APPLICATION FOR HCAI SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

OFFICE USE ONLY

APPLICATION #: OSP-0729

HCAI Special Seismic Certification Preapproval (OSP)

Type: [X] New [ ] Renewal

Manufacturer Information

Manufacturer: Industrial Electric Mfg.

Manufacturer's Technical Representative: Ashok Kulkarni

Mailing Address: 48205 Warm Springs Blvd., Fremont, CA 94539

Telephone: (510) 360-1247 Email: ashok.kulkarni@iemfg.com

Product Information

Product Name: Switchgear/Switchboards

Product Type: Switchgear - Low Voltage

Product Model Number: IEM LV/MV Switchgear & PIE/PIU Panels

General Description: Low & medium voltage switchgear in NEMA Type 1 or 3R (non-walk-in) enclosures; PIU & PIE Panels in NEMA Type 1 or 3R enclosures. Switchgear and panels have a variety of voltage and amp ratings.

Mounting Description: Rigid, Floor/Wall Mounted

Tested Seismic Enhancements: Seismic enhancements made to the test units and/or modifications required to address anomalies during the tests shall be incorporated into the production units.

Applicant Information

Applicant Company Name: Industrial Electric Mfg.

Contact Person: Ashok Kulkarni

Mailing Address: 48205 Warm Springs Blvd., Fremont, CA 94539

Telephone: (510) 360-1247 Email: ashok.kulkarni@iemfg.com

Title: Vice President of Engineering

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DATE: 01/26/2023
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California Licensed Structural Engineer Responsible for the Engineering and Test Report(s)

Company Name: FORELL / ELSESSER ENGINEERS, INC.

Name: Marco Scanu California License Number: S4454

Mailing Address: 160 Pine Street, Suite 600, San Francisco, CA 94111

Telephone: (415) 837-0700 Email: scanu@forell.com

Certification Method

- [ ] GR-63-Core
- [x] ICC-ES AC156
- [ ] IEEE 344
- [ ] IEEE 693
- [ ] NEBS 3
- [ ] Other (Please Specify):

Testing Laboratory

Company Name: Pacific Earthquake Engineering Research Center (PEER)

Contact Person: Amarnath Kasalanati

Mailing Address: 1301 South 46th St., Bldg. 420, Richmond CA 94720-1729

Telephone: (510) 642-3437 Email: Amarnath1@berkeley.edu

Company Name: SOUTHWEST RESEARCHINSTITUTE (SWRI)

Contact Person: Mark Orlowski

Mailing Address: 6220 Culebra Road, San Antonio TX 78238-5166

Telephone: (210) 684-5111 Email: Mark.orlowski@swri.org

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Seismic Parameters

Design Basis of Equipment or Components (F_p/W_p) = 1.5

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

a_p (Amplification factor) = 2.5

R_p (Response modification factor) = 6

Ω_0 (System overstrength factor) = 2.0

I_p (Importance factor) = 1.5

z/h (Height ratio factor) = 1

Natural frequencies (Hz) = See Attachment

Overall dimensions and weight = See Attachment

HCAI Approval (For Office Use Only) - **Approval Expires on 01/26/2029**

Date: 1/26/2023

Name: Mohammad Karim Title: Supervisor, Health Facilities

Special Seismic Certification Valid Up to: S_{DS} (g) = 2.0 z/h = 1

Condition of Approval (if applicable):

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Industrial Electric Mfg. - LV & MV Switchgear and Panels
I. Certified Product Table

