APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY	
APPLICATION #:	OSP – 0601 – 10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☒ New ☐ Renewal

Manufacturer Information

Manufacturer: Daikin Applied

Manufacturer's Technical Representative: Art Rizoli

Mailing Address: 207 Laurel Hill Rd., Verona, VA 24482

Telephone: 540.248.9539 Email: Mad Art.rizoli@daikinapplied.com

Product Information

Product Name: Magnitude® Magnetic Bearing Centrifugal Chillers (WME)

Product Type: Water Cooled Chillers

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

General Description: Centrifugal Chillers. Seismic enhancements made to the test units required to address the anomalies observed during the tests shall be incorporated into the production units.

Mounting Description: Base mounted - neoprene isolated.

Applicant Information

Applicant Company Name: Structural Integrity Associates, Inc. dba TRU Compliance

Contact Person: Andrew M. Coughlin, SE

Mailing Address: 5215 Hellyer Ave., Suite 210, San Jose, CA 95138

Telephone: 844-878-0200 Email: acoughlin@structint.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: Andrew M Coughlin Date: 4/23/2019

Title: Director, TRU Compliance Company Name: Structural Integrity Associates, Inc.

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

Company Name: Structural Integrity Associates, Inc.

Name: Andrew M. Coughlin California License Number: S6082

Mailing Address: 5215 Hellyer Ave., Suite 210, San Jose, CA 95138

Telephone: 844-878-0200 Email: acoughlin@structint.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: PEER, UC Berkeley

Contact Name: Alex R. Mead

Mailing Address: 1302 South 46th Street, Richmond CA 94804

Telephone: (616) 901-2479 Email: Alex.r.mead@gmail.com

Company Name: U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL)

Contact Name: Jim Wilcoski

Mailing Address: 2902 Newmark Dr. Champaign, IL 61822

Telephone: (217) 373-6763 Email: james.wilcoski@usace.army.mil

Seismic Parameters

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

Design Basis of Equipment or Components (F_p/W_p) = 1.50 @ S_{DS} = 2.00, z/h = 1; 1.13 @ S_{DS} = 2.50, z/h = 0

S_{DS} (Design spectral response acceleration at short period, g) = 2.00 @ z/h = 1.0; 2.50 @ z/h = 0.0

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

R_p (Equipment or component response modification factor) = 6.0

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height factor ratio) = 1 @ S_{DS} = 2.00; 0 @ S_{DS} = 2.50

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, 2015: ☐ Yes ☒ No

List of Attachments Supporting Special Seismic Certification

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

☒ Other(s) (Please Specify): Attachment

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

Signature: _____ Date: May 7, 2019

Print Name: Timothy J. Piland Title: SSE

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

Condition of Approval (if applicable):

SPECIAL SEISMIC CERTIFICATION CERTIFIED COMPONENT MATRIX

TRU PROJECT NO. 1700688

TRU COMPLIANCE

Manufacturer: Daikin Applied
Model Line: Magnitude Magnetic Bearing Centrifugal Chillers

TABLE 1

Certified Product Construction Summary:
Carbon Steel

Certified Options Summary:
Subcomponents and options are summarized in Table 2 and Table 3.

Mounting Configuration:
Base mounted - rigid & neoprene isolated
Note: Installed mounting configuration must be of similar configuration and equivalent strength and stiffness to those tested.

Building Code: CBC 2016 ***Seismic Certification Limits:*** S_{DS}= ***2.0 g*** ***z/h=1.0*** S_{DS}= ***2.5 g*** ***z/h=0.0*** I_P= ***1.5***

Model Line	Model[1]	Dimensions (in)[2]			Weight (lb)[3]	Notes	UUT
		Depth	Width	Height			
Magnitude Magnetic Bearing Centrifugal Chillers, Model WMC	WMC060DC/E3009	168.5	55.2	94.3	9,555		3
Magnitude® Magnetic Bearing Centrifugal Chillers, Model WME, 400-1600 tons	WME501 E3012/C2612	168	68	97	14,307		Interp.
	WME501 E3012/C3012	168	71	101	15,958		Interp.
	WME501 E3612/C3012	170	71	116	18,709		Interp.
	WME701 E3612/C3612	170	88	107	22,478		Interp.
	WME701 E3612/C3012	170	85	101	19,423		Interp.
	WME092AS	194.9	96.1	102.7	25,557		Interp.
	WME092BS	194.9	96.1	102.7	25,557		Interp.
	WME106AS	195.1	101.8	108.7	30,731		Interp.
	WME106BS	195.2	101.8	108.7	30,371		Interp.
	WME092AD	252	116	110	48,490		Interp.
	WME092BD	252	116	110	48,490		Interp.
	WME106AD	252	116	110	48,490		Interp.
	WME106BD	252	116	110	48,490		Interp.
	WME099AD	252	116	110	48,490		Interp.
	WME099BD	252	116	110	48,490		4

Notes:
[1] WME 501/701 are identical to WME096/099/106 except for software.
[2]All WME model configurations limited to dimensions of UUT 4.
[3]All WME model configurations limited to the weight of UUT 4.

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1700688

TRU COMPLIANCE

Manufacturer:	Daikin Applied	***Table Description:*** Compressor, Evaporator and Condensors	**TABLE 2**
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers		

Building Code: CBC 2016 ***Seismic Certification Limits:*** S_{DS} = 2.0 g z/h = 1.0; S_{DS} = 2.5 g z/h = 0.0 I_P = 1.5

Component Type	Manufacturer	Model	Description	Notes	UUT
Compressor	Danfoss/Turbocor	TT700	380V to 460V, 318 lbs., 20.4"x31"x19.2"	Magnetic Bearing Compressor with Integral Motor and Variable Frequency Drive (Cast Aluminum Shell)	3
	Daikin	092A	32.91"d x 44.85"w x 24.5"h, 961 lbs.	Magnetic Bearing Compressor (Carbon Steel)	4
		092B	32.91"d x 44.85"w x 24.5"h, 961 lbs.		Interp.
		106A	35.21"d x 44.95"w x 25.2"h, 1118 lbs.		4
		106B	35.21"d x 44.95"w x 25.2"h, 1118 lbs.		Interp.
Evaporator	Daikin	E2209	22"ø x 9"h, 1624 lbs.	Carbon Steel ASME Shell with Copper Tubes	Extrap.
		E2212	22"ø x 12"h, 2803 lbs.		Extrap.
		E2609	26"ø x 9"h, 2271 lbs.		Extrap.
		E2612	26"ø x 12"h, 2907 lbs.		Extrap.
		E3009	30"ø x 9"h, 3032 lbs.		3
		E3012	30"ø x 12"h, 3, 861lbs.		Interp.
		E3612	36"ø x 12"h, 5,669 lbs.		Interp.
		E4216	42"ø x 16"h, 10,200 lbs.		4

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1700688

TRU COMPLIANCE

Manufacturer:	Daikin Applied	***Table Description:*** Compressor, Evaporator and Condensors	**TABLE 2**
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers		

Building Code: CBC 2016 ***Seismic Certification Limits:*** S_{DS} = 2.0 g z/h = 1.0; S_{DS} = 2.5 g z/h = 0.0 I_P = 1.5

