



OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD SPECIAL SEISMIC
CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP – 0556-10

OSHPD Special Seismic Certification Preapproval (OSP)

Type: ☐ New ☒ Renewal

Manufacturer Information

Manufacturer: Vertiv Corporation

Manufacturer's Technical Representative: Keith Goshia

Mailing Address: 975 Pittsburgh Drive, Delaware, OH 43015

Telephone: 740-833-8557

Email: Keith.Goshia@vertivco.com

Product Information

Product Name: Vertiv EXM UPS

Product Type: Uninterruptible Power Supply (UPS)

Product Model Number: Various - See Attachments

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

General Description: 208V & 480V UPS System. 10-250 kVA. Modifications made to test units to address anomalies observed during testing shall be incorporated into production units.

Mounting Description: Base Mounted – Rigid

Applicant Information

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

Contact Person: Galen Reid

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

Telephone: 844-878-0200

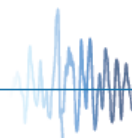
Email: greid@structint.com

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:  Date: 1/30/2019

Title: Program Manager Company Name: TRU Compliance, by Structural Integrity Associates, Inc.

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





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

Company Name: TRU Compliance, by 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: QualTech NP, by Curtiss-Wright

Contact Name: Jason VonNida

Mailing Address: 4600 East Tech Drive, Cincinnati, OH 45245

Telephone: 513-201-2139 Email: jvonnida@curtisswright.com

Company Name: Pacific Earthquake Engineering Research (PEER)

Contact Name: Amarnath Kasalanati

Mailing Address: 1301 South 46th St., Bldg.420, Richmond, CA 94804

Telephone: 510-642-6475 Email: peer_center@berkeley.edu



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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) = 1.45 (z/h = 1); 0.87 (z/h = 0)

S_{DS} (Design spectral response acceleration at short period, g) = 1.93 (z/h = 1.0); 1.93(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 and 0

Equipment or Component Natural Frequencies (Hz) = See Attachment A

Overall dimensions and weight (or range thereof) = See Attachment A

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) = OSP-0556-10

Ω_0 (System overstrength factor) = _____

C_d (Deflection amplification factor) = BY: Ali Sumer

I_p (Importance factor) = 1.5

Height to Center of Gravity above base = DATE: 04/08/2019

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): Product Matrices

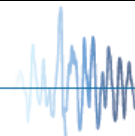
OSHDP Approval (For Office Use Only) – Approval Expires on December 31, 2022

Signature: [Signature] Date: April 8, 2019

Print Name: Ali Sumer Title: DSE

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. 1701371



Manufacturer: Vertiv Corporation						TABLE 1	
Model Line: EXM							
Certified Product Construction Summary: Carbon steel housing, 16ga. Rear panel and door, 18ga. side panels							
Certified Options Summary: See tables 2 - 8 for a complete listing of optional components.							
Mounting Configuration: Base mounted - rigid Note: Installed mounting configuration must be of similar configuration and equivalent strength and stiffness to those tested.							
Building Code: CBC 2016		Seismic Certification Limits:				$S_{DS} = 1.93 g \quad z/h=1.0$ $S_{DS} = 1.93 g \quad z/h=0.0$	$I_P = 1.5$
Model Line	Model	Dimensions (in)			Weight (lb)	Notes	UUT
		Depth	Width	Height			
208V EXM UPS	10-40 kVA	39.1	23.6	78.7	1790		5
	10-100 kVA	39.1	23.6	78.7	1753		Interp.
	10-200 kVA	39.1	34.5	78.7	1753	UUT3 = standalone	2, 3
480V EXM UPS	30 -200 kVA	39.1	24	78.7	1030		Interp.
	30-250 kVA	39.1	32.9	78.7	1356	UUT4 = standalone	1, 4
208V Battery Cabinets	320MM	39.4	12.6	78.7	1102		6
	600MM	39.4	23.6	78.7	2477		Interp.
	880MM	39.4	34.7	78.7	3341		2
480V Battery Cabinets	880MM	39.4	34.7	78.7	2962		Interp.
	1200MM	39.4	47.1	78.7	4943		1
208V Transformer Cabinet	600MM	39.4	23.6	78.7	2043		2
208V Paralleling Cabinet	300MM	39.4	11.8	78.7	263		2
	600MM	39.4	23.6	78.7	594		Interp.
	800MM	39.4	31.5	78.7	714		2
480V Maintenance Bypass Cabinets	200MM	39.4	8.1	78.7	195		Extrap.
	300MM	39.4	11.8	78.7	288		Extrap.
	600MM	39.4	23.6	78.7	887		1
208V Maintenance Bypass Cabinets	200MM	39.4	8.1	78.7	241		5
	300MM	39.4	11.8	78.7	288		Interp.
	600MM	39.4	23.6	78.7	687		Interp.
	800MM	39.4	31.5	78.7	728		6
208V Bypass Distribution Cabinet	600MM	39.4	23.6	78.7	441	w/225 A Panelboard	2
	600MM	39.4	23.6	78.7	1555	w/400 A Panelboard	2
Wiring Cabinet	200MM	39.4	7.9	78.9	132		2