Unit	Width	Depth	Max Height	Max. Service Weight	Construction Material[1]	S_{DS}	F_P/W_P	Model Number	Notes	Test Status
Low Voltage Switchgear										
Auxiliary Section	12"	22"	69"	180 lbs	7 & 12 GA CRS	2.00	1.50	IEM LV Switchgear	2	Rpt. 18.18135.06 - UUT7
Tie Section	24"	22"	69"	420 lbs	7 & 12 GA CRS	2.00	1.50	IEM LV Switchgear	2	Rpt. 18.18135.06 - UUT6
Distributed Section	38"	42"	91.5"	960 lbs	7 & 12 GA CRS	2.00	1.50	IEM LV Switchgear	2	Rpt.18.18116.14 - UUT2
Main/Tie/Distributed/Auxiliary Section	12"-42"	12"-42"	91.5"	2,500 lbs	7 & 12 GA CRS	2.00	1.50	IEM LV Switchgear	2	Interpolated
Main Section	42"	42"	91.5"	2,500 lbs	7 & 12 GA CRS	2.00	1.50	IEM LV Switchgear	2	Rpt. 18.18.116.14 - UUT1
Main Section	48"	62"	91.5"	2880 lbs	7 & 12 GA CRS	2.00	1.50	114565-01	2	Rpt. PEER STI 2021-12-UUT12
Main/Tie/Distributed/Auxiliary Section	12"-42"	12"-46"	94.5"	2,750 lbs	7 & 12 GA CRS	2.00	1.50	IEM LV Switchgear	2	Interpolated
LV Power Distribution Unit (PDU)	58"	42"	80"	4500 lbs	7 & 12 GA CRS	2.00	1.50	111070-002	2	Rpt. PEER STI 2019-13-UUT9
LV Automatic Transfer Switch	32"	48"	91.5"	2170 lbs	7 & 12 GA CRS	2.00	1.50	113073-01	2	Rpt. PEER STI 2021-12-UUT12
LV 1200A Plug-in Panel	44"	20"	72"	760 lbs	7 & 12 GA CRS	2.00	1.50	118272-12	2	Rpt. PEER STI 2022-12-UUT14
LV Power Distribution Unit (IPC/PDU)	42"	36"	72"	2250 lbs	7 & 12 GA CRS	2.00	1.50	118272-16	2	Rpt. PEER STI 2022-12-UUT16
Medium Voltage Switchgear										
Main Section	30"	32"	74"	700 lbs	7 & 12 GA CRS	2.00	1.50	IEM MV Switchgear	2	Rpt. 18.18135.06 - UUT8
Main Section	30"-38"	32"-54"	94"	1,290 lbs	7 & 12 GA CRS	2.00	1.50	IEM MV Switchgear	2	Interpolated
Main Section	38"	54"	94"	1,290 lbs	7 & 12 GA CRS	2.00	1.50	IEM MV Switchgear	2	Rpt. 18.18135.01 - UUT5
Main Section	30"-42"	32"-59"	97"	1,420 lbs	7 & 12 GA CRS	2.00	1.50	IEM MV Switchgear	2	Extrapolated
Panels										
PIU Panel	20"	7"	69"	220 lbs	12 GA CRS	2.00	1.50	IEM PIU/PIE Panel	3	Rpt. 18.18116.14 - UUT3
PIU & PIE Panel	20"	6"-7"	78"	250 lbs	12 GA CRS	2.00	1.50	IEM PIU/PIE Panel	3	Interpolated
PIE Panel	20"	7"	78"	250 lbs	12 GA CRS	2.00	1.50	IEM PIU/PIE Panel	3	Rpt. 18.18116.14 - UUT4
PIU & PIE Panel	20"-22"	6"-7"	81"	275 lbs	12 GA CRS	2.00	1.50	IEM PIU/PIE Panel	3	Extrapolated
PIU Panel	20"	7"	60"	135 lbs	12 GA CRS	2.00	1.50	112334-17	3	Rpt. PEER STI 2021-11-UUT11
PIU Plug-in Panel	32"	11.5"	68"	255 lbs	12 GA CRS	2.00	1.50	115710-3	3	Rpt. PEER STI 2021-11-UUT11

Notes

1. All units are available in NEMA Type 1 and 3R enclosures. CRS = ASTM-A-1011-00-CS TYPE B/SAE-1008 Cold Rolled Carbon Steel
2. Rigid Floor mounted
3. Rigid Wall mounted

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Industrial Electric Mfg. - LV & MV Switchgear and Panels
II. Certified Subcomponents Table

LOW VOLTAGE SWITCHGEAR

Internal Sub Components	Manufacturer	Part #	Testing Status
GE Entelliguard Breaker 5000A	GE	GA50M1	UUT1
GE Entelliguard Breaker 3200A	GE	GA32M1	UUT1
GE Entelliguard Breaker 800A	GE	GA08M1	UUT6
Square D MasterPact NW 5000A	Schneider Electric	YA5LLR	UUT1
Square D MasterPact NW 800A	Schneider Electric	WA5EER	UUT2,7
Square D MasterPact NW 2000A	Schneider Electric	WA5FFR	UUT2
GE Spectra Breaker 1200A	GE	SKL-1200A	UUT2
GE Spectra Breaker 600A	GE	SGL-600A	UUT6
ABB Emax 2 Breaker 5000A	ABB	Z6LKUS	UUT6
ABB Emax 2 Breaker 2000A	ABB	12VFUK	UUT1
ABB Emax 2 Breaker 800A	ABB	11VDUF	UUT1
Schweitzer Protective Relay	Schweitzer	IEM-SEL-PROT-RELAY	UUT1
Power meter	Square D	ION-8650	UUT1,2
Illuminated Pilot Light Realy	IEM	IEM-ILL-PB	UUT1
Illuminated Push Button Relay	IEM	IEM-LED-PILOT	UUT1
Push Button	IEM	IEM-PB	UUT1,2
Breaker Control Switch	IEM	IEM-BKR-CRTL-SW	UUT1
LED RED	IEM	IEM-LED-RED	UUT1
LED GREEN	IEM	IEM-LED-GRN	UUT1
Transformer 600 kVA	MGM	600-kVA-XFMR	UUT9
Transformer 500 kVA	MGM	500-kVA-XFMR	Interpolated
Transformer 450 kVA	MGM	450-kVA-XFMR	Interpolated
Transformer 300 kVA	MGM	300-kVA-XFMR	UUT16
Siemens Breaker 1000A	Siemens	3VA66105HL320AA0	UUT16
Power Meter	ACCUENERGY	ACUCT-4161R-1000:333MV	UUT16
Square D PowerPact 1200A	Schneider Electric	PJL36120	UUT9
Square D PowerPact 400A	Schneider Electric	LGL36400	UUT9
Square D PowerPact 400A	Schneider Electric	LGL36400	UUT9
Square D PowerPact 400A	Schneider Electric	LGL36400	UUT9
Square D PowerPact 400A	Schneider Electric	LGL36400	UUT9
Square D PowerPact 250A	Schneider Electric	JGL36250	UUT9
Square D PowerPact 250A	Schneider Electric	JGL36250	UUT9
Sqaure D PowerPact 60A	Schneider Electric	HGL36060	UUT9
Surge Protection Device 150 kA	APT	TE42XRS152	UUT9
CT Split Core 1000:333mV	ACCUENERGY	ACUCT-3050-1000:333	UUT9
CT Split Core 100:333mV	ACCUENERGY	ACUCT-H100-100:333	UUT9
Control Power Transformer 150 VA	Hammond	SP150MQMJ	UUT9
Fuse Holder 3 Pole	Allen Bradley	1492-FB3C30	UUT9
Fuse 1A	Bussman	LP-CC-1	UUT9
ACUVIM II Multifunction Transducer	ACCUENERGY	ACUVIMII-M-333-P1	UUT9
ACUVIM CL Multifunction Transducer	ACCUENERGY	ACUVIM-CL-M-333-P1	UUT9
Touch Screen HMI 7 inch	RED LION	CR10000700000210	UUT9

