PART 1 - GENERAL

1.1  SUMMARY

    A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, configuration and installation for medium voltage freestanding or close-coupled metal-clad draw-out switchgear with vacuum circuit breakers (also identified as MV SWGR, SWGR) as required for the complete performance of the Work, as shown on the Drawings, as specified herein, and as specified elsewhere for the assemblies or systems comprised of the components specified herein.

    B. Related Sections: Related sections include, but shall not be limited to, the following:

       1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

       2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections apply to this Section.

       3. The following information is typically depicted on the Drawings: bus configuration, bus ratings, [interrupting ratings,] circuit breaker ratings, circuit breaker protective relaying, elevation and footprint, etc. Where not shown on or able to be derived from the Drawings, the minimum requirements specified herein shall be provided.

       4. Refer to specification Section 26 09 17 Protective Relays and Controllers for additional requirements

       5. Refer to specification Section 26 27 13.13 Power and Energy Meters for additional requirements.

       6. Refer to specification Section 26 27 13.16 Power Quality Meters for additional requirements.

       7. Refer to specification Section 26 09 13 Electrical Power Management Systems for additional requirements

       8. Refer to specification Section 13 34 23.11 Fabricated Electrical Houses for additional requirements

1.2  REFERENCES

    A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.
1. **Canadian Standards Association (CSA)**
   b. CSA C22.2 No. 31-10, “Switchgear Assemblies.”

2. **American National Standards Institute (ANSI)**
   a. ANSI/IEEE C37.20.2 - “IEEE Standard for Metal-Clad Switchgear”
   b. ANSI/IEEE C37.20.7 - “Guide for Testing Metal-Enclosed Switchgear Rated Up to 38kV for Internal Arcing Faults”
   d. ANSI/IEEE C37.06 - “IEEE Standard for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis - “Preferred Rating and Related Required Capabilities for Voltages Above 1000V”
   e. ANSI/IEEE C37.11 - “IEEE Standard Requirements for Electrical Control for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis”
   g. ANSI Z55.1 - “Gray Finishes for Industrial Apparatus and Equipment”

3. **International Organization for Standardization (ISO):**
   a. ISO 9001, “Quality Management Systems - Requirements”

4. **National Electrical Manufacturers Association (NEMA):**
   a. NEMA SG4 - “Alternating Current High Voltage Circuit Breakers”
   b. NEMA SG5 - “Power Switchgear Assemblies.”

5. **National Fire Protection Association (NFPA):**
   a. NFPA 70, “National Electrical Code,” (NEC)
   b. NFPA 79 – “Electrical Standard for Industrial Machinery.”

### 1.3 Definitions

A. Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

1. **MV: Medium voltage**

### 1.4 Submittals

A. Submittals shall be in accordance with the requirements of Section [01 33 00][01300] Submittals and Section [26 00 10][16010] Electrical, in addition to those specified herein.

1. Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.

2. Deviations from the Contract Documents shall be indicated within the submittal. Each deviation shall reference the corresponding drawing or specification number, show the Contract Document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.

3. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications.
a. Manufacturer, supplier, and proposal specific contact information
b. Manufacturer's catalog data indicating model numbers, equipment specifications and construction features including all furnished options, and accessories
c. Enclosure type, [NEMA][IEC] rating, material and finishes
d. Certification of UL conformity

4. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer’s standard product data. Submit shop drawings indicating outline dimensions, enclosure construction, shipping splits, lifting and supporting points, electrical single line diagram, and equipment electrical ratings.

5. Wiring Diagrams: Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring, and between components provided by the manufacturer and those provided by others.

B. Operation & Maintenance (O&M) manuals shall be provided in accordance with the minimum requirements specified in Section [01 78 23][1780] Operation and Maintenance Data, Section [26 00 10][16010] Electrical Requirements and additional requirements specified herein.