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SPECIAL SEISMIC CERTIFICATION CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation		Table Description: Batteries			TABLE 4
Model Line: EXM					
Building Code: CBC 2016		Seismic Certification Limits: $S_{DS} = 1.93 g$ $z/h = 1.0$ $S_{DS} = 1.93 g$ $z/h = 0.0$			$I_p = 1.5$
Component Type	Manufacturer	Model	Description	Notes	UUT
Battteries (Lead Acid)	EnerSys DataSafe	12HX100	12 V, 21Ah, 22 lbs.		Extrap.
		12HX150E	12 V, 32Ah, 32 lbs.		6
		12HX205	12 V, 44Ah, 43 lbs.		5
		12HX300	12 V, 70 Ah,60 lbs.		Interp.
		12HX330	12 V, 82 Ah, 71 lbs.		Interp.
		12HX400	12 V, 94 Ah, 80 lbs.		Interp.
		12HX505	12 V, 119 Ah, 103 lbs.		Interp.
		12HX540	12 V, 123 Ah, 106 lbs.		2
		12HX150-FR	12 V, 32 Ah, 32 lbs.		Interp.
		12HX205-FR	12 V, 44 Ah, 43 lbs.		6
		12HX300-FR	12 V, 70 Ah,60 lbs.		Interp.
		12HX330-FR	12 V, 82 Ah, 71 lbs.		Interp.
		12HX400-FR	12 V, 94 Ah, 80 lbs.		Interp.
		12HX505-FR	12 V, 119 Ah, 103 lbs.		Interp.
		12HX540-FR	12 V, 123 Ah, 106 lbs.		2
		Deka-Unigy	HR1500	12 V, 29.6Ah, 27 lbs.	
	HR2000		12 V, 48.8Ah, 40 lbs.		Interp.
	HR3000		12 V, 74.4 Ah, 61 lbs.		Interp.
	HR3500		12 V, 89.1 Ah, 66 lbs.		Interp.
	HR4000		12 V, 94 Ah, 74 lbs.		Interp.
	HR5000		12 V, 134 Ah, 98 lbs.		Interp.
	HR5500		12 V, 149 Ah, 107 lbs.		2

