers	MS3303FL	MS0330FC3L	170 5/16	49 1/5	102	18,225	↓ Largest	1.93	Interpolated
	MS3304FL	MS0330FC4L	170 5/16	49 1/5	102	18,225			Interpolated
	MS3601FL	MS0360FC1L	170 5/16	49 1/5	102	18,225			Interpolated
	MS3602FL	MS0360FC2L	170 5/16	49 1/5	102	18,225			Interpolated
	MS3603FL	MS0360FC3L	170 5/16	49 1/5	102	18,225			Interpolated
	MS3604FL	MS0360FC4L	170 5/16	49 1/5	102	18,225			Interpolated
	MS3901FL	MS0390FC1L	170 5/16	49 1/5	102	18,225			Interpolated
	MS3902FL	MS0390FC2L	170 5/16	49 1/5	102	18,225			Interpolated
	MS3904FL	MS0390FC4L	170 5/16	49 1/5	102	18,225			Interpolated
	MS4201FL	MS0420FC1L	174	55 1/4	109	22,200			Interpolated
	MS4202FL	MS0420FC2L	174	55 1/4	109	22,200			Interpolated
	MS4204FL	MS0420FC4L	174	55 1/4	109	22,200			Interpolated
	MS4501FL	MS0450FC1L	174	55 1/4	109	22,200			Interpolated
	MS4502FL	MS0450FC2L	174	55 1/4	109	22,200			Interpolated
	MS4504FL	MS0450FC4L	174	55 1/4	109	22,200			Interpolated
	MS5001FL	MS0500FC1L	181	73 5/8	120 1/8	25,955			Interpolated
	MS5004FL	MS0500FC4L	181	73 5/8	120 1/8	25,955			Interpolated
	MS5501FL	MS0550FC1L	181	73 5/8	120 1/8	25,955			Interpolated
MS6001FL	MS0600FC1L	181	73 5/8	120 1/8	26,275*	Interpolated	UUT1		

Old Model Numbers: MS = Series, 090-600 = Module Nominal capacity, 1-4 = Frame Style, F = Flooded, L/S = Shell Length

New Model Numbers: MS = Series, 090-0600 = Module Nominal Capacity, F = Flooded, C = AHRI Certified, 1-4 = Frame Style, L/S = shell Length. The C may be replaced by N, meaning Not AHRI Certified.

*Note: Actual operating weight.

Special Seismic Certification Certified Units



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 2

Certified Product Construction:

Painted shell (carbon steel) and tube (copper) heat exchanger

Certified Options:

460V, 1 to 3 compressors, condensers and evaporators, control panel

Certified Mounting Description:

Flexible base mounted with neoprene pads

Product Line	Model Number	Dimensions (inches)			Estimated Operating Weight (lb)	Size	Sds (g), z/h=1	Unit
		Depth	Width	Height				
MagLev Flooded Chillers	MS0122FC1M	139 1/8	32 1/2	63 7/8	4,500	Smallest ↓ Largest	2.00	Interpolated
	MS0132FC1M	139 1/8	32 1/2	63 3/4	4,670*			UUT6
	MS0152FC1M	139 1/8	34 5/8	77 1/16	6,270			Interpolated
	MS0162FC1M	139 1/8	34 5/8	77	6,990			Interpolated
	MS0192FC1M	140 11/16	35 9/16	77 3/16	7,150			Interpolated
	MS0202FC1M	140 11/16	35 9/16	77 3/16	7,860			Interpolated
	MS0242FC1M	142 3/16	35 1/4	77 3/16	8,670			Interpolated
	MS0292FC1M	143 5/16	37 1/4	77 3/16	9,840			Interpolated
	MS0332FC1M	143 5/16	37 1/4	77 3/16	9,960			Interpolated
	MS0392FC1M	143 11/16	39 1/2	80 3/4	11,350			Interpolated
	MS0412FC1L	167 11/16	39 1/2	88 3/4	13,050			Interpolated
	MS0482FC1L	168 13/16	42 1/2	94 3/8	15,350*			UUT5

Nomenclature: MS = Series, 0122-0482 = Module Nominal Capacity, F = Flooded, C = AHRI Certified, 1-4 = Frame Style, M/L = shell Length. The C may be replaced by N, meaning Not AHRI Certified.