Component Type	Manufacturer	Model	Description	Notes	UUT
Condenser	Daikin	C2009	20"ø x 9"h, 1926 lbs.	Carbon Steel ASME Shell with Copper Tubes	Extrap.
		C2012	20"ø x 12"h, 2381 lbs.		Extrap.
		C2209	22"ø x 9"h, 2228 lbs.		Extrap.
		C2212	22"ø x 12"h, 2716 lbs.		Extrap.
		C2609	26"ø x 9"h, 3189 lbs.		3
		C2612	26"ø x 12"h, 3,806 lbs.		Interp.
		C3012	30"ø x 12"h, 5,011 lbs.		Interp.
		C3612	36"ø x 12"h, 7264 lbs.		Interp.
		C4212	42"ø x 12"h, 9706 lbs.		Interp.
		C4216	42"ø x 16"h, 13,367 lbs.		4

SPECIAL SEISMIC CERTIFICATION
CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1700688

TRU COMPLIANCE

Manufacturer:	Daikin Applied	***Table Description:*** Electrical Subcomponents	**TABLE 3**
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers		

Building Code: CBC 2016 ***Seismic Certification Limits:*** $S_{DS} = 2.0\,g$ $z/h = 1.0$; $S_{DS} = 2.5\,g$ $z/h = 0.0$; $I_P = 1.5$

Component Type	Manufacturer	Model	Description	Notes	UUT
Motor	Daikin	M7-092Y	450hp, 380V - 480V, Al shell 32.91"d x 44.85"w x 24.5"h, 961 lbs.	Permanent Magnet	4
		M7-092X	450hp, 380V - 480V, Al shell 32.91"d x 44.85"w x 24.5"h, 961 lbs.		Interp.
		M9-106Y	600hp, 380V - 480V, Al shell 35.21"d x 44.95"w x 25.19"h, 1118 lbs.		Interp.
		M9-106X	600hp, 380V - 480V, Al shell 35.21"d x 44.95"w x 25.19"h, 1118 lbs.		4
VFD Starter	PSI	FRN0520E2S-4UDA-220C	20.87"d x 57.75"w x 57.75"H, 1155 lbs.		4
		FRN0590E2S-4UDA-280C	20.87"d x 57.75"w x 57.75"H, 1155 lbs.		Interp.
		FRN0650G1S-4UDA-315C	20.87"d x 62.5"w x 62.13"H, 1155 lbs.		Interp.
		FRN0740G1S-4UDA-355C	20.87"d x 62.5"w x 62.13"H, 1155 lbs.		Interp.
		FRN160VG1S-4UDA-160C	20.87"d x 85"w x 57.5"H, 1575 lbs.		Interp.
		FRN200VG1S-4UDA-200C	20.87"d x 85"w x 57.5"H, 1575 lbs.		Interp.
		FRN220VG1S-4UDA-220C	20.87"d x 85"w x 57.5"H, 1575 lbs.		4
Controllers	PSI	Part 331346712	MicroTech, Siemens/PC based 8.9"d x 18.2"w x 25"h, 79 lbs.	Unit Controller	4
	Benshaw/Carel	Part 332830705	MicroTech II, Carel based, Carbon Steel 8.9"d x 16"w x 32.8"h, 75 lbs.		3
Operator Interface	AxiomTech	Part 331670401	OITS, 21" Touch Screen, Plastic 2.2"d x 20.7"w x 12.6"h, 6.4 lbs.		3,4

UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

Manufacturer: Daikin Applied

Model Line: Magnitude Magnetic Bearing Centrifugal Chillers

UUT	Unit Description	Report Number	Testing Laboratory	S_{DS}	z/h	I_P
3	WMC060DC/E3009-HB2CL2V/C2609-GB2CL2V	15046-TR-001, Rev. 0	PEER Laboratory, UC Berkeley	2.0	1.0	1.5
				2.5	0.0	
4	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V	1700688-TR-001 R0	ERDC-CERL	2.0	1.0	1.5
				2.5	0.0	

UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 3

Manufacturer:	Daikin Applied		
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers		
Model Number:	WMC060DC/E3009-HB2CL2V/C2609-GB2CL2V	***Serial Number:***	517A000900

Product Construction Summary:

Carbon Steel

Options/Subcomponent Summary:

WMC060D with E3009 Evaporator, C2609 Condenser, Dual Danfoss TT700 Compressors, MicroTech II Unit Controller in Benshaw Enclosure (Part 332830705), Power Panel in Benshaw Enclosure (Part BOX-ELEC,BEN-WMC_350D_C_ TT700_ 01640_TT700_01640_ D_ 00460_ H6_ A_ S_ D_ N_ N_ S_ N_ N_ N_ S_RA), Tru-Vu 21" Interface (Part 331670401)

UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
9,555	168.5	55.2	94.3	14.2	14.3	12.8

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2016	ICC-ES AC156 (2015)	2.0	1.0	1.5	3.2	2.4	1.67	0.67
		2.5	0.0					

Test Mounting Details:

Unit was rigid base mounted to the table using (8) 1" diameter SAE Grade 8 bolts and a 1/4" ribbed neoprene pad under each mounting foot.
Unit maintained structural integrity and remained functional per manufacturer requirement.
Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer: Daikin Applied
Model Line: Magnitude Magnetic Bearing Centrifugal Chillers
Model Number: WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

Product Construction Summary:
Carbon Steel

Options/Subcomponent Summary:
WME099BD/E4216-YE2CR2V/C4216-JB2CR2V with E4216 Evaporator, C4216 Condenser, Daikin 092Y and 106X Dual Compressors, Daikin M7 and M9 dual motors (450hp and 600hp), FRN0520E2S-4UDA and FRN220VG1S-4UDA Dual VFD Starters, PSI MicroTech Controller (Part 331346712), Tru-Vu 21" Interface (Part 331670401), Daikin Seismic Kit (Part 910268269)

UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
48,490	252	116	110	5.97	5.57	16.47

UUT Highest Passed Seismic Run Information

Building Code	Test Criteria	S_{DS} (g)	z/h	I_P	A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2016	ICC-ES AC156 (2015)	2.0	1.0	1.5	3.2	2.4	1.67	0.67
		2.5	0.0					

Test Mounting Details:

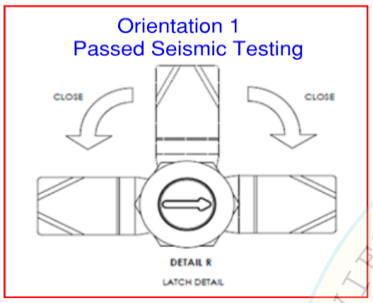
UUT4 was base mounted to the table fixture using (8) 1" diameter SAE Grade 8 bolts and a 3/8" ribbed neoprene pad under each mounting foot. The fixture was mounted to the table using (36) 1-1/4" diameter SAE Grade 8 bolts.
Unit maintained structural integrity and remained functional per manufacturer requirement.
Contents were included in testing per operating conditions.