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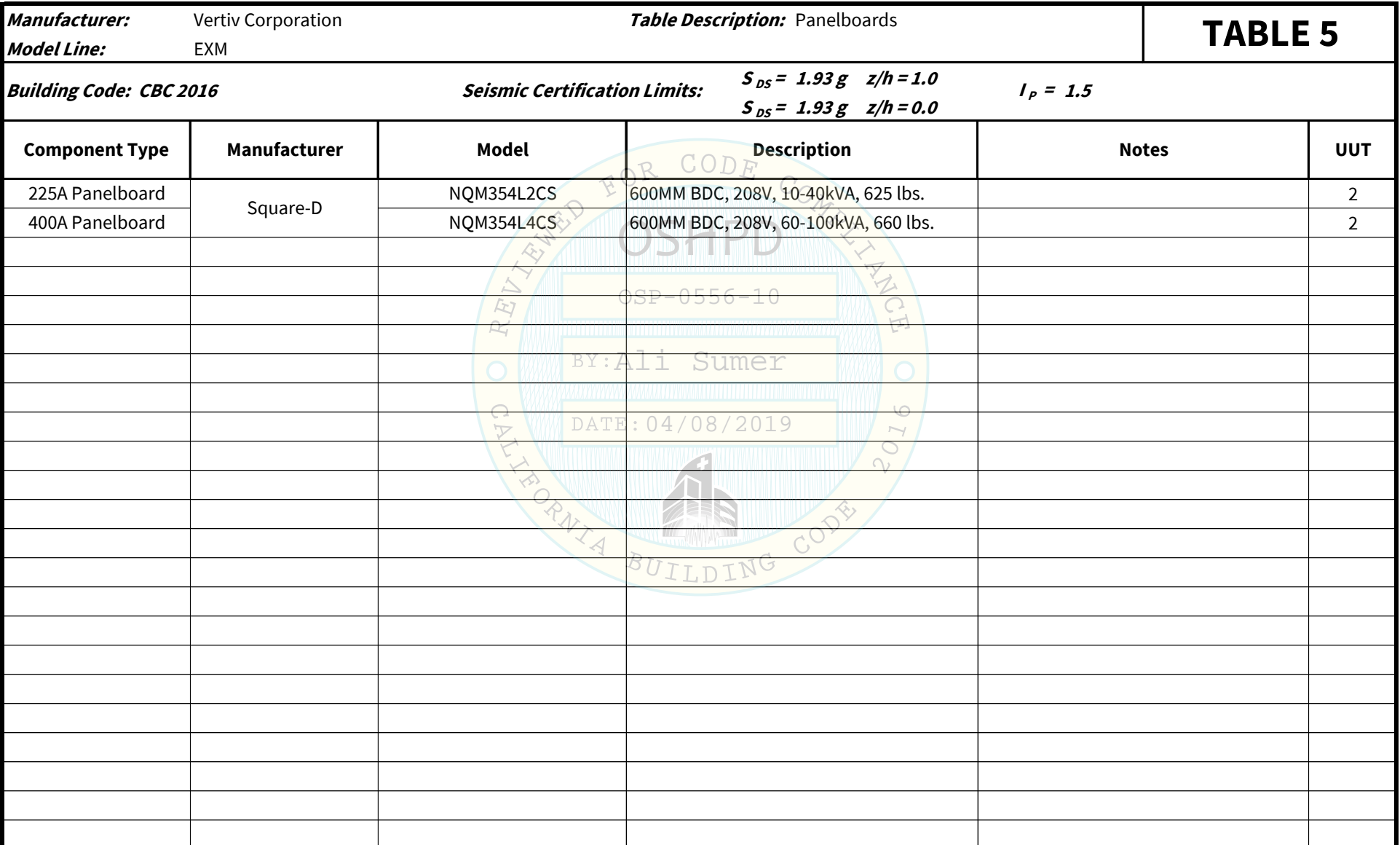
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TRU PROJECT NO. 1701371



SPECIAL SEISMIC CERTIFICATION CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation		Table Description: Circuit Breakers			TABLE 6
Model Line: EXM					
Building Code: CBC 2016		Seismic Certification Limits: $S_{DS} = 1.93\text{ g}$ $z/h = 1.0$ $S_{DS} = 1.93\text{ g}$ $z/h = 0.0$			$I_p = 1.5$
Component Type	Manufacturer	Model	Description	Notes	UUT
Circuit Breakers	ABB	T3N225TWBAS2	208V, 225AF/225AT	DC	2
		T6N600TWAS2	208V, 600AF/465AT	DC	1
		T2S040TW	208V, 100AF/40AT		2
		T2S050TW	208V, 100AF/45AT		Interp.
		T3S060TW	208V, 225AF/60AT		Interp.
		T3S070TW	208V, 225AF/70AT		Interp.
		T3S080TW	208V, 225AF/80AT		Interp.
		T3S090TW	208V, 225AF/90AT		Interp.
		T3S110TW	208V, 225AF/110AT		Interp.
		TS125TW	208V, 225AF/125AT		Interp.
		T3S150TW	208V, 225AF/150AT		Interp.
		T3N225TW	208V, 225AF/225AT		Interp.
		T3S175TW	208V, 225AF/175AT		Interp.
		T5N300TW	208V, 400AF/225AT		Interp.
		T5N400TW	208V, 400AF/350AT		Interp.
		609130P2	208V, 600AF/300AT		Interp.
		604283P2	208V, 600AF/400AT		Interp.
		546923P1	208V, 600AF/600AT		Interp.
		T5N600BW	208V, 600AF/600AT		Interp.
		T6N800TW	208V, 800AF/800AT		1
		T7S1000BW	208V, 1000AF/1000AT		1
		XT1SU3040AFF000XXX	208V, 100AF/40AT		2
		XT1SU3050AFF000XXX	208V, 100AF/50AT		Interp.