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Power Supply 24 VDC, 60W	Phoenix Contact	2902992	UUT9
Ice Cube Relay	FINDER	55.34.8.120.0054	UUT9
Red Push Button	Siemens	KIT=3SU122REDPB	UUT9
Remote I/O Module RS-485	MOXA	IOLOGIK-R1212	UUT9
3SU1 SIRIUS 22MM ACOUSTIC SIGNAL DEVICE	Siemens	3SU1250-6KB10-1AA0	UUT9
RJ45 to DIN Rail Patech Panel CATSE	Phoenix Contact	2744610	UUT9
RJ45-RJ45 DIN Rail Patch Panel	Phoenix Contact	2901646	UUT9
Fuse, Current limiting, time delay 4A	Bussman	LP-CC-4	UUT9
Eaton Magnum DS Draw-out Breaker 6000A	Eaton	MDSC603EEA60CMNXX	UUT10
Eaton Magnum DS Breaker Cassette 6000A	Eaton	MN6E3TADNSNNNWC	UUT10
Neutral Current Sensor 3000A	Eaton	9253C03H12	UUT10
Siemens WL 4P Drawout Breaker 3200A	Siemens	L2S432SSDCXGCXN	UUT11
Siemens WL Drawout Breaker Cradle 3200A	Siemens	GL2432EXXXXMXXN	UUT11
Woodward Transfer Controller DTSC-200	Woodward	8440-1868	UUT11
Current Transformer 3000:5	ITI	568TS-302	UUT11
Shorting Terminal Box - 6 Points	Cooper-Bussmann	KUSC6	UUT11
Power Supply 24VDC, 5A	Phoenix Contact	2904600	UUT11
Control Power Transformer 750VA	Hammond	SP750MQMJ	UUT11
2P Plug in Relay Test Button + LED	Finder	55.32.9.024.0094	UUT11
FIN Relay Socket, DIN 14PIN 10A 250A, BLUE	Finder	94.74	UUT11
Qunit Module, 24VDC INPUT, 24VDC/5A	Phoenix Contact	2320539	UUT11
Contactor, 20A AC-1, 9A AC-3, 2NO+2NC	Square D	LC1D098G7	UUT11
Selector Switch 3SU1 SIRIUS 22MM 3 POS	Siemens	KIT=3SU122BLK3PSHSS	UUT11
Selector Switch 3SU1 SIRIUS 22MM 2 POS BLACK	Siemens	KIT=3SU122BLKSS	UUT11
Selector Switch 3SU1 SIRIUS 22MM 3 POS MOM	Siemens	KIT=3SU122BLK3PMSHSS	UUT11
Contact Module 1NO	Siemens	3SU1400-1AA10-1BA0	UUT11
3 Pole Class CC Fuse Holder	Allen Bradley	1492-FB3C30-L	UUT11
2 Pole Class CC Fuse Holder	Allen Bradley	1492-FB2C30-L	UUT11
1 Pole Class CC Fuse Holder	Allen Bradley	1492-FB1C30-L	UUT11
480-120V, 4:1 Instrument Transformer	ITI	468-480	UUT11
Fuse 3A, Class CC Cureent-Limiting	Bussmann	LP-CC-3	UUT11
Fuse 2A, Class CC Cureent-Limiting	Bussmann	LP-CC-2	UUT11
Fuse 1A, Class CC Cureent-Limiting	Bussmann	LP-CC-1	UUT11
WL Truck Operated Contacts	Siemens	WLGSGSW111	UUT11
Contact Module with 1NC	Siemens	3SU1400-1AA10-1CA0	UUT11
Panel Main Lugs - 1200A	ILSCO	TA-600-2NS	UUT 14
Siemens Plug-in Base 150A/250A	Siemens	3VA91430KP00	UUT 14
Siemens 3VA Brekaer 150A	Siemens	3VA61156JP310AA0	UUT 14
Siemens 3VA Breaker 250A	Siemens	3VA62256JP310AA0	UUT 14
Siemens 3VA Breaker Lug Terminal	Siemens	3VA92430JB12	UUT 14
Siemens Plug-in Base 400A/600A	Siemens	3VA94430KP00	UUT 14
Siemens 3VA Brekaer 400A	Siemens	3VA63406JP310AA0	UUT 14
Siemens 3VA Breaker 600A	Siemens	3VA64607HL310AA0	UUT 14
Siemens 3VA Breaker 600A	Siemens	3VA64600HL310AA0	UUT 14
Siemens 3VA 600A Output lugs	ILSCO	AU-350	UUT 14
Siemens 3VA 600A Output Heat Sink 3"	Thermal Solutions Intl.	552-3292E	UUT 14
Siemens 3VA 600A Output Heat Sink 2"	Thermal Solutions Intl.	552-3292D	UUT 14