1. Manufacturer, supplier, support, and repair center specific contact information.
2. Manufacturer’s standard operation and maintenance data assembled for each size and type of equipment furnished.
3. All construction, installation, schematic, and wiring diagrams updated to an as-installed and commissioned state.] [All submittal information updated to an as-installed and commissioned state.
4. All configured settings/parameters for adjustable components updated to an as-installed and commissioned stated if different from the factory default. Electronic copies of configuration files shall be provided, on media acceptable to the Owner (e.g. CD, USB stick, etc.), where these configurations can be saved as an electronic file for future upload into replaced or repaired components.
5. List of furnished and recommended spare parts.
7. O&M manuals shall be submitted prior to arrival of equipment on site.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of metalclad switchgear of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 10 years.

1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.
2. The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.

B. Installer Qualifications: Installer shall be a firm that shall have a minimum of [10] years of successful installation experience with projects utilizing equipment similar in type and scope to that required for this Project [and shall be approved by the manufacturer's representative].

C. All work performed and all materials used shall be in accordance with the [National Electrical Code], [Canadian Electrical Code] and with applicable local regulations and ordinances. Equipment assemblies, materials, and equipment shall be listed and labeled by Underwriter’s Laboratories or by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
1.6 DELIVERY, STORAGE AND HANDLING

A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.

B. Deliver materials to the Project site in supplier’s or manufacturer’s original wrappings and containers, labeled with supplier’s or manufacturer’s name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.

C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.7 WARRANTY

A. General: Refer to [Section 01 77 00 - Closeout Procedures] [Section 01770 - Closeout Procedures].

B. The manufacturer shall warrant products against defects in material and workmanship for [12 months from the date of commissioning or 18 months from the date of shipment – whichever comes first.] [24 months from the date of commissioning or 36 months from the date of shipment, whichever comes first, provided that the manufacturer performs functional testing, commissioning and first parameter adjusting of equipment.] During the warranty period the manufacturer shall repair or replace defective products. This warranty shall be in addition to any provided by the Contractor. The warranty shall exclude normal wear and tear under normal usage and any damage caused by abuse, modification, or improper maintenance by entities other than the manufacturer or its approved representative.

C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.8 SPECIAL TOOLS AND SPARE PARTS [- NOT USED]

A. The Contractor shall provide a recommended spare parts list with the following information provided as a minimum:

1. Contact information for the closest parts stocking location to the Owner.

2. Critical spare parts shall be identified as those parts being associated with long lead times and/or those being critical to the unit’s operation.

3. Maintenance spares shall be identified as being those parts required to regularly perform scheduled maintenance on the MV equipment. These spares shall include, but shall not be limited to, consumable spares that are required to be exchanged during scheduled maintenance periods.

B. Spare parts shall be provided for each type and size of unit installed. At a minimum, the following shall be provided:

1. Provide the minimum spare parts recommended by the manufacturer.

2. Provide [1] set of each type of power and control fuse installed within equipment

3. Provide [1] of each type and color of non-LED type indicating light

C. Any manufacturer specific special tool, not normally found in an electrician’s toolbox, required to remove and install recommended or furnished spare parts shall be furnished. At a minimum the following shall be provided:
1. Provide [1] racking handle(s) with equipment. Charging handle to be furnished on each breaker mechanism.

2. For all switchgear with circuit breakers in upper compartments, provide [1] circuit breaker lifting device - portable, floor-supported with a roller base. Also provide same portable lifting device with each outdoor non-walk-in lineup(s).


8. If available from manufacture[ and required to configure equipment], provide PC-based configuration software tool and a minimum of [one] communication interface cable for each type of cable required to connect a PC-based computer to the devices specified herein for configuration and programming.

9. Electronic configuration files, in a media format acceptable by the Owner (e.g. CD, USB stick, etc.), updated to an as-installed and commissioned state.

D. Spare parts shall be properly marked and packaged for long term storage. Printed circuit boards shall be provided in separate anti-static containers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. [Basis-of-Design Product: Subject to compliance with requirements, provide Square D Masterclad Switchgear, by Schneider Electric.]