*Note: Actual operating weight.

Certified Components



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 1

Certified Mounting Description: Rigid base mounted

COMPRESSORS		Manufacturer: Danfoss Turbocor	
Mfg. Part No.	Qty Tested	Size	Unit
TT-300	1	Smallest	UUT4
TT-350	n/a	↓	Interpolated
TT-400	4	Largest	UUT1

Note: Variable frequency drive is part of the compressor.

EXPANSION VALVES		Manufacturer: Mueller	
Mfg. Part No.	Qty Tested	Size	Unit
A17924	1	N/A	UUT1, UUT4
AQ17834-225	1		UUT1, UUT4
AR17834	1		UUT1, UUT4

CONDENSERS		Manufacturer: Standard Refrigeration		
Mfg. Part No.	Qty Tested	Size	Unit	
HSE1606		Smallest	UUT4	
HSE1612 OR HSE2405MU1		↓	Interpolated	
HSE2405MU1			Interpolated	
HSE1812			Interpolated	
HSE2012			Interpolated	
QHSE2212			Interpolated	
HSE2412MU1			Interpolated	
HSE2812			Largest	UUT1

EVAPORATORS		Manufacturer: Standard Refrigeration		
Mfg. Part No.	Qty Tested	Size	Unit	
FEV2206		Smallest	UUT4	
FEV2012 OR FEV3005MU2		↓	Interpolated	
FEV2412			Interpolated	
FEV2612			Interpolated	
FEV3005MU2			Interpolated	
QFEV3012			Interpolated	
FEV3612MU1			Interpolated	
FEV4212			Largest	UUT1

FLEXSYS CONTROL SYSTEM		Manufacturer: Beckhoff	
Mfg. Part No.	Qty Tested	Size	Unit
KIT-MULTISTACK2		Smallest	UUT4
KIT-MULTISTACK4		Largest	UUT1

Certified Components



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 2

Certified Mounting Description: Flexible base mounted with neoprene pads

COMPRESSORS **Manufacturer: Danfoss Turbocor**

Mfg. Part No.	Qty Tested	Size	Unit
TT300	2	Smallest	UUT6
TT350	N/A	↓	Interpolated
TT400	2	↓	UUT5
TT450	N/A	↓	Interpolated
TT500	1	Largest	UUT5

Note: Variable frequency drive is part of the compressor.

CONDENSERS **Manufacturer: Standard Refrigeration**

Mfg. Part No.	Qty Tested	Size	Unit
HSE1210		Smallest	Extrapolated
HSE1410		↓	UUT6
HSE1610		↓	Interpolated
HSE1810		↓	Interpolated
HSE2010		↓	Interpolated
HSE2212		↓	Interpolated
HSE2412		Largest	UUT5

EVAPORATORS **Manufacturer: Standard Refrigeration**

Mfg. Part No.	Qty Tested	Size	Unit
FEV1410		Smallest	Extrapolated
FEV1610		↓	UUT6
FEV1810		↓	Interpolated
FEV2010		↓	Interpolated
FEV2210		↓	Interpolated
FEV2412		↓	Interpolated
FEV2612		Largest	UUT5

CONDENSER/EVAPORATOR EXPANSION VALVES **Manufacturer: Carel**

Mfg. Part No.	Qty Tested	Size	Unit
E7V		N/A	UUT6

EXPANSION VALVES **Manufacturer: Sporlan**

Mfg. Part No.	Qty Tested	Size	Unit
Y12-31		N/A	UUT5

Certified Components



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 2

Certified Mounting Description: Flexible base mounted with neoprene pads

ECONOMIZER (BPHE)		Manufacturer: SWEP	
Mfg. Part No.	Capacity (Tons)	Dimensions, WxHxD (in)	Unit
V200THx40	10-25	9.6x20.7x4.2	UUT6
V200THx60		9.6x20.7x6.0	Interpolated
V200THx80	25-45	9.6x20.7x7.8	Interpolated
V200THx130		9.6x20.7x12.3	Interpolated
S400THx120	30-80	12.0x27.3x11.5	UUT5