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MEDIUM VOLTAGE SWITCHGEAR

Internal Sub Components	Manufacturer	Part #	Testing Status
Load Interrupter Switch, 15 kV, 1200A	Powercon	PIF-L-1200	UUT5
Load Interrupter Switch, 15 kV, 600A	Powercon	PIF-L-600	UUT8
Load Interrupter Switch, 15 kV 1200A	ABB	244-040	UUT5
Load Interrupter Switch, 15 kV 600A	ABB	244-042	UUT8
Power Meter	Square D	ION-8650	UUT5
Fuse 1200A. 15 kV	IEM	IEM-LI-FUSE-1200A	UUT5
Fuse 600A, 15 kV	IEM	IEM-LI-FUSE-600A	UUT8
Infra-red Viewing Window	IEM	IEM-IR-WINDOW	UUT5
LED RED	IEM	IEM-LED-RED	UUT5&8
LED GREEN	IEM	IEM-LED-GRN	UUT5&8

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Industrial Electric Mfg. - LV & MV Switchgear and Panels
II. Certified Subcomponents Table

PIE PANEL

Internal Sub Components	Manufacturer	Part #	Testing Status
GE Spectra Breaker	GE	SGL-600A	UUT4
GE Branch Breaker	GE	THHQ-15A	UUT4
GE Branch Breaker	GE	THHQ-30A	UUT4
GE Branch Breaker	GE	THHQ-50A	UUT4
GE Branch Breaker	GE	THHQ-100A	UUT4
GE Branch Breaker	GE	TEYL-50A	UUT4
GE Branch Breaker	GE	TEYL-125A	UUT4
GE Branch Breaker	GE	SEL-150A	UUT4
GE Branch Breaker	GE	TJJ-225A	UUT4
Siemens Main Breaker	Siemens	JXD6-400A	UUT4
Siemens Branch Breaker	Siemens	ED4-50	UUT4
Siemens Branch Breaker	Siemens	ED4-100	UUT4

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PIU PANEL

Internal Sub Components	Manufacturer	Part #	Testing Status
GE Spectra Breaker	GE	SFL-400A	UUT3
GE Branch Breaker	GE	TQD-15A	UUT3
GE Branch Breaker	GE	TQD-30A	UUT3
GE Branch Breaker	GE	TQD-50A	UUT3
GE Branch Breaker	GE	TQD-100A	UUT3
GE Branch Breaker	GE	THQD-50A	UUT3
GE Branch Breaker	GE	THQD-100A	UUT3
GE Branch Breaker	GE	TEY-125A	UUT3
GE Branch Breaker	GE	TEY-70A	UUT3
GE Branch Breaker	GE	TEY-30A	UUT3
Siemens Branch Breaker - Plug-in Base	Siemens	3VA91430KP00	UUT13
Siemens Branch Breaker	Siemens	3VA61156JP310AA0	UUT13
Siemens Branch Breaker	Siemens	3VA61156JP310AA0	UUT13
Siemens Branch Breaker	Siemens	NGB-125A	Interpolated
Siemens 3VA Breaker Lug Terminal	Siemens	3VA92430JB12	UUT13
Eaton Main Breaker	Eaton	JG-250A	Interpolated
Eaton Main Breaker	Eaton	KD-400A	Interpolated
Eaton Main Breaker	Eaton	LD-600A	Interpolated
Eaton Main Breaker	Eaton	LG-600A	UUT12
Eaton Main Breaker	Eaton	PD2-G225A	Interpolated
Eaton Main Breaker	Eaton	PD3-G600A	Interpolated
Eaton Main Breaker	Eaton	GD-100A	Interpolated
Eaton Main Breaker	Eaton	EG-125A	Interpolated
Eaton Branch Breaker	Eaton	PD3-400A	UUT12
Eaton Branch Breaker	Eaton	PD2-250A	UUT12
Eaton Branch Breaker	Eaton	PD1-125A	UUT12
Eaton Branch Breaker	Eaton	BAB-70	UUT12
Eaton Branch Breaker	Eaton	QBHW-125	Extrapolated

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Test Report 18.18116.14 – UUT 1&2
LV Switchgear Main Section - UUT1 (shown Left)
LV Switchgear Distribution Section - UUT2 (shown Right)
7 GA CRS for base of switchgear and 12 GA CRS, NEMA 1
42”W x 42”D x 91.5”H, 2,500 lbs - UUT1
38”W x 42”D x 91.5”H, 960 lbs - UUT2
UUT1 & 2 were attached and tested together
Rigid Floor mounted using: (8) - 5/8” bolts