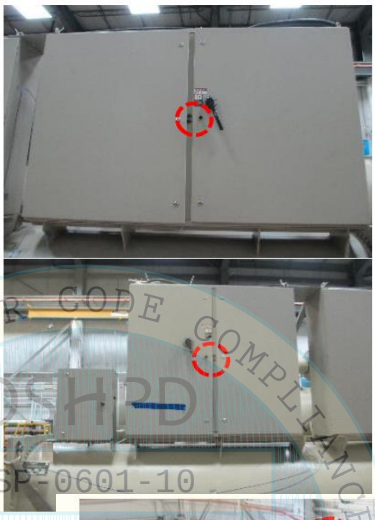
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

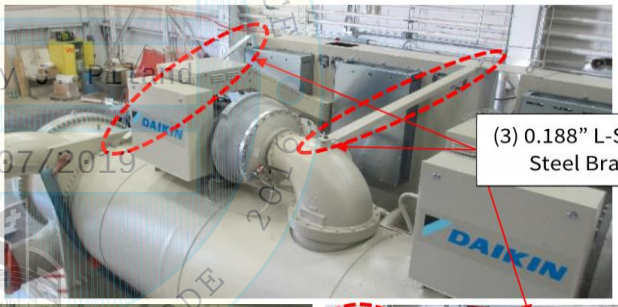
Manufacturer:	Daikin Applied	**UUT 4**
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers	
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V	***Serial Number:***

A door closure mechanism were added to the electrical cabinets. Please see the Daikin Seismic Drawing below for more details. Daikin (Part 910268269)

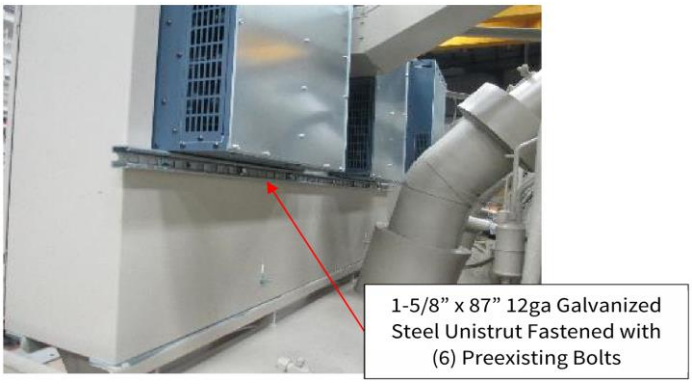




The electrical cabinets were braced using (3) 0.188" L-shaped carbon steel braces. The cabinets were restrained to each other using a 0.188" carbon steel plate fastened using (4) existing eye hooks. Please see the Daikin Seismic Drawings (RH Bracket- Drawings 1 & 6 -11 and LH Bracket-Drawings 3 & 11) for more details including material and dimensions. Daikin (Part 910268269)



The large electrical cabinet was stiffened using a 1-5/8" x 87" 12ga galvanized carbon steel Unistrut fasten with (6) preexisting bolts. Please see the Daikin Seismic Drawings 4 & 12 for more details including material and dimensions. Daikin (Part 910268269)



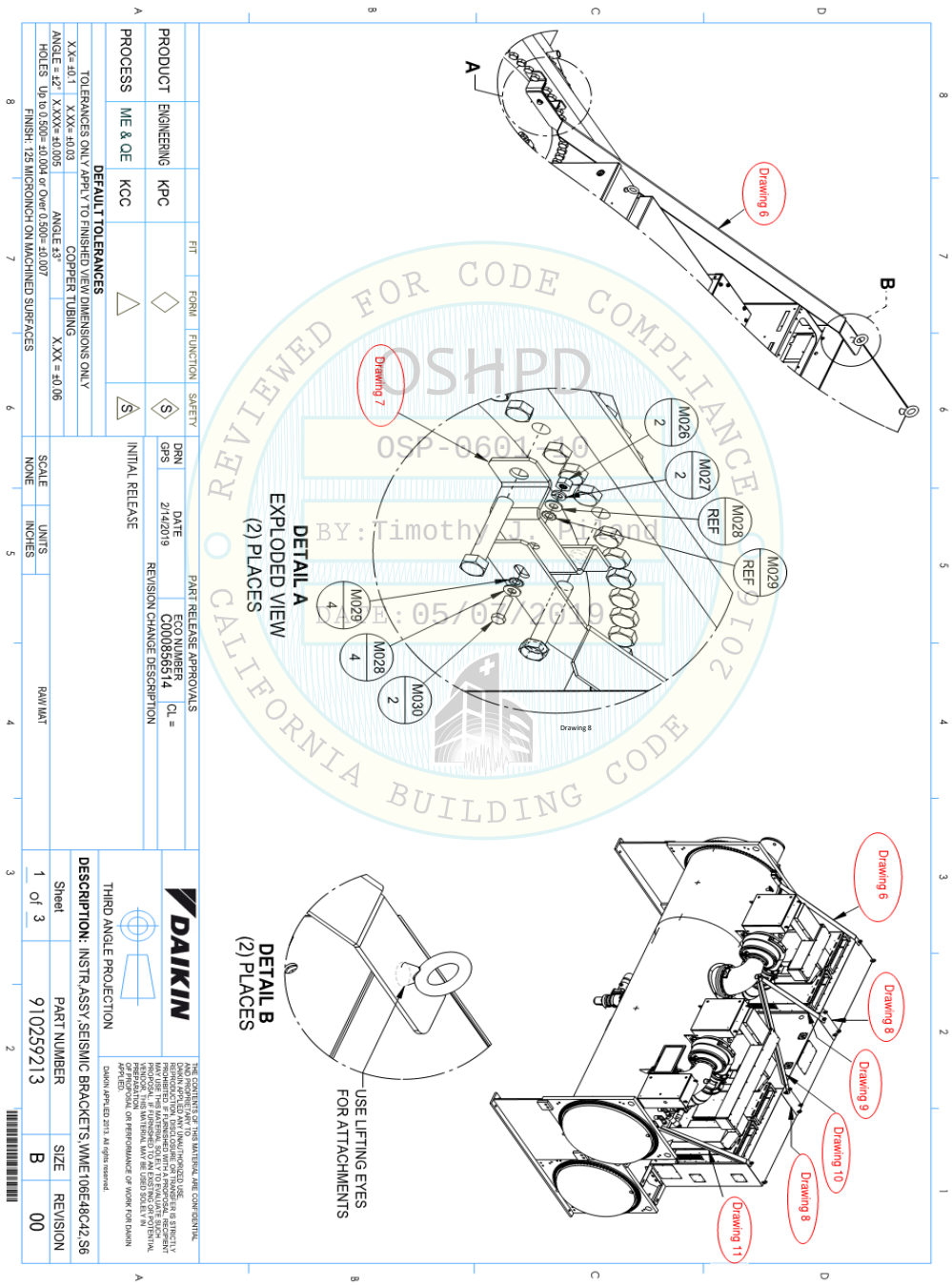
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