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SPECIAL SEISMIC CERTIFICATION CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation		Table Description: Circuit Breakers			TABLE 6
Model Line: EXM					
Building Code: CBC 2016		Seismic Certification Limits: $S_{DS} = 1.93\text{ g}$ $z/h = 1.0$ $S_{DS} = 1.93\text{ g}$ $z/h = 0.0$			$I_p = 1.5$
Component Type	Manufacturer	Model	Description	Notes	UUT
Circuit Breakers	ABB	XT3SU3060AFF000XXX	208V, 225AF/60AT		Interp.
		XT3SU3070AFF000XXX	208V, 225AF/70AT		Interp.
		XT3SU3090AFF000XXX	208V, 225AF/90AT		Interp.
		XT3SU3110AFF000XXX	208V, 225AF/110AT		Interp.
		XT3SU3150AFF000XXX	208V, 225AF/150AT		Interp.
		XT3SU3175AFF000XXX	208V, 225AF/175AT		Interp.
		XT4NU3225AFF000XXX	208V, 225AF/225AT		1
	Square D	HJF36150U33XYE	480V, 150AF/150AT	LSI Trip Unit	2
		JJF36250U33XYE	480V, 250AF/250AT	LSI Trip Unit	Interp.
		LJF36400TU33XTW	480V, 400AF/350AT	LSI Trip Unit	Interp.
		LJF36500TU33XTW	480V, 400AF/300AT	LSI Trip Unit	Interp.
		LJF36600TU33XTW	480V, 600AF/450AT	LSI Trip Unit	Interp.
		LGF36400RU33XAE	208V, 600AF/400AT	LSI Trip Unit	Interp.
		LGF36600TU33X	208V, 600AF/600AT	LSI Trip Unit	Interp.
		PGF36120U33AYE	208V, 1200AF/1200AT	LSI Trip Unit	1
		HGF36040YE	208V, 150AF/40AT		2
		HGF36060YE	208V, 150AF/60AT		Interp.
		HGF36070YE	208V, 150AF/70AT		Interp.
		HGF36150YE	208V, 150AF/150AT		Interp.
		HJF36050YE	480V, 150AF/50AT		Interp.
		HJF36060TYE	480V, 150AF/60AT		Interp.
		HJF36070TYE	480V, 150AF/70AT		Interp.
		HJF36080YE	480V, 150AF/80AT		Interp.

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SPECIAL SEISMIC CERTIFICATION CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation		Table Description: Circuit Breakers			TABLE 6
Model Line: EXM					
Building Code: CBC 2016		Seismic Certification Limits: $S_{DS} = 1.93\text{ g}$ $z/h = 1.0$ $S_{DS} = 1.93\text{ g}$ $z/h = 0.0$ $I_p = 1.5$			
Component Type	Manufacturer	Model	Description	Notes	UUT
Circuit Breakers	Square D	HJF36090YE	480V, 150AF/90AT		Interp.
		HJF36110YE	480V, 150AF/110AT		Interp.
		HJF36125YE	480V, 150AF/125AT		Interp.
		HJF36150YE	480V, 150AF/150AT		Interp.
		JJF36175TYE	480V, 250AF/175AT		Interp.
		JJF36200TYE	480V, 250AF/200AT		Interp.
		JJF36225YE	480V, 250AF/225AT		Interp.
		LLF37030D88	480V, 600AF/300AT		Interp.
		LLF37040D88	480V, 600AF/400AT		Interp.
		LLF37045D88	480V, 600AF/450AT		Interp.
		LLF37050D88	480V, 600AF/500AT		Interp.
		LLF37060D88	480V, 600AF/600AT		1

SPECIAL SEISMIC CERTIFICATION CERTIFIED SUBCOMPONENT MATRIX

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation		Table Description: Transformers			TABLE 7
Model Line: EXM					
Building Code: CBC 2016		Seismic Certification Limits: $S_{DS} = 1.93\text{ g}$ $z/h = 1.0$ $S_{DS} = 1.93\text{ g}$ $z/h = 0.0$			$I_p = 1.5$
Component Type	Manufacturer	Model	Description	Notes	UUT
Transformers	Vertiv	02-818064-10	015K 220-208Y//208-220Y K1, 199 lbs.	Material: Cu Windings and Carbon Steel Core	Extrap.
		02-818054-10	015K 480//220-208Y K1, 205 lbs.		Extrap.
		02-818055-10	015K 600//220-208Y K1, 203 lbs.		Extrap.
		02-818064-00	020K 220-208Y//208-220Y K1, 238 lbs.		Extrap.
		02-818054-00	020K 480//220-208Y K1, 232 lbs.		Extrap.
		02-818055-00	020K 600//220-208Y K1, 232 lbs.		Extrap.
		02-818063-10	025K 220-208Y//208-220Y K1, 264 lbs.		Extrap.
		02-818053-10	025K 480//220-208Y K1, 260 lbs.		Extrap.
		02-818056-10	025K 600//220-208Y K1, 252 lbs.		Extrap.
		02-818009-00	030K 208-220//480 K1, 192 lbs.		Extrap.
		02-818063-00	045K 220-208Y//208-220Y K1, 415 lbs.		Extrap.
		02-818053-00	045K 480//220-208Y K1, 425 lbs.		Extrap.
		02-818056-00	045K 600//220-208Y K1, 424 lbs.		Extrap.
		02-818062-00	050K 220-208Y//208-220Y K1, 425 lbs.		Extrap.
		02-818052-00	050K 480//220-208Y K1, 424 lbs.		Extrap.
		02-818057-00	050K 600//220-208Y K1, 422 lbs.		Extrap.
		02-818061-00	075K 220-208Y//208-220Y K1, 570 lbs.		Extrap.
		02-818051-00	075K 480//220-208Y K1, 570 lbs.		Extrap.
		02-818058-00	075K 600//220-208Y K1, 570 lbs.		Extrap.
		02-818060-10	100K 220-208Y//208-220 K1, 694 lbs.		Extrap.
		02-818050-10	100K 480//220-208Y K1, 680 lbs.		Extrap.
		02-818059-10	100K 600//220-208Y K1, 686 lbs.		Extrap.
		02-818060-00	125K 220-208Y//208-220 K1, 850 lbs.		2