Figure 4-1: IEM Low Voltage Switchgear

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.41	1	3.86	2.91	1.61	0.64

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
3.94	4.13	15.81	

Subcomponents	Manufacturer	Part #
GE Entelliguard Breaker 5000A	GE	GA50M1
GE Entelliguard Breaker 3200A	GE	GA32M1
Square D MasterPact NW 5000A	Schneider Electric	YA5LLR
ABB Emax 2 Breaker 2000A	ABB	Z2VFUK
ABB Emax 2 Breaker 800A	ABB	Z1VDUF
Schweitzer Protective Relay	Schweitzer	IEM-SEL-PROT-RELAY
Power meter	Square D	ION-8650
Illuminated Pilot Light Realy	IEM	IEM-ILL-PB
Illuminated Push Button Relay	IEM	IEM-LED-PILOT
Push Button	IEM	IEM-PB
Breaker Control Switch	IEM	IEM-BKR-CRTL-SW
LED RED	IEM	IEM-LED-RED
LED GREEN	IEM	IEM-LED-GRN

Subcomponents	Manufacturer	Part #
Square D MasterPact NW 800A	Schneider Electric	WA5EER
Square D MasterPact NW 800A	Schneider Electric	WA5EER
GE Spectra Breaker 1200A	GE	SKL-1200A
Push Button	IEM	IEM-PB
Illuminated Pilot Light Realy	IEM	IEM-ILL-PB

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Test Report 18.18116.14 – UUT 3&4
PIU Panel - UUT3 (Shown Right)
PIE Panel – UUT4 (Shown Left)
7 GA CRS for base of switchgear and 12 GA CRS ,NEMA 1
20”W x 7”D x 69”H, 220 lbs - UUT3
20”W x 7”D x 78”H, 250 lbs - UUT4
UUT3 & 4 were tested together
Rigid Wall mounted using: (6) - 5/8” bolts each unit

Figure 4-2: IEM PIU Panel (right side) and PIE Panel (left side)

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.67	1	4.27	3.20	1.79	0.71

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
N/A	N/A	N/A	

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Subcomponents	Manufacturer	Part #
GE Main Breaker	GE	SFL-400A
GE Branch Breaker	GE	TQD-15A
GE Branch Breaker	GE	TQD-30A
GE Branch Breaker	GE	TQD-50A
GE Branch Breaker	GE	TQD-100A
GE Branch Breaker	GE	THQD-50A
GE Branch Breaker	GE	THQD-100A
GE Branch Breaker	GE	TEY-125A
Siemens Breaker	Siemens	JXD6-400
Siemens Breaker	Siemens	ED4-70
Siemens Breaker	Siemens	ED4-100

Subcomponents	Manufacturer	Part #
GE Spectra Breaker	GE	SGL-600A
GE Branch Breaker	GE	THHQ-15A
GE Branch Breaker	GE	THHQ-30A
GE Branch Breaker	GE	THHQ-50A
GE Branch Breaker	GE	THHQ-100A
GE Branch Breaker	GE	TEYL-50A
GE Branch Breaker	GE	TEYL-125A
GE Branch Breaker	GE	SEL-150A
GE Branch Breaker	GE	TJJ-225A
Siemens Main Breaker	Siemens	JXD6-400A
Siemens Branch Breaker	Siemens	ED4-50
Siemens Branch Breaker	Siemens	ED4-100

Test Report 18.18135.01 – UUT 5
Medium Voltage Switchgear
7 GA CRS for base of switchgear and
12 GA CRS ,NEMA 1
38”W x 54”D x 94”H, 1,400 lbs
Rigid Floor mounted using: (6) – 12mm bolts

Figure 1-10: IEM Medium Voltage Switchgear Mounted to Earthquake Simulator for Vertical Vibration

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Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.03	1	3.25	2.44	1.36	0.54

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
14.26	7.95	46.7	

Subcomponents	Manufacturer	Part #
Load Interrupter Switch, 15 kV, 1200A	Powercon	PIF-L-1200
Load Interrupter Switch, 15 kV 1200A	ABB	244-040
Fuse 1200A. 15 kV	IEM	IEM-LI-FUSE-1200A
Power Meter	Square D	ION-8650
Infra-red Viewing Window	IEM	IEM-IR-WINDOW
LED RED	IEM	IEM-LED-RED
LED GREEN	IEM	IEM-LED-GRN

Test Report 18.18135.06 – UUT 6&7
Lower Voltage Switchgear Tie Section – UUT 6 (shown left)
Lower Voltage Switchgear Auxiliary Section – UUT 7 (shown right)
7 GA CRS for base of switchgear and 12 GA CRS ,NEMA 1
24”W x 22”D x 91.5”H, 2250 lbs – UUT6
12”W x 22”D x 91.5”H, 1500 lbs – UUT7
UUT6 & 7 were attached and tested together
Rigid Floor mounted using: (8) - 5/8” bolts

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Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.41	1	3.86	2.91	1.61	0.64

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
11.7	13.21	47.0	

Subcomponents	Manufacturer	Part #
GE Entelliguard Breaker 800A	GE	GA08M1
GE Entelliguard Breaker 600A	GE	SGL-600A
Emax 2 Breaker 5000A	ABB	Z6LKUS