Modification Drawing Key and RH Bracket-Drawing 1



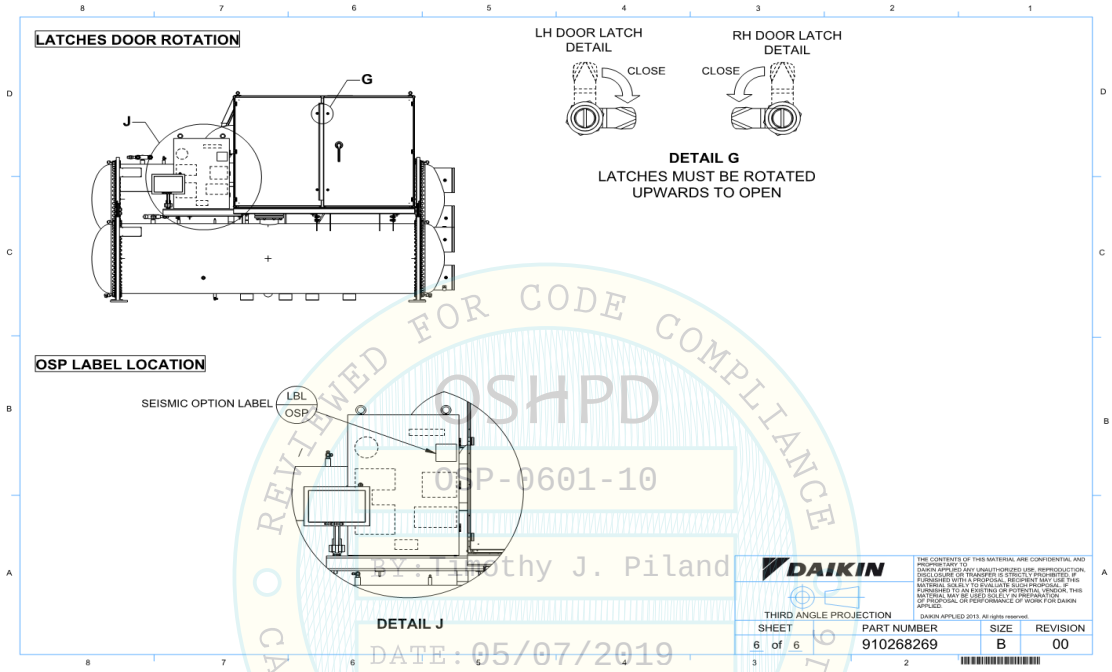
Materials and Dimensions referenced in Drawing 6 - 11

UNIT UNDER TEST (UUT) SUMMARY SHEET

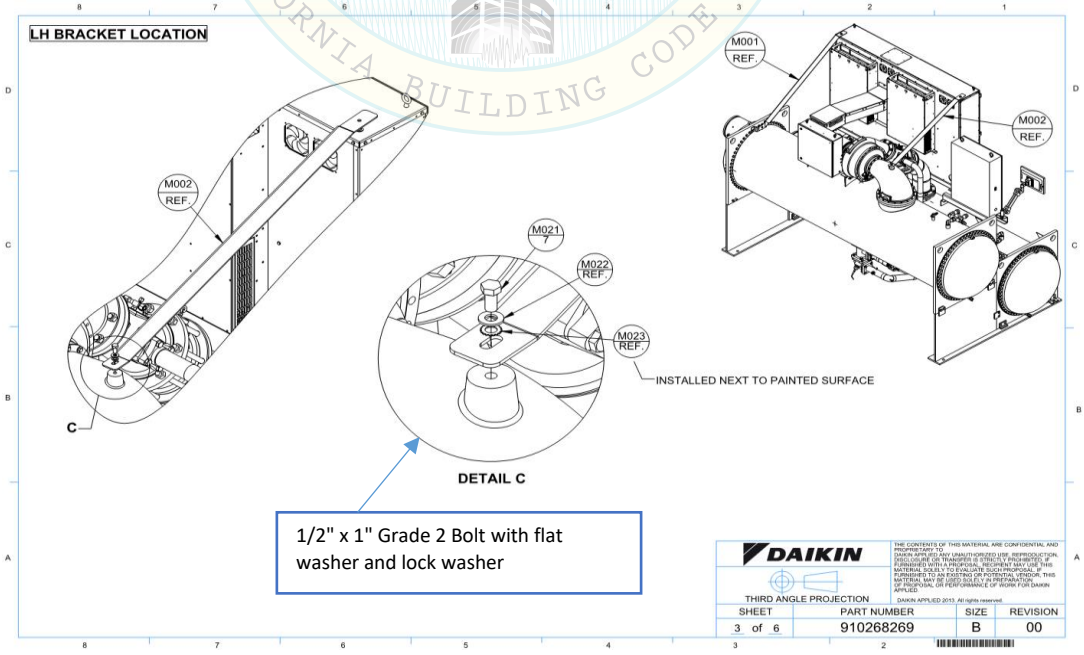
TRU PROJECT NO. 1700688

Manufacturer:	Daikin Applied	**UUT 4**
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers	
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V	***Serial Number:***