ECONOMIZER EXPANSION VALVES		Manufacturer: Sporlan	
Mfg. Part No.		Size	Unit
SERI-G		Smallest	UUT6
SERI-J		↓	Interpolated
SERI-K		Largest	UUT5

FLEXSYS CONTROL SYSTEM		Manufacturer: Multistack	
Mfg. Part No.		Size	Unit
FLEXSYS-GEN2		N/A	UUT5, UUT6

UUT1 Unit Under Test Summary Sheet



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line

Model Number: Old Model Number, MS6001FL; New Model Number MS0600FC1L

Product Construction Summary:
Painted shell (carbon steel) and tube (copper) heat exchanger

Options / Component Summary:
460V, 4 compressors - size TT-400 (frame size 1), 1 condenser and 1 evaporator, long shells, control panel

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 (inches)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
26,275	181	74	121	11.3	9.4	28.0

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
CBC 2013	ICC-ES AC156	1.93	1.0	1.5	3.09	2.32	1.29	0.51

Unit Mounting Description:



UUT1 was mounted to a rigid steel frame with eight (8) 7/8-inch diameter Grade 8 bolts. There were four (4) bolts per mounting plate on the unit. The mounting fixture frame consisted of W10X33 steel beams. The mounting fixture was secured to the shake table with twelve (12) 1 1/4-inch diameter A490 bolts.

UUT4 Unit Under Test Summary Sheet



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line

Model Number: Old Model Number, MS0901FS; New Model Number, MS0090FC1S

Product Construction Summary:
Painted shell (carbon steel) and tube (copper) heat exchanger

Options / Component Summary:
460V, 1 compressor - size TT-300 (frame size 1), 1 condenser and 1 evaporator, short shells, control panel

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 (inches)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
5,250	91	40.5	83	>33	9.0	26.5

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
CBC 2013	ICC-ES AC156	1.93	1.0	1.5	3.09	2.32	1.29	0.51

Unit Mounting Description:



UUT4 was mounted to the DCL-provided steel shake table interface plate using eight (8) 3/4-inch diameter Grade 8 bolts. There were four (4) bolts per each mounting plate. The shake table interface plate was attached to the shake table using M12 threaded rod, spaced approximately 8-inches on-center. The UUT was full of operating fluid during the test.

UUT5 Unit Under Test Summary Sheet



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 2

Model Number: MS0482FC1L

Product Construction Summary:

Painted shell (carbon steel) and tube (copper) heat exchanger

Options / Component Summary:

460V, (2) size TT-400 compressors and (1) size TT-500 compressor (frame size 1), condenser, evaporator, economizer, 12-foot shells and controller

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 (inches)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
15,350	168 13/16	42 1/2	94 3/8	6.5	5.5	11.8

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Afix-H	Arig-H	Afix-V	Arig-V
CBC 2013	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:



UUT5: The unit was mounted to the shake table interface frame using 3/8-inch thick neoprene pads and eight (8) 3/4-inch diameter Grade 5 bolts (four per each base plate). The shake table interface frame was mounted to the shake table with 1 1/4-inch diameter threaded studs.

UUT6 Unit Under Test Summary Sheet



Manufacturer: Multistack

Product Line: MS_F MagLev Flooded Chiller Line: Gen 2

Model Number: MS0132FC1M

Product Construction Summary:
Painted shell (carbon steel) and tube (copper) heat exchanger

Options / Component Summary:
460V, (2) size TT-300 compressors (frame size 1), condenser, evaporator, economizer, 10-foot shells and controller

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 (inches)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
4,670	139 1/8	32 1/2	63 3/4	8.5	7.3	14.5

Seismic Test Parameters

Building Code	Test Criteria	Sds	z/h	Ip	Aflx-H	Arig-H	Aflx-V	Arig-V
CBC 2013	ICC-ES AC156	2.00	1.0	1.5	3.20	2.40	1.33	0.53

Unit Mounting Description:



The unit was mounted to the shake table interface frame using 1/2-inch thick neoprene pads and eight (8) 5/8-inch diameter Grade 5 bolts (four per each base plate). The shake table interface frame was attached to the shake table with M12 threaded rod, spaced approximately 8-inches on-center.