Subcomponents	Manufacturer	Part #
Square D MasterPact NW 800A	Schneider Electric	WA5EER

Test Report 18.18135.06 – UUT 8
Medium Voltage Switchgear
7 GA CRS for base of switchgear and 12 GA CRS ,NEMA 1
30”W x 32”D x 94”H, 700 lbs
Rigid Floor mounted using: (6) - 5/8” bolts

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Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.03	1	3.25	2.44	1.36	0.54

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
9.30	9.51	45.3	

Subcomponents	Manufacturer	Part #
Load Interrupter Switch, 15 kV, 600A	Powercon	PIF-L-600
Load Interrupter Switch, 15 kV 600A	ABB	244-042
Fuse 600A, 15 kV	IEM	IEM-LI-FUSE-600A
LED RED	IEM	IEM-LED-RED
LED GREEN	IEM	IEM-LED-GRN

Test Report PEER STI 2019-13– UUT 9
Low Voltage Power Distribution Unit (PDU)
Model # 111070-0002
7 GA CRS for base of switchgear and 12 GA CRS, NEMA 1
58"Wx42"Dx80"H, W=4500 lbs
Rigid Floor mounted using: (6) – ½" Grade 5 bolts

Figure 3. Attachment for UUT

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2	1	3.20	2.40	1.34	0.54

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
11.4	8.6	N/A	

Subcomponents	Manufacturer	Part #
Transformer 600 kVA	MGM	600 kVA-XFMR
Square D PowerPact 1200A	Schneider Electric	PJL36120
Square D PowerPact 400A	Schneider Electric	LGL36400
Square D PowerPact 400A	Schneider Electric	LGL36400
Square D PowerPact 400A	Schneider Electric	LGL36400
Square D PowerPact 400A	Schneider Electric	LGL36400
Square D PowerPact 250A	Schneider Electric	JGL36250
Square D PowerPact 250A	Schneider Electric	JGL36250
Sqaure D PowerPact 60A	Schneider Electric	HGL36060
Surge Protection Device 150 kA	APT	TE42XRS152
CT Split Core 1000:333mV	ACCUENERGY	ACUCT-3050-1000:333
CT Split Core 100:333mV	ACCUENERGY	ACUCT-H100-100:333
Control Power Transformer 150 VA	Hammond	SP150MQMJ
Fuse Holder 3 Pole	Allen Bradley	1492-FB3C30
Fuse 1A	Bussman	LP-CC-1
ACUVIM II Multifunction Transducer	ACCUENERGY	ACUVIMII-M-333-P1
ACUVIM CL Multifunction Transducer	ACCUENERGY	ACUVIM-CL-M-333-P1
Touch Screen HMI 7 inch	RED LION	CR10000700000210
Power Supply 24 VDC, 60W	Phoenix Contact	2902992
Ice Cube Relay	FINDER	55.34.8.120.0054
Red Push Button	Siemens	KIT=3SU122REDPB
Remote I/O Module RS-485	MOXA	IOLOGIK-R1212
3SU1 SIRIUS 22MM ACOUSTIC SIGNAL DEVICE	Siemens	3SU1250-6KB10-1AA0
RJ45 to DIN Rail Patech Panel CATSE	Phoenix Contact	2744610
RJ45-RJ45 DIN Rail Patch Panel	Phoenix Contact	2901646
Fuse, Current limiting, time delay 4A	Bussman	LP-CC-4

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Test Report PEER STI 2021-12– UUT 10
Switchboard UL 891 6000A EATON
Model # 114565-01
7 GA CRS for base of switchgear and 12 GA CRS, NEMA 1
62”Wx48”Dx 91.5”H, W=2880 lbs (UUT1 in Figure 4)

UUT 10 and 11 were tested together.

Rigid Floor mounted using: (6) – ½” A325 bolts.

Figure 4. Test setup for UUTs

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Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.00	1	3.20	2.40	1.34	0.54

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	
6.6	9.2	N/A	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.

Subcomponents	Manufacturer	Part #
Eaton Magnum DS Draw-out Breaker 6000A	Eaton	MDSC603EEA60CMNXX
Eaton Magnum DS Breaker Cassette 6000A	Eaton	MN6E3TADNSNNNWC
Neutral Current Sensor 3000A	Eaton	9253C03H12
Siemens WL 4P Drawout Breaker 3200A	Siemens	L2S432SSDCXGCXN
Siemens WL Drawout Breaker Cradle 3200A	Siemens	GL2432EXXXXMXXN
Woodward Transfer Controller DTSC-200	Woodward	8440-1868
Current Transformer 3000:5	ITI	568TS-302
Shorting Terminal Box - 6 Points	Cooper-Bussmann	KUSC6
Power Supply 24VDC, 5A	Phoenix Contact	2904600
Control Power Transformer 750VA	Hammond	SP750MQMJ
2P Plug in Relay Test Button + LED	Finder	55.32.9.024.0094
FIN Relay Socket, DIN 14PIN 10A 250A, BLUE	Finder	94.74
Qunit Module, 24VDC INPUT, 24VDC/5A	Phoenix Contact	2320539