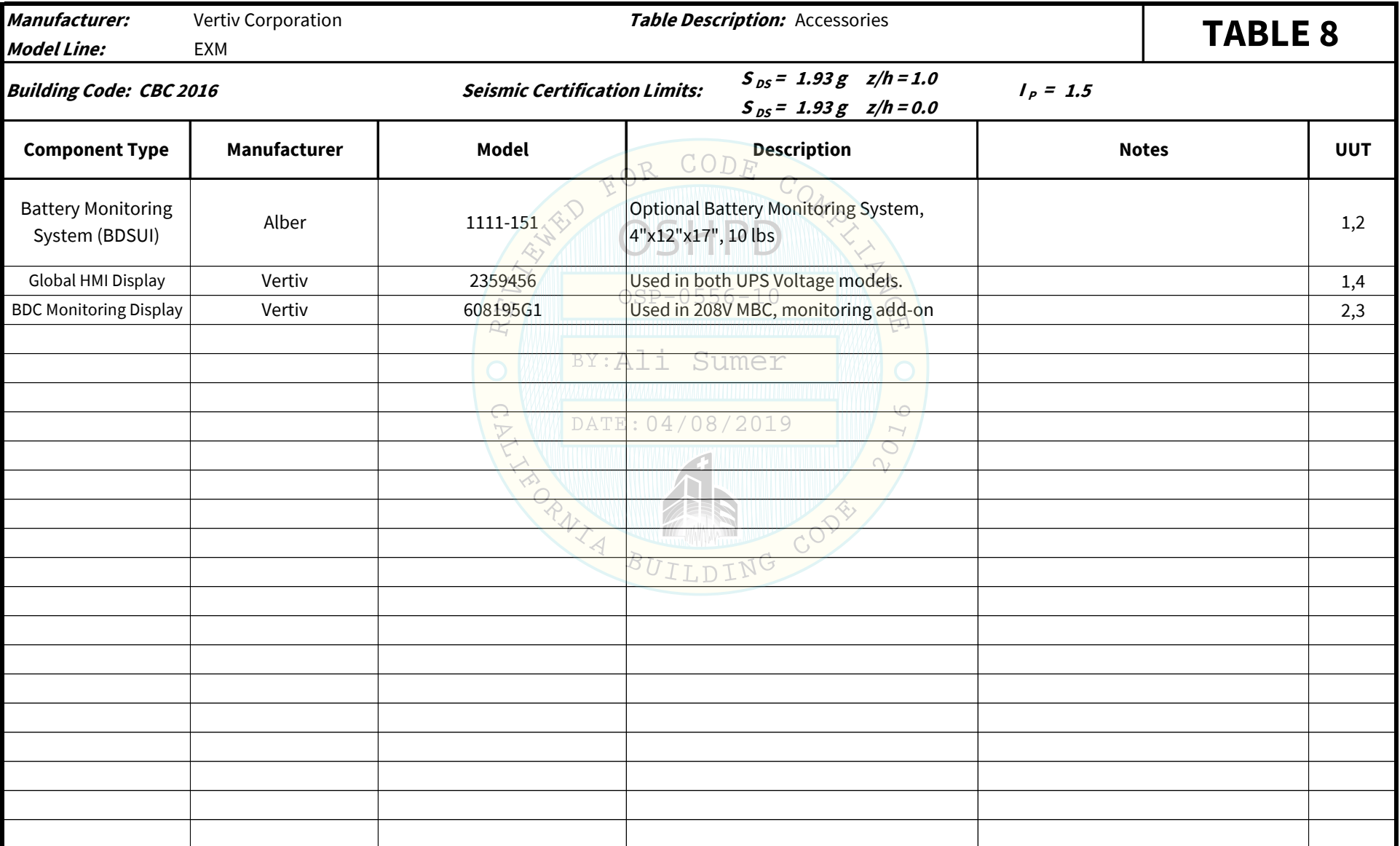
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UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation
Model Line: EXM
Model Number: EXM 480V Lineup