B. Acceptable Products: MV SWGR specified herein shall be the product of a single manufacturer. Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. Provide the following specified product and manufacturer without exception, unless approved as a substitute by addendum to the Contract Documents prior to the bid date:

1. Square D Masterclad Switchgear by Schneider Electric

2. [2nd manufacturer and model]

3. [3rd manufacturer and model]

2.2 GENERAL REQUIREMENTS

A. The metal-clad switchgear shall consist of an [indoor][outdoor non-walk-in][outdoor walk-in front aisle][outdoor common aisle double row][outdoor electrical house with indoor] enclosure(s) containing circuit breakers and the necessary accessory components all factory assembled (except for necessary shipping splits) and operationally checked. The assembly shall be a self-supporting and floor mounted on a level concrete pad. The integrated switchgear assembly shall withstand the effects of closing, carrying and interrupting currents up to the assigned maximum short circuit rating.

B. The following information is typically depicted on the Drawings: bus configuration, bus ratings, [interrupting ratings,] circuit breaker ratings, circuit breaker protective relaying, elevation and footprint, etc. Where not shown on or able to be derived from the Drawings, the minimum requirements specified herein shall be provided.
C. System Voltage shall be [XX] kV nominal, three-phase [grounded][high impedance grounded][ungrounded], 60 Hz.

D. Maximum Design Voltage shall be [4.76][8.25][15.0][27.0] kV.

E. Impulse Withstand (Basic Impulse Level) shall be [60][95][125] kV.

F. Power Frequency Withstand shall be [19][36][60] kV, 1 minute test.

G. Main Bus Ampacity shall be [1200][2000][3000 or 2750@27kV] amps, continuous.

H. Momentary Current Ratings shall be equal to the circuit breaker close and latch rating.

2.3 COMPONENTS

A. Stationary Structure
   1. The switchgear shall consist of sections including breaker compartments and auxiliary compartments as specified on drawings assembled to form a rigid self-supporting completely enclosed structure providing steel barriers between sections.
   2. The sections shall be divided by metal barriers into the following separate compartments:
      a. Circuit breaker, instrument, main bus, auxiliary device and cable. Each feeder section may have up to two circuit breaker compartments.

B. Circuit Breaker Compartment
   1. Each circuit breaker compartment shall be designed to house a horizontal drawout metal-clad vacuum circuit breaker. The stationary primary disconnecting contacts are to be silver-plated copper and mounted within [glass polyester][porcelain][molded cycloaliphatic epoxy @ 27kV] support bushings. The movable contacts and springs shall be mounted on the circuit breaker element for ease of inspection/maintenance.
   2. Entrance to the stationary primary disconnecting contacts shall be automatically covered by metal shutters when the circuit breaker is withdrawn from the connected position to the test or disconnected position or removed from the circuit breaker compartment. Ground bus shall be extended into the circuit breaker compartment to automatically ground the breaker frame with high-current spring type grounding contacts located on the breaker chassis when in the test and connected positions. Guide rails for positioning the circuit breaker and all other necessary hardware shall be an integral part of the circuit breaker compartment. Blocking devices shall interlock breaker frame sizes to prevent installation of a lower ampere rating or interrupting capacity element into a compartment designed for one of a higher rating. It shall be possible with indoor or outdoor walk-in switchgear to install a circuit breaker into a bottom compartment without use of a transport truck or lift device.

C. Cable Compartment/Ground Bus
   1. [Clamp type cable lugs][Compression type cable lugs][Cable terminators][Poleheads] shall be furnished as shown on plans. The ground bus shall be 1/4" x 2" copper and shall extend through this compartment for the full length of the switchgear. Auxiliary bus, if needed, and load bus support NEMA Class A-20 standoff insulators shall be constructed of high-track-resistant polyester material. Porcelain insulators shall be provided.

D. Main Bus Compartment
   1. The main bus shall be fully insulated for its entire length with an epoxy coating by the fluidized bed process. The conductors shall be [silver-plated copper][tin-plated aluminum] and be of a bolted [not welded] design. Access to this compartment shall be accessed from the front or rear of the structure by removing a steel barrier. [Provisions for future extension shall be provided where shown on drawings][Provisions shall be provided for future extension].
E. Doors and Panels
1. Relays, meters, control switches, etc., shall be mounted on a formed front-hinged panel for each circuit breaker compartment as required by electrical drawings and schedules.