Contactor, 20A AC-1, 9A AC-3, 2NO+2NC	Square D	LC1D098G7
Selector Switch 3SU1 SIRIUS 22MM 3 POS	Siemens	KIT=3SU122BLK3PSHSS
Selector Switch 3SU1 SIRIUS 22MM 2 POS BLACK	Siemens	KIT=3SU122BLKSS
Selector Switch 3SU1 SIRIUS 22MM 3 POS MOM	Siemens	KIT=3SU122BLK3PMSHSS
Contact Module 1NO	Siemens	3SU1400-1AA10-1BA0
3 Pole Class CC Fuse Holder	Allen Bradley	1492-FB3C30-L
2 Pole Class CC Fuse Holder	Allen Bradley	1492-FB2C30-L
1 Pole Class CC Fuse Holder	Allen Bradley	1492-FB1C30-L
480-120V, 4:1 Instrument Transformer	ITI	468-480
Fuse 3A, Class CC Cureent-Limiting	Bussmann	LP-CC-3
Fuse 2A, Class CC Cureent-Limiting	Bussmann	LP-CC-2
Fuse 1A, Class CC Cureent-Limiting	Bussmann	LP-CC-1
WL Truck Operated Contacts	Siemens	WLGSGSW111
Contact Module with 1NC	Siemens	3SU1400-1AA10-1CA0

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Test Report PEER STI 2021-12– UUT 11
Switchboard UL 1008
Model # 113073-01
7 GA CRS for base of switchgear and 12 GA CRS ,NEMA 1
48”Wx32”Dx 91.5”H, W=2170 lbs (UUT2 in Figure 4)

UUT 10 and 11 were tested together.

Rigid Floor mounted using: (4) – ½” A325 bolts.

Figure 4. Test setup for UUTs

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Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.00	1	3.20	2.40	1.34	0.54

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	
9.2	6.8	22.2	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.

Subcomponents	Manufacturer	Part #
Eaton Magnum DS Draw-out Breaker 6000A	Eaton	MDSC603EEA60CMNXX
Eaton Magnum DS Breaker Cassette 6000A	Eaton	MN6E3TADNSNNNWC
Neutral Current Sensor 3000A	Eaton	9253C03H12
Siemens WL 4P Drawout Breaker 3200A	Siemens	L2S432SSDCXGCXN
Siemens WL Drawout Breaker Cradle 3200A	Siemens	GL2432EXXXXMXXN
Woodward Transfer Controller DTSC-200	Woodward	8440-1868
Current Transformer 3000:5	ITI	568TS-302
Shorting Terminal Box - 6 Points	Cooper-Bussmann	KUSC6
Power Supply 24VDC, 5A	Phoenix Contact	2904600
Control Power Transformer 750VA	Hammond	SP750MQMJ
2P Plug in Relay Test Button + LED	Finder	55.32.9.024.0094
FIN Relay Socket, DIN 14PIN 10A 250A, BLUE	Finder	94.74
Quint Module, 24VDC INPUT, 24VDC/5A	Phoenix Contact	2320539
Contactor, 20A AC-1, 9A AC-3, 2NO+2NC	Square D	LC1D098G7

Selector Switch 3SU1 SIRIUS 22MM 3 POS	Siemens	KIT=3SU122BLK3PSHSS
Selector Switch 3SU1 SIRIUS 22MM 2 POS BLACK	Siemens	KIT=3SU122BLKSS
Selector Switch 3SU1 SIRIUS 22MM 3 POS MOM	Siemens	KIT=3SU122BLK3PMSHSS
Contact Module 1NO	Siemens	3SU1400-1AA10-1BA0
3 Pole Class CC Fuse Holder	Allen Bradley	1492-FB3C30-L
2 Pole Class CC Fuse Holder	Allen Bradley	1492-FB2C30-L
1 Pole Class CC Fuse Holder	Allen Bradley	1492-FB1C30-L
480-120V, 4:1 Instrument Transformer	ITI	468-480
Fuse 3A, Class CC Cureent-Limiting	Bussmann	LP-CC-3
Fuse 2A, Class CC Cureent-Limiting	Bussmann	LP-CC-2
Fuse 1A, Class CC Cureent-Limiting	Bussmann	LP-CC-1
WL Truck Operated Contacts	Siemens	WLGSGSW111
Contact Module with 1NC	Siemens	3SU1400-1AA10-1CA0

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Test Report PEER STI 2021-11 – UUT 12
PIU Panel
Model # 112334-17
12 GA CRS, NEMA 1
20”W x 7”D x 60”H, 140 lbs (UUT3 in Figure 9)
Rigid Wall mounted using (4) 1/2” A325 bolts

Figure 20. Triaxial accelerometers on UUT3 CG (A09)

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-H} (g)
CBC 2022	ICC-ES AC 156	2.00	1	3.20	2.40	2.00	0.80

Natural Frequencies			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during test.
8.6	7.0	18.9	

Subcomponents	Manufacturer	Part #
Main Breaker Eaton PD 600A	Eaton	PD4-600A
Branch Breaker Eaton PD 400A	Eaton	PD3-400A
Branch Breaker Eaton PD 250A	Eaton	PD2-250A
Branch Breaker Eaton PD 125A	Eaton	PD1-150A
Barnch Breaker Eaton BAB 70	Eaton	BAB-70A