UUT 1

Product Construction Summary:

Carbon steel housing, 16ga. Rear panel and door, 18ga. side panels

Options/Subcomponent Summary:

Cabinets: 250kVA UPS (MNL 51SN250NAA01N96, SN: M18A2U008), 1200mm Battery Cabinet (MN: 51BENXXE2L11009), 600mm Maintenance Bypass Cabinet-MBC (SN: 51MBN45AAOR1009, SN: M18A660024)

Subcomponents: Bypass Module (Vertiv:0235007L), Power Module (Vertiv: 023500LB), Batteries(C&D Technologies: UPS12-150MR), Circuit Breakers (ABB: T6N600TWSA2, T6N800TW, T7S1000BW, XT4NU3225AFF000XXX), Circuit Breakers (Square D: PGF36120U33AYE, LLF37060D88), Battery Monitoring System -BDSUI (Alber: 1111-151), Global HMI Display (Vertiv: 2359456)

UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
7186	39	103.6	79	8.2	7.8	10.9

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	3.20	2.40	1.33	0.53
		2.0	0.0	1.5				

Test Mounting Details:



Rear mounting angles and cleats



Front mounting angles



UUT 1's cabinets were ganged together using four (4) M10 ganging bolts with lock and flat washer at each cabinet junction(front and back). Each cabinet was mounted using Vertiv's seismic mounting brackets (PN: 608812G1 or 605370G2). PN 605370G2 front mounting angles were attached to the cabinet with eight (8) M10 bolts with lock and flat washers and attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. The back mounting angles were attached to the unit with four (4) M10 bolts with lock and flat washers. Cleats were placed over back mounting angles and were attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. PN 608812G1 mounting kits were attached to the cabinets and table in the same manner but with three (3) and (4) M10 bolts per angle, two (2) 5/8"-11 Grade 8 bolts with lock and flat washers (front angle) and two (2) 5/8"-11 Grade 8 bolts with lock and flat washers per cleat (back).

Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.

Contents were included in testing per operating conditions.

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UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation
Model Line: EXM
Model Number: EXM Lineup

UUT 2

Product Construction Summary:

Carbon steel housing, 16ga. rear panel and door, 18ga. side panels

Options/Subcomponent Summary:

Cabinets: 208V 200 kVA UPS (MN: 47SN200UAC01009, SN:M18A1B0006), 880MM BC (MN:47BEUYA92L11009, SN: M18ACG0044), 208V DTC (MN:47TXJ260BC0RS09, SN: M18A6U0006), 208V PBC 300MM (MN:47PLU8ACC1S1009, SN:M18A790001), 2208V PBC 800MM (MN:47PLE3BCC1009, SN:M18A1B0005), BDC 225A (MN:47MBJ06CC3R0, SN:M18A600007), BDC400A (MN:47MBJ37CC21S09, SN: M18A60007)
Subcomponent: Bypass Module (Vertiv: 02359717), Bypass Module (Vertiv: 02359344), Power Module (Vertiv: 2359335), Battery (EnerSys DataSafe: 12HX540), (Deka-Unigy : HR5500), (C&D Technologies: UPS12-540MR), Panelboard (225A -NQM354L2CS), (400A -NQM354L4CS), Circuit Breakers : (ABB: T3N225TWBAS2, T2S040TW, XT1SU3040AFF000XXX), (Squard D: LGF36600TU33X, PGF36120U33AYE), (Siemens: HFK3B225MA2REX6), Transformers (Vertiv: 02-818060-00, 02-818059-00), BDC Monitoring Display (Vertiv: 608195G1), Battery Monitoring System (Vertiv: 1111-151)

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
10,242	39	203	79	6.71	9.16	7.39

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)	2.08	1.0	1.5	3.33	2.50	1.39	0.55
		2.08	0.0					

Test Mounting Details:



