# APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

| OFFICE USE ONLY | |
|---|---|
| APPLICATION #: | OSP – 0021 – 10 |

## OSHPD Special Seismic Certification Preapproval (OSP)

**Type:** ☐ New ☒ Renewal

## Manufacturer Information

Manufacturer: Industrial Electric Mfg.

Manufacturer's Technical Representative: Ashok Kulkarni

Mailing Address: 48205 Warm Springs Blvd., Fremont, CA 94536

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

## Product Information

Product Name: IEM LV/MV Switchgear & PIE/PIU Panels

Product Type: IEM Switchgear & Panels

Product Model Number: Low and Medium Voltage Switchgear & PIU/PIE Panels
(List all unique product identification numbers and/or part numbers)

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: The PIU and PIE panels are rigidly wall mounted while the Low and Medium Voltage Switchgear are rigidly floor mounted.

## Applicant Information

Applicant Company Name: Industrial Electric Mfg.

Contact Person: Ashok Kulkarni

Mailing Address: 48205 Warm Springs Blvd., Fremont, CA 94536

Telephone: (510) 360-1247 Email: ashokk@iemfg.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: 8/25/2016

Title: Vice President of Engineering Company Name: Industrial Electric Mfg.

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

Company Name: Forell/Elsesser Engineers, Inc.

Name: Marco Scanu, SE California License Number: S4454

Mailing Address: 160 Pine St., 6th Flr., San Francisco, CA 94111

Telephone: (415) 837-0700 Email: m.scanu@forell.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: Southwest Research Institute

Contact Name: Mark Orlowski

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

Telephone: (210) 522-2624 Email: Mark.orlowski@swri.org

## Seismic Parameters

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

Design Basis of Equipment or Components ($F_p/W_p$) = Refer to attached "Certified Product Table"

$S_{DS}$ (Design spectral response acceleration at short period, g) = Refer to attached "Certified Product Table"

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

$R_p$ (Equipment or component response modification factor) = 6.0

$\Omega_0$ (System overstrength factor) = 2.0

$I_p$ (Importance factor) = 1.5

z/h (Height factor ratio) = 1.0

Equipment or Component Natural Frequencies (Hz) = See attachment, UUT Summary Sheets

Overall dimensions and weight (or range thereof) = See attachment, Certified Products Table

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 ) = _____

$\Omega_0$ (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): Certified Products Table, Certified Subcomponents Table, UUT Summary Sheets

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

Signature: _____ Date: 11/04/2016

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): _____

## 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 | 2.41 | 1.82 | IEM LV Switchgear | 2 | Rpt. 18.18135.06 - UUT7 |
| Tie Section | 24" | 22" | 69" | 420 lbs | 7 & 12 GA CRS | 2.41 | 1.82 | IEM LV Switchgear | 2 | Rpt. 18.18135.06 - UUT6 |
| Distributed Section | 38" | 42" | 91.5" | 960 lbs | 7 & 12 GA CRS | 2.41 | 1.82 | 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 | 2.41 | 1.82 | IEM LV Switchgear | 2 | Interpolated |
| Main Section | 42" | 42" | 91.5" | 2,500 lbs | 7 & 12 GA CRS | 2.41 | 1.82 | IEM LV Switchgear | 2 | Rpt. 18.18.116.14 - UUT1 |
| Main/Tie/Distributed/Auxiliary Section | 12"-42" | 12"-46" | 94.5" | 2,750 lbs | 7 & 12 GA CRS | 2.41 | 1.82 | IEM LV Switchgear | 2 | Extrapolated |
| | | | | | | | | | | |
| **Medium Voltage Switchgear** | | | | | | | | | | |
| Main Section | 30" | 32" | 74" | 700 lbs | 7 & 12 GA CRS | 2.03 | 1.52 | IEM MV Switchgear | 2 | Rpt. 18.18135.06 - UUT8 |
| Main Section | 30"-38" | 32"-54" | 94" | 1,290 lbs | 7 & 12 GA CRS | 2.03 | 1.52 | IEM MV Switchgear | 2 | Interpolated |
| Main Section | 38" | 54" | 94" | 1,290 lbs | 7 & 12 GA CRS | 2.03 | 1.52 | IEM MV Switchgear | 2 | Rpt. 18.18135.01 - UUT5 |
| Main Section | 30"-42" | 32"-59" | 97" | 1,420 lbs | 7 & 12 GA CRS | 2.03 | 1.52 | IEM MV Switchgear | 2 | Extrapolated |
| | | | | | | | | | | |
| **Panels** | | | | | | | | | | |
| PIU Panel | 20" | 7" | 69" | 220 lbs | 12 GA CRS | 2.67 | 2.00 | IEM PIU/PIE Panel | 3 | Rpt. 18.18116.14 - UUT3 |
| PIU & PIE Panel | 20" | 6"-7" | 78" | 250 lbs | 12 GA CRS | 2.67 | 2.00 | IEM PIU/PIE Panel | 3 | Interpolated |
| PIE Panel | 20" | 7" | 78" | 250 lbs | 12 GA CRS | 2.67 | 2.00 | IEM PIU/PIE Panel | 3 | Rpt. 18.18116.14 - UUT4 |
| PIU & PIE Panel | 20"-22" | 6"-7" | 81" | 275 lbs | 12 GA CRS | 2.67 | 2.00 | IEM PIU/PIE Panel | 3 | Extrapolated |
| | | | | | | | | | | |