Latches -Drawing 2



LH Bracket -Drawing 3

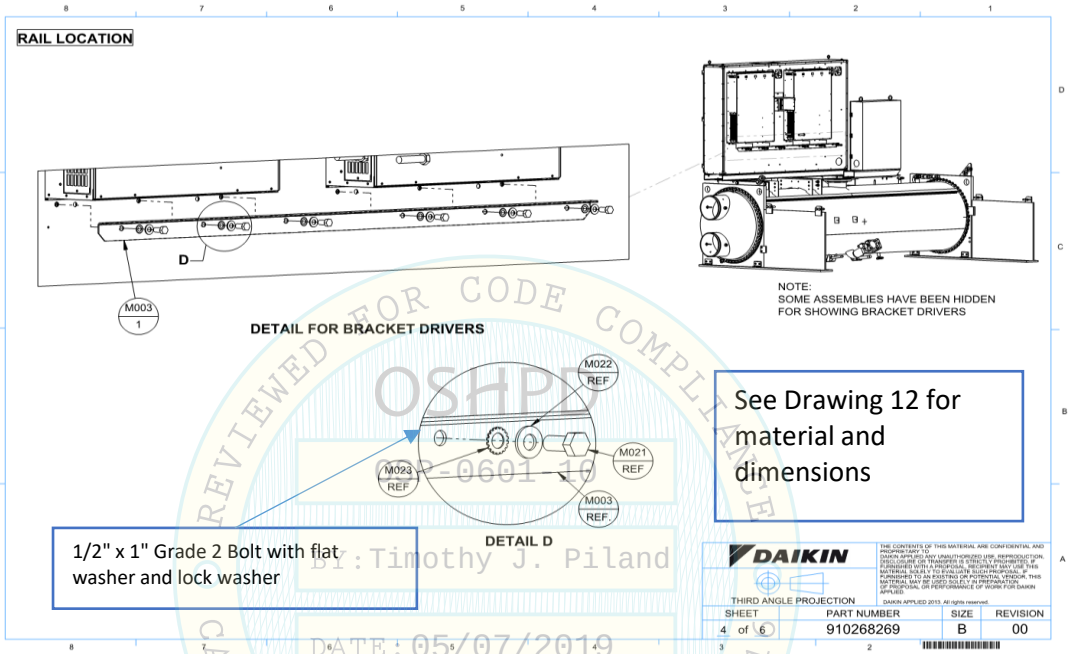


UNIT UNDER TEST (UUT) SUMMARY SHEET

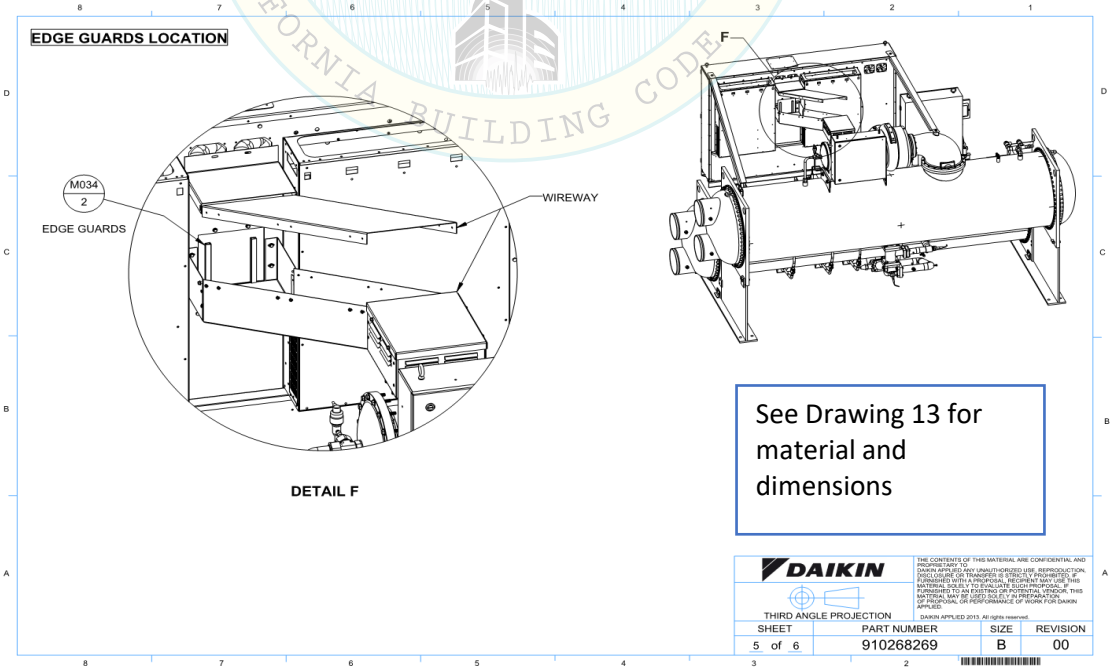
TRU PROJECT NO. 1700688

Manufacturer:	Daikin Applied	**UUT 4**
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers	
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V	***Serial Number:***

RAIL-Drawing 4



Edge Guard - Drawing 5



Materials and Dimensions referenced in Drawing 13

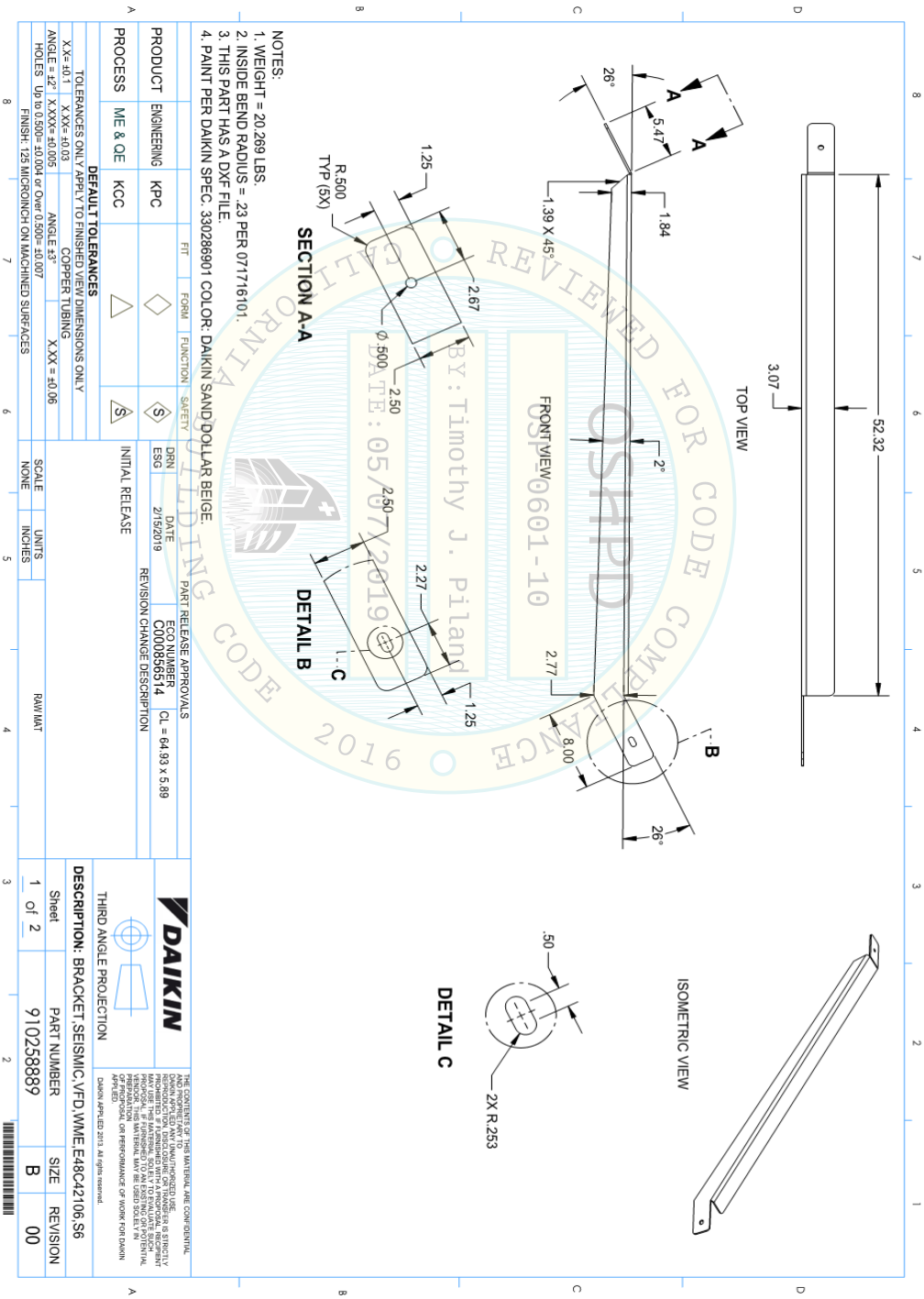
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V
Serial Number:	