Rear mounting angle and cleat



Front mounting angle



M10 Ganging Bolts



M6 Thumb Screw



Cabinets in UUT 2 were ganged together using four (4): M10 ganging bolts, lock washers and flat washer at each cabinet junction(front and back). Each cabinet was mounted using Vertiv's seismic mounting brackets:PN 605370G1, 605370G2, or 607949G1. PN 605370G2 front mounting angles were attached to the cabinet with eight (8) M10 bolts with lock and flat washers and attached to the table using four (4): 5/8"-11 Grade 8 bolts, lock washers, and flat washers. Rear mounting angles were attached to the unit with four (4): M10 bolts, lock washers, and flat washers. Cleats were placed over rear mounting angles and were attached to the table using four (4): 5/8"-11 Grade 8 bolts, lock washers, and flat washers. PN 607949G1 mounting kits were attached to the cabinets and table in the same manner but with three (3) M10 bolts per angle and two (2) 5/8"-11 Grade 8 bolts with lock and flat washers (front angle). The rear cleat was attached to the shake table with two (2): 5/8"-11 Grade 8 bolts, lock washers, and flat washers. Each cabinet will be fitted by manufacturer with (1) M6 thumb screw as an additional measure to secure doors. The thumb screw will be installed at the top corner of the front cabinet door on the same side as the door latch. Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test. Contents were included in testing per operating conditions.

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UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation

Model Line: EXM

Model Number: 47SN200UAC01100

Serial Number: M18A1B0004

UUT 3

Product Construction Summary:

Carbon steel housing, 16ga. rear panel and door, 18ga. side panels

Options/Subcomponent Summary:

Power Module (Vertiv: 2359335), Battery (EnerSys DataSafe: 12HX540, Deka-Unigy: HR5500, C&D Technologies: UPS12-540MR), Bypass Module (Vertiv: 02359717), Bypass Module (Vertiv: 02539344)

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
1,753	39	34.5	79	6.05	10.22	18.64

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)	1.93	1.0	1.5	3.09	2.32	1.29	0.52
		1.93	0.0					

Test Mounting Details:



Seismic mount kit (PN 605370G2) front mounting angles were attached to the cabinet with eight (8) M10 bolts with lock and flat washers and attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. The rear mounting angle was attached to the unit with four (4): M10 bolts, lock washers and flat washers. Cleats were placed over back mounting angles and were attached to the table using four (4): 5/8"-11 Grade 8 bolts, lockwashers and flat washers. Each cabinet will be fitted by manufacturer with (1) M6 thumb screw as an additional measure to secure doors. The thumb screw will be installed at the top corner of the front cabinet door on the same side as the door latch.

Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.

Contents were included in testing per operating conditions.

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UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1701371



Manufacturer: Liebert Corporation

Model Line: EXM

Model Number: 51SN250NAA01345

Serial Number: M18A2U0006

UUT 4

Product Construction Summary:

Carbon steel housing, 16ga. Rear panel and door, 18ga. side panels

Options/Subcomponent Summary:

Bypass Module (Vertiv:0235007L), Power Module (Vertiv: 023500LB)

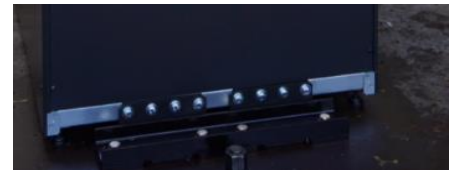
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
1356	39	33	79	5.03	7.71	20.16

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	1.93	1.0	1.5	3.09	2.32	1.29	0.52
		1.93	0.0					

Test Mounting Details:



Seismic mount kit (PN 605370G2) front mounting angles were attached to the cabinet with eight (8) M10 bolts with lock and flat washers and attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. The back mounting angles were attached to the unit with four (4) M10 bolts with lock and flat washers. Cleats were placed over back mounting angles and were attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. PN 605370G1 mounting kits were attached to the cabinets and table in the same manner but with three (3) M10 bolts per angle, two (2) 5/8"-11 Grade 8 bolts with lock and flat washers (front angle) and two (2) 5/8"-11 Grade 8 bolts with lock and flat washers per cleat (back). Front skin of MBC attached using one (1) self tapping 1/4" screw at upper right corner of door.

Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.