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Test Report PEER STI 2021-11 – UUT 13
PIU Panel – Plug In
Model # 115710-3
12 GA CRS, NEMA 1
32”W x 11.5”D x 68”H, 255 lbs (UUT6 in Figure 9)
Rigid Wall mounted using (4) 1/2” A325 bolts

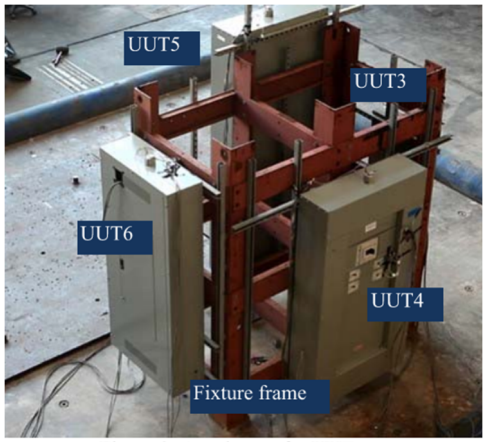

Figure 9. Attachment for UUTs

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-H} (g)
CBC 2022	ICC-ES AC 156	2.00	1	3.20	2.40	1.34	0.54

Natural Frequencies			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during test.
8.5	7.6	19.5	

Subcomponents	Manufacturer	Part #
Main Lugs - 1000A	Connector Mfg. Co.	4ABV-750
Siemens Plug-in Base 150A/250A	Siemens	3VA91430KP00
Siemens 3VA Brekaer 150A	Siemens	3VA62256JP310AA0
Siemens 3VA Breaker 250A	Siemens	3VA61156JP310AA0
Siemens 3VA Breaker Lug Terminal	Siemens	3VA92430JB12

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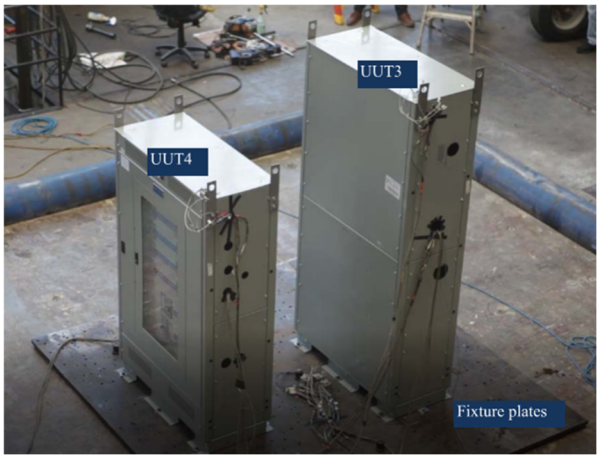
Test Report PEER STI 2022-12– UUT 14
1200 A Panel 72H – UUT4 (shown Left)
Model # 118272-12
7 GA CRS for base of switchgear and 12 GA CRS, NEMA 1
44”W x 20”D x 72”H, 760 lbs
Rigid Floor mounted using: (6) – 1/2” bolts



Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.00	1	3.20	2.40	1.34	0.54

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
8.6	9.1	21.3	

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Subcomponents	Manufacturer	Part #
Main Lugs - 1200A	ILSCO	TA-600-2NS
Siemens Plug-in Base 150A/250A	Siemens	3VA91430KP00
Siemens 3VA Brekaer 150A	Siemens	3VA61156JP310AA0
Siemens 3VA Breaker 250A	Siemens	3VA62256JP310AA0
Siemens 3VA Breaker Lug Terminal	Siemens	3VA92430JB12
Siemens Plug-in Base 400A/600A	Siemens	3VA94430KP00
Siemens 3VA Brekaer 400A	Siemens	3VA63406JP310AA0
Siemens 3VA Breaker 600A	Siemens	3VA64607HL310AA0
Siemens 3VA Breaker 600A	Siemens	3VA64600HL310AA0
Siemens 3VA 600A Output lugs	ILSCO	AU-350
Siemens 3VA 600A Output Heat Sink 3"	Thermal Solutions Intl.	552-3292E
Siemens 3VA 600A Output Heat Sink 2"	Thermal Solutions Intl.	552-3292D

Test Report PEER STI 2022-12– UUT 16
IPC – UUT1 (shown right)
Model # 11272-16
7 GA CRS for base of switchgear and 12 GA CRS, NEMA 1
42”W x 36”D x 72”H, 2250 lbs
Rigid Floor mounted using: (6) – 1/2” bolts

Building Code	Test Criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
				A_{FLX-H} (g)	A_{RIG-H} (g)	A_{FLX-V} (g)	A_{RIG-V} (g)
CBC 2022	ICC-ES AC 156	2.00	1	3.20	2.40	1.34	0.54

Natural Frequencies (Hz)			Test Results
F-B	S-S	V	The UUT maintained structural integrity and functionality after the AC156 test. UUT full of contents during testing.
13.9	10.5	22.5	

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Subcomponents	Manufacturer	Part #
Transformer 300 kVA	MGM	300 kVA-XFMR
Siemens Breaker 1000A	Siemens	3VA66105HL320AA0
Power Meter	ACCUENERGY	ACUCT-4161R-1000:333MV