RH Bracket Part 1 Material and Dimensions - Drawing 6



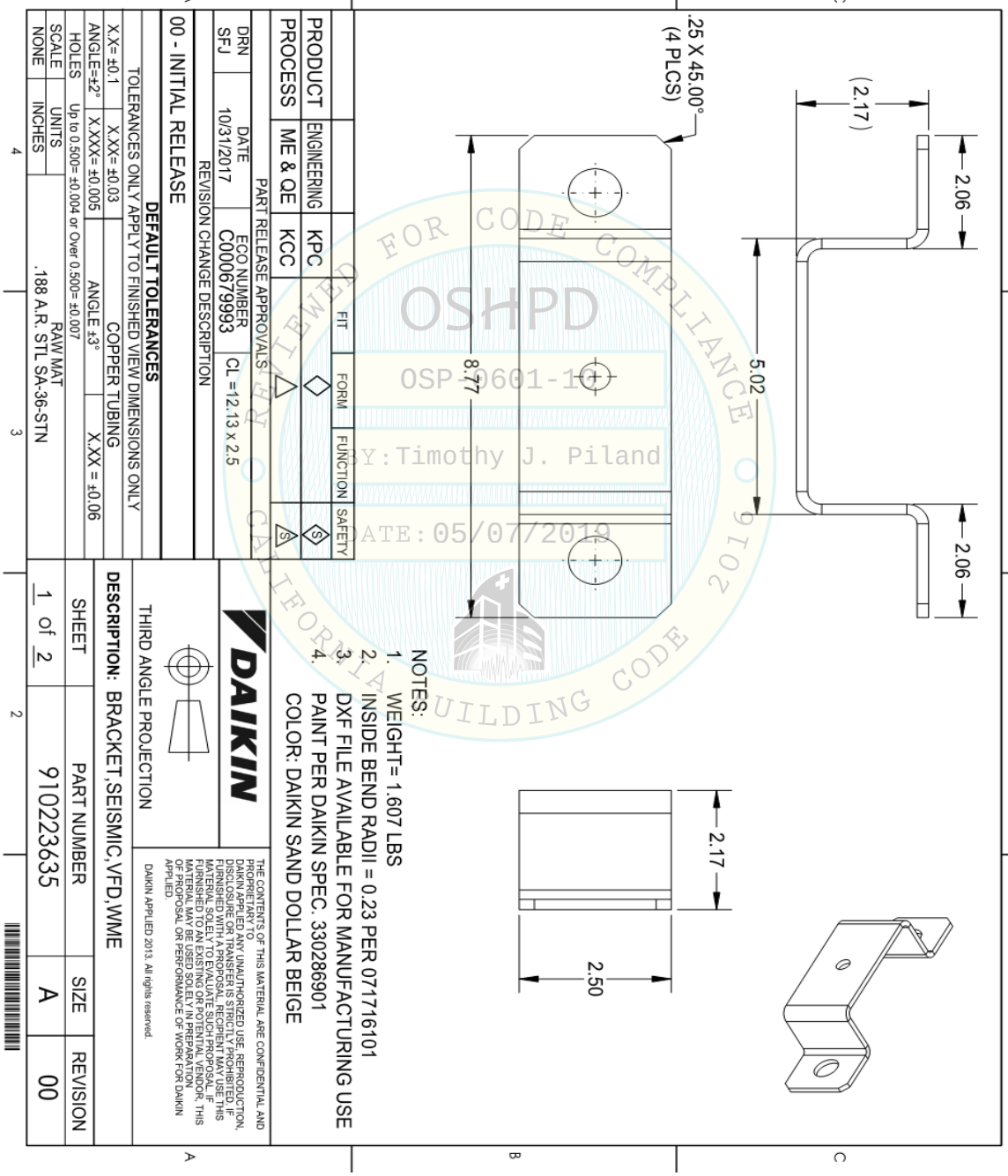
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

RH Bracket Part 1 Material and Dimension - Drawing 7



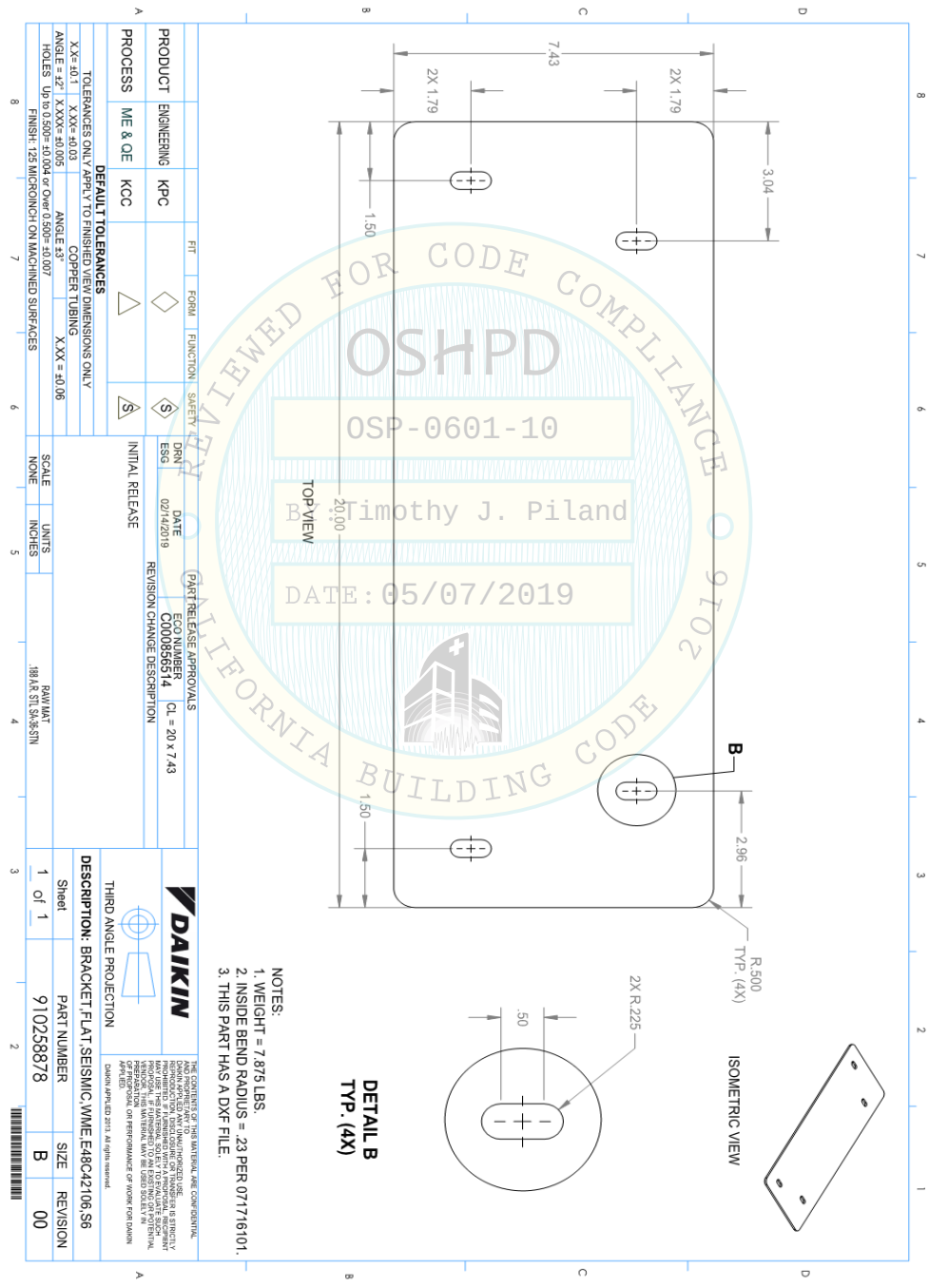
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