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UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1701371



Manufacturer:	Liebert Corporation	UUT 5
Model Line:	EXM	
Model Number:	EXM UPS 208V w/200mm Battery Cabinet	
Serial Number:		47SA03DACM0QS and M17HZB0074

Product Construction Summary:

Carbon steel housing, 16ga. Rear panel and door, 18ga. side panels

Options/Subcomponent Summary:

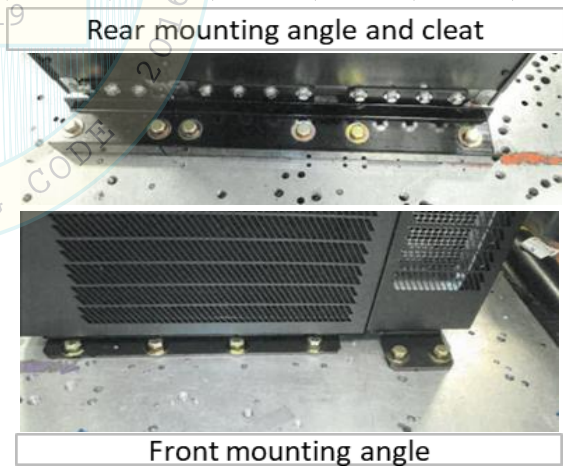
Power Module (Vertiv: 2359335), Siemens Circuit Breaker (HFK3B225MA2REX6), Batteries - EnerSys Data Safe (12HX205)

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
2031	39-1/8	31-3/4	78-1/4	13.56	6.91	24.71

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	1.98	1.0	1.5	3.17	2.38	1.46	0.59
		2.18	0.0					

Test Mounting Details:



Seismic mounting kit (P/N 605370G1) front mounting angle was attached to the UPS with eight (8) M10 bolts with lock and flat washers and attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. Each back mounting angle was attached to the UPS unit with four (4) M10 bolts with lock and flat washers. Cleats were placed over back mounting angles and were attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. Seismic mounting kit (P/N 607949G2) for the MBC cabinet, was attached to the cabinets and table in the same manner but with three (3) M10 bolts per angle, two (2) 5/8"-11 Grade 8 bolts with lock and flat washers (front angle) and two (2) 5/8"-11 Grade 8 bolts with lock and flat washers per cleat (back). Front skin of MBC attached using two(2)M6 x 35mm cap screws. Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test. Contents were included in testing per operating conditions.

UNIT UNDER TEST (UUT) SUMMARY SHEET

TRU PROJECT NO. 1701371



Manufacturer: Vertiv Corporation
Model Line: EXM
Model Number: EXM 208V Lineup

UUT 6

Product Construction Summary:

Carbon steel housing, 16ga. Rear panel and door, 18ga. side panels

Options/Subcomponent Summary:

Cabinets: 208V 320MM Battery Cabinet(MN:47BPEMX52L10S82 SN:M18ECG0026) and 208V 800MM Maintenance Bypass Cabinet (MN: 47MBU48CC0R1065 SN:M18BEP006)

Subcomponents: Batteries (EnerSys DataSafe: 12HX150E, 12HX205-FR) and (Deka-Unigy: HR1500)

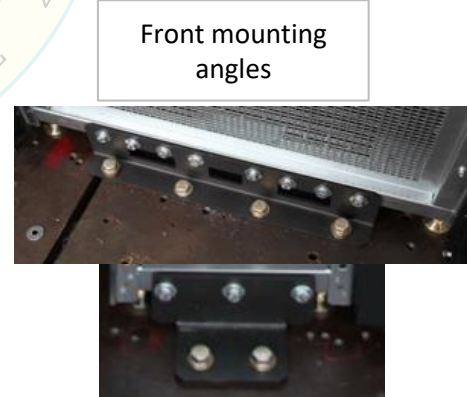
UUT Properties

Weight (lb)	Dimension (in)			Lowest Natural Frequency (Hz)		
	Depth	Width	Height	Front-Back	Side-Side	Vertical
1830	39	44	79	5.5	9.2	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)	2.2	1.0	1.5	3.52	2.64	1.47	0.59
		2.2	0.0	1.5				

Test Mounting Details:



UUT 6's cabinets were ganged together using four (4) M10 ganging bolts with lock and flat washer at each cabinet junction(front and back). Each cabinet was mounted using Vertiv's seismic mounting brackets (PN: 607962G1 or 605370G2). PN 605370G2 front mounting angles were attached to the cabinet with eight (8) M10 bolts with lock and flat washers and attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. The back mounting angles were attached to the unit with four (4) M10 bolts with lock and flat washers. Cleats were placed over back mounting angles and were attached to the table using four (4) 5/8"-11 Grade 8 bolts with lock and flat washers. PN 607962G1 mounting kits were attached to the cabinets and table in the same manner but with three (3) M10 bolts per angle, two (2) 5/8"-11 Grade 8 bolts with lock and flat washers (front angle) and two (2) 5/8"-11 Grade 8 bolts with lock and flat washers per cleat (back).

Unit maintained structural integrity and remained functional per manufacturer requirement after shake table test.

Contents were included in testing per operating conditions.

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