F. Circuit Breakers:
1. The circuit breakers shall be rated [XX] nominal volts, [4760][8250][15000][27000]maximum volts, 60 Hz, with a continuous current rating of [1200][2000][3000 or 2750@ 27 kV*] amps and a maximum symmetrical interrupting rating of [40kA/250MVA - 4.76 kV system][50kA/350MVA - 4.76 kV system][63kA/500MVA - 8.76 kV system][50kA/500MVA - 15 kV system][40kA/750MVA - 15 kV system][50kA/1000MVA - 15 kV system][63kA/1500MVA - 15 kV system][16kA / 750 MVA @ 27kV][25kA / 1250 MVA @ 27kV][40kA / 2000 MVA @ 27kV].
2. Furnish Type VR circuit breakers with one vacuum interrupter per phase.
3. Breakers of same type and rating shall be completely interchangeable.
4. The circuit breaker shall be operated by means of a stored energy mechanism which is normally charged by a universal motor but can also be charged by the manual handle supplied on each VR breaker for manual emergency closing or testing.
5. The closing speed of the moving contacts shall be independent of both the control voltage and the operator.
6. A full front shield shall be provided on the breaker.
7. Secondary control circuits shall be connected automatically with a self-aligning, self-engaging plug and receptacle arrangement when the circuit breaker is racked into the connected position.
8. Provision shall be made for secondary control plug to be manually connected in test position.
9. A minimum of 4 auxiliary contacts (2a 2b), shall be provided for external use.
10. Provisions shall be made for [10 / 5a, 5b][13 / 7a, 6b] additional cell-mounted auxiliary contacts [MOC type][TOC type][both MOC and TOC type] for external use. The racking mechanism to move the breaker between positions shall be operable with the front door closed and position indication shall be visible with door closed.
11. An interlocking system shall be provided to prevent racking a closed circuit breaker to or from any position. An additional interlock shall automatically discharge the stored-energy operating mechanism springs upon removal of the breaker out of the compartment.
12. The circuit breaker control voltage shall be: [48][125][250], volts DC [120][230], volts AC - one capacitor trip unit shall be provided for each circuit breaker when AC control power is required.

G. Instrument Transformers
1. Current transformers: Each breaker compartment shall have provision for front-accessible mounting of up to four current transformers per phase (ANSI standard relay accuracy), two on bus side and two on cable side of circuit breaker. The current transformer assembly shall be insulated for the full voltage rating of the switchgear. The current transformers wiring shall be Type SIS #12 AWG. Relaying and metering accuracy shall conform to ANSI Standards.
2. Voltage transformers shall be drawout mounted with primary current-limiting fuses and shall have ratio as indicated. The transformers shall have mechanical rating equal to the momentary rating of the circuit breakers and shall have metering accuracy per ANSI Standards.

H. Control Wiring: The switchgear shall be wired with type SIS #14 AWG, except where larger size wire is specified. The switchgear shall be provided with terminal blocks for outgoing control connections. Wire markers shall be provided for each end of all control wires.

I. Service, construction, and operation of the SWGR shall be in accordance with ANSI Standard C37.20.7 Type 2B (Passive) and Type 2BC (Active) Arc Resistance at 5/15kV
2.4 CONSTRUCTION

A. Construction: Each equipment bay shall be a separately constructed cubicle assembled to form a rigid freestanding unit. Minimum sheet metal thickness shall be 11 gauge steel on all exterior surfaces. Adjacent bays shall be securely bolted together to form an integrated rigid structure. The rear covers shall be removable to assist installation and maintenance of bus and cables. Each individual unit shall be braced to prevent distortion.

B. Dimensions: Standard dimensions for 5-15 kV SWGR per indoor section shall be: 36 in W x 95 in H x 92/100 in D. Standard dimensions for 27 kV SWGR per indoor section shall be: 36 in W x 95 in H x 110.5 in D.

C. Outdoor equipment dimensions will vary with enclosure style and circuit breaker selection. Maximum height shall be [109 in for non-walk-in][115 in for walk-in] style enclosure, measured to peak of the sloped roof.