**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. Floor mounted
3. Wall mounted

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

LOW VOLTAGE SWITCHGEAR

| Internal Components | Manufacturer | Part # | Testing Status |
|---|---|---|---|
| GE Entelliguard Breaker 5000A | GE | GA50M1 | UUT1 |
| GE Entelliguard Breaker 3200A | GE | GA32M1 | UUT1 |
| GE Entelliguard Breaker 2000A | GE | GA20M1 | UUT2 |
| 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 |

MEDIUM VOLTAGE SWITCHGEAR

| Internal 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 |

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

PIE PANEL

| Internal 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 |

PIU PANEL

| Internal 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 |

**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 for enclosure
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
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) | $A_{RIG-H}$ (g) |
| CBC 2016 | 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 | |

| UUT1 | | |
|---|---|---|
| **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 | 12VFUK |
| ABB Emax 2 Breaker 800A | ABB | 11VDUF |
| Schweitzer Protective Relay | Schweitzer | IEM-SEL-PROT-RELAY |
| Power meter | Square D | ION-8650 |
| Illuminated Pilot Light Relay | 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 |

| UUT2 | | |
|---|---|---|
| **Subcomponents** | **Manufacturer** | **Part #** |
| GE Entelliguard Breaker 2000A | GE | GA20M1 |
| Square D MasterPact NW 800A | Schneider Electric | WA5EER |
| Square D MasterPact NW 2000A | Schneider Electric | WA5FFR |
| GE Spectra Breaker 1200A | GE | SKL-1200A |
| Push Button | IEM | IEM-PB |
| Illuminated Pilot Light Relay | IEM | IEM-ILL-PB |

**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 for enclosure
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
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) | $A_{RIG-H}$ (g) |
| CBC 2016 | 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 | |

| UUT3 | | |
|---|---|---|
| **Subcomponents** | **Manufacturer** | **Part #** |
| GE Spectra 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 |
| GE Branch Breaker | GE | TEY-70A |
| GE Branch Breaker | GE | TEY-30A |

| UUT4 | | |
|---|---|---|
| **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 for enclosure
38”W x 54”D x 94”H, 1,290 lbs
Floor mounted using: (6) – 12mm bolts

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

| 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 2016 | 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 | |

| UUT5 | | |
|---|---|---|
| **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 for enclosure
24”W x 22”D x 69”H, 420 lbs – UUT6
12”W x 22”D x 69”H, 180 lbs – UUT7
UUT6 & 7 were attached and tested together
Floor mounted using: (8) - 5/8” bolts

| Building Code | Test Criteria | $S_{DS}$ (g) | z/h | Horizontal | | Vertical | |
|---|---|---|---|---|---|---|---|
| | | | | $A_{FLX-H}$ (g) | $A_{RIG-H}$ (g) | $A_{FLX-V}$ (g) | $A_{RIG-H}$ (g) |
| CBC 2016 | 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 | |

| UUT6 | | |
|---|---|---|
| **Subcomponents** | **Manufacturer** | **Part #** |
| GE Entelliguard Breaker 800A | GE | GA08M1 |
| GE Spectra Breaker 600A | GE | SGL-600A |
| ABB Emax 2 Breaker 5000A | ABB | Z6LKUS |

| UUT7 | | |
|---|---|---|
| **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 for enclosure
30”W x 32”D x 74”H, 700 lbs
Floor mounted using: (6) - 5/8” bolts

| Building Code | Test Criteria | $S_{DS}$ (g) | z/h | Horizontal | | Vertical | |
|---|---|---|---|---|---|---|---|
| | | | | $A_{FLX-H}$ (g) | $A_{RIG-H}$ (g) | $A_{FLX-V}$ (g) | $A_{RIG-H}$ (g) |
| CBC 2016 | 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 | |

| UUT8 | | |
|---|---|---|
| **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 |