RH Bracket Material and Dimensions - Drawing 8



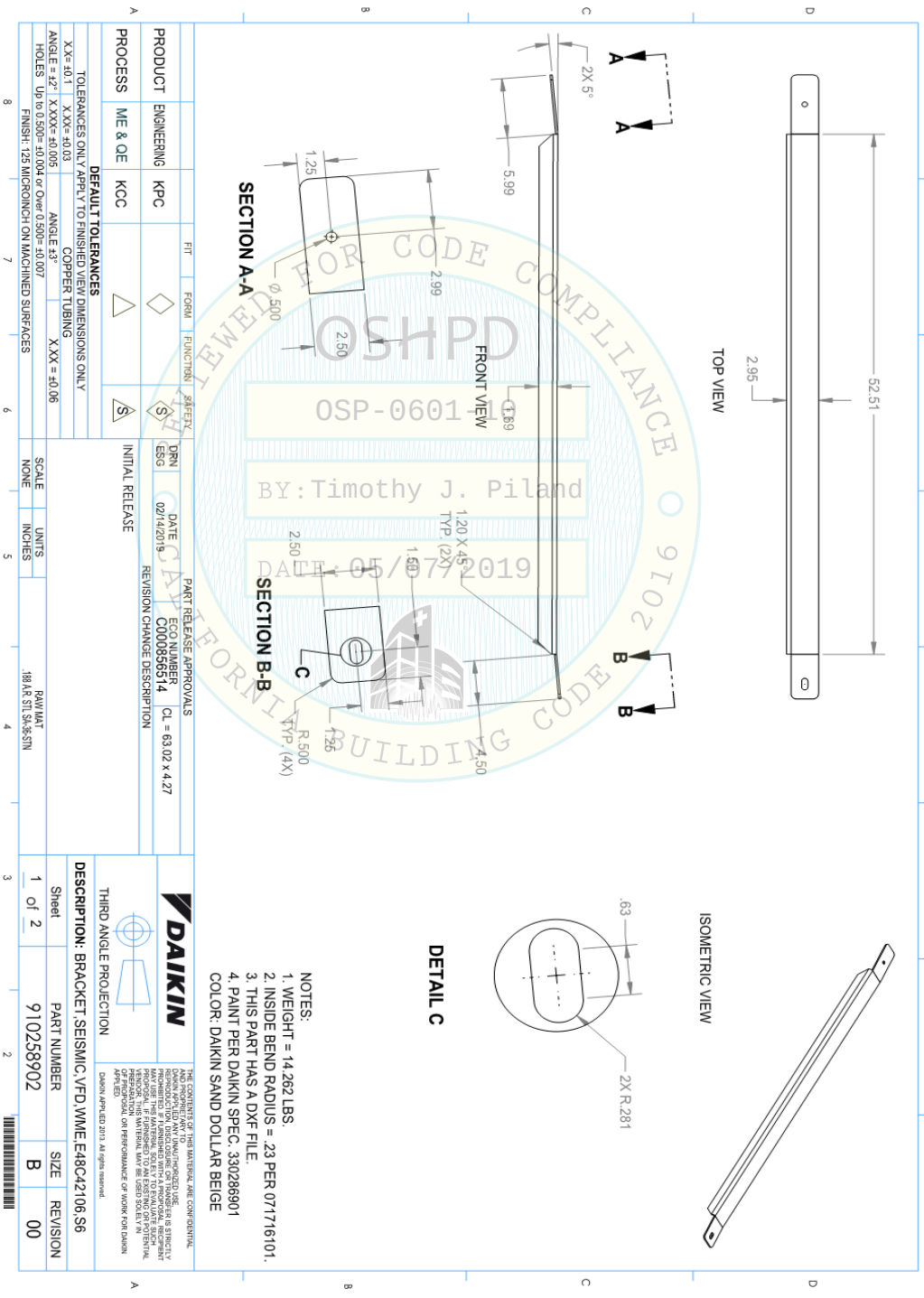
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

Center Brace #1 Material and Dimensions - Drawing 9



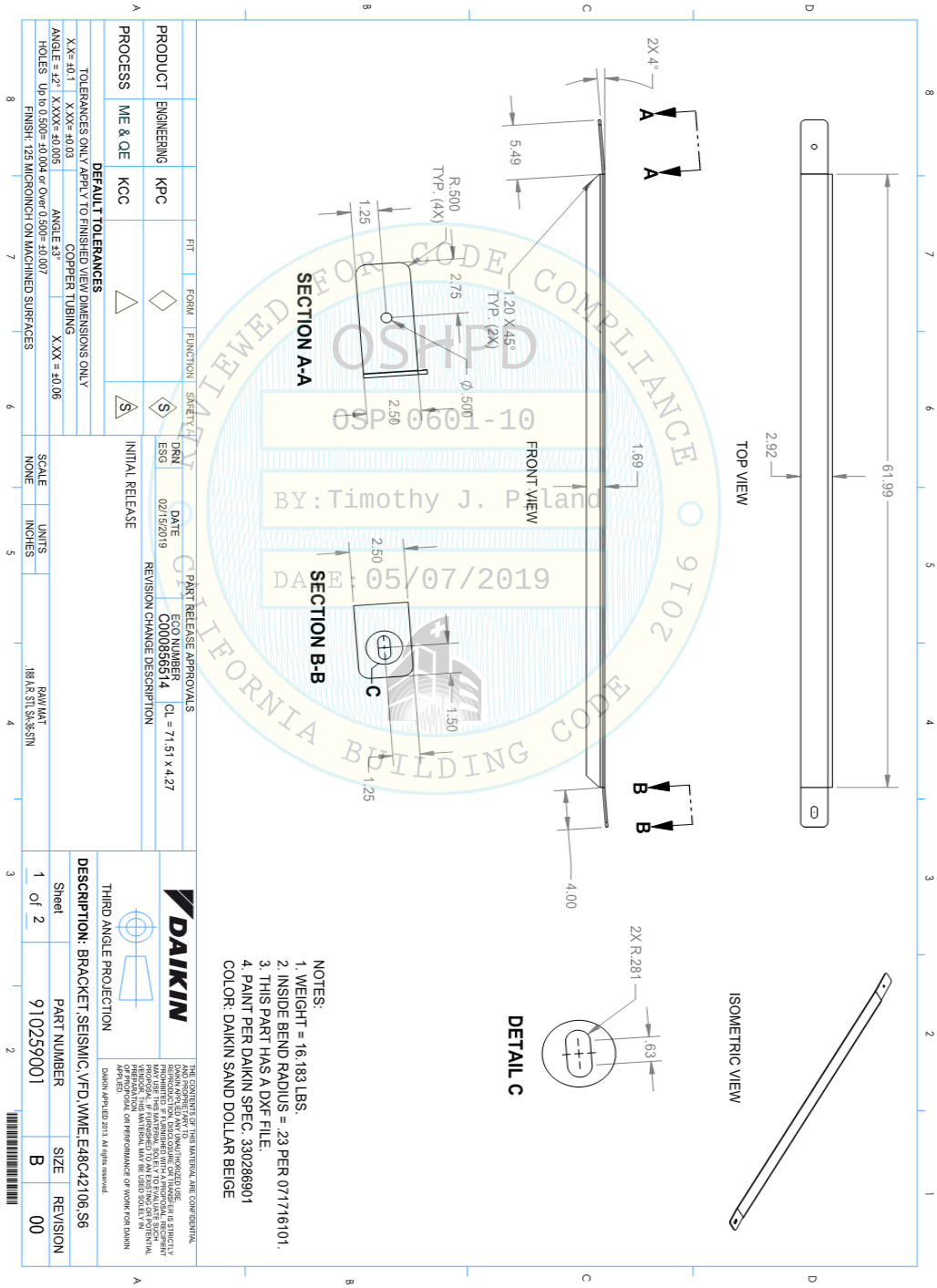
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

Center Brace #2 Material and Dimensions - Drawing 10



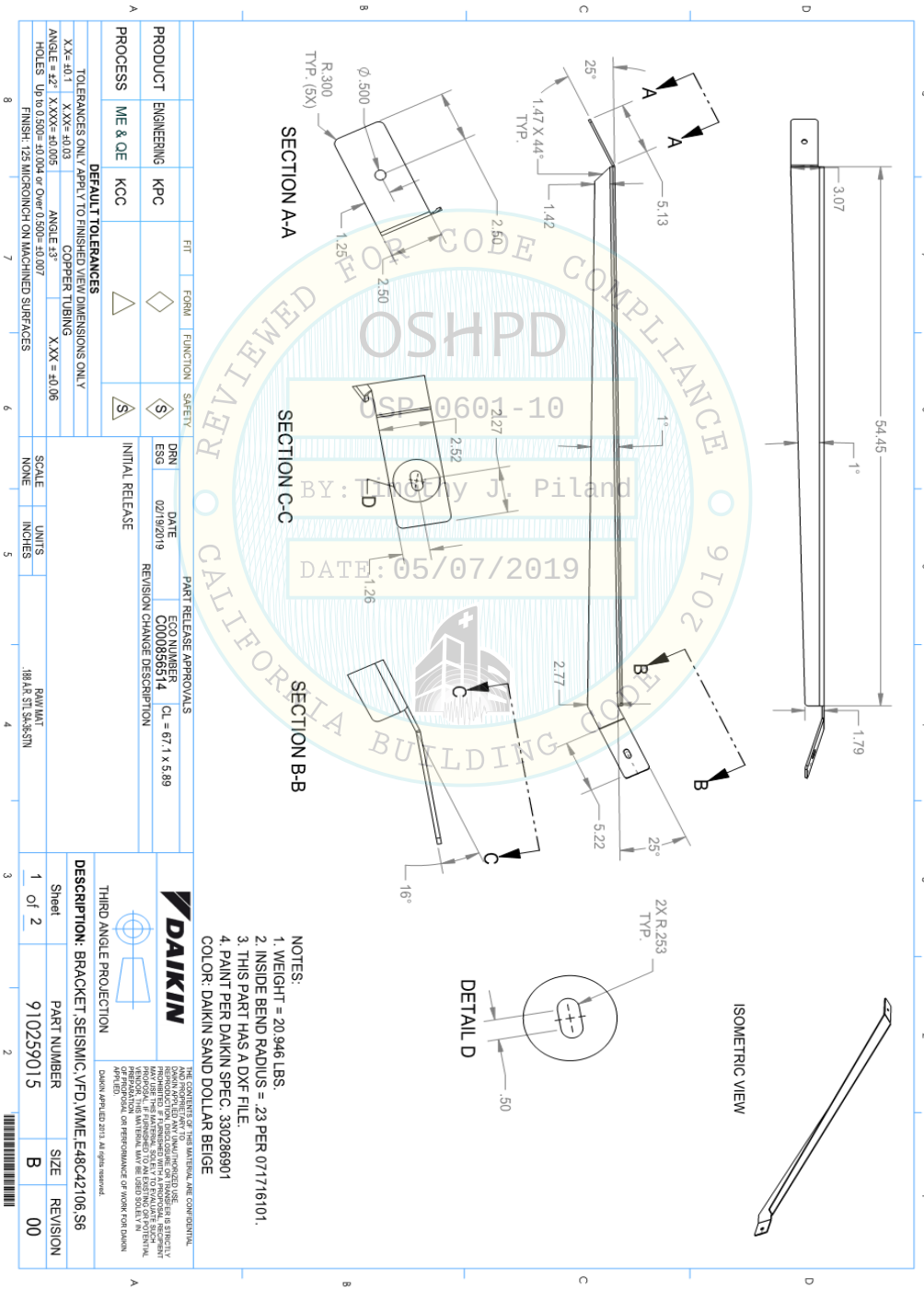
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

LH Bracket Material and Dimensions - Drawing 11



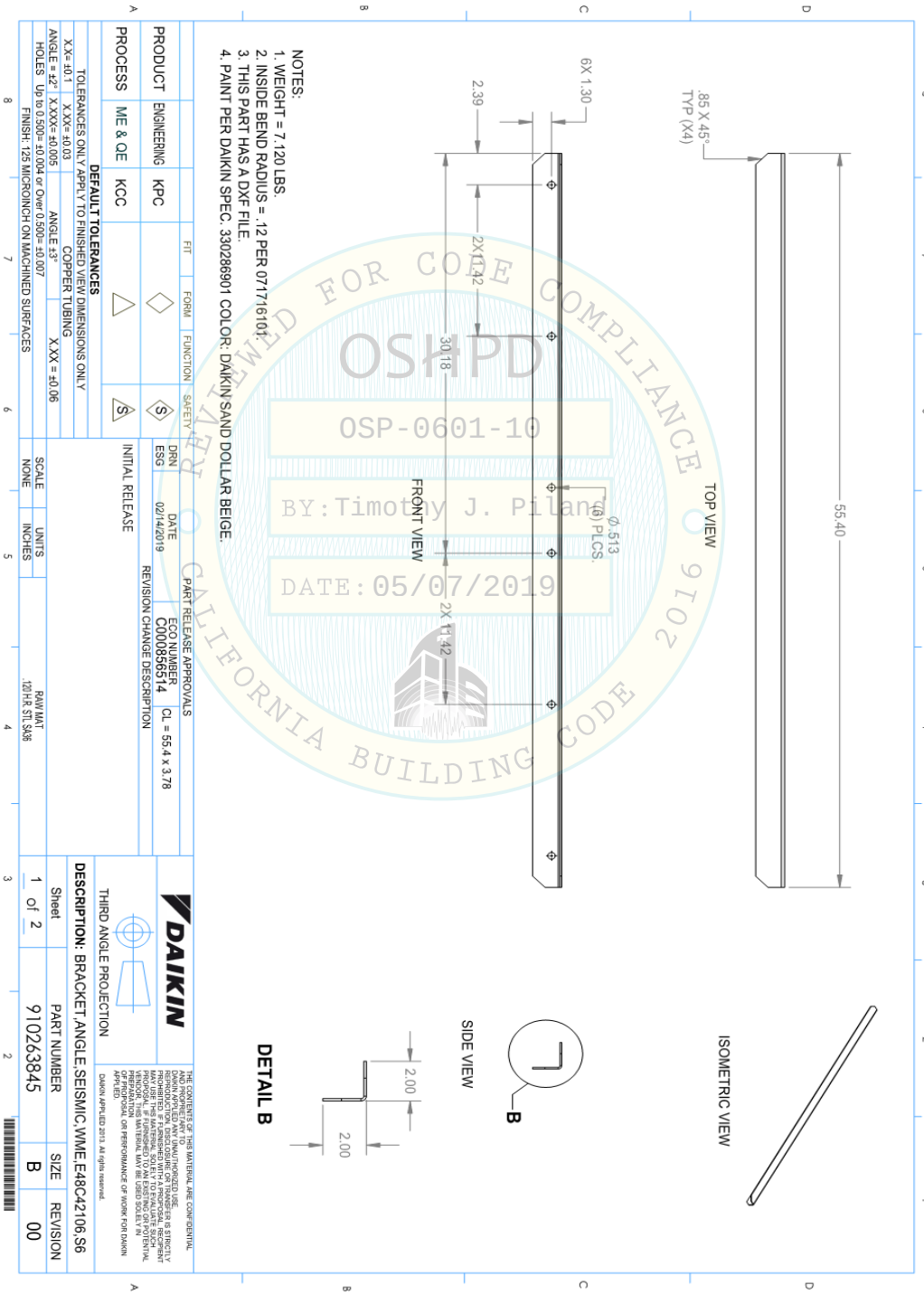
UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V
Serial Number:	

Rail Material and Dimensions - Drawing 12



UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1700688

UUT 4

Manufacturer:	Daikin Applied
Model Line:	Magnitude Magnetic Bearing Centrifugal Chillers
Model Number:	WME099BD/E4216-YE2CR2V/C4216-JB2CR2V ***Serial Number:***

Rail Material and Dimensions - Drawing 13

Edge guard length will vary depending on WME. Installer will cut to insure the length of edge guard protect wires from being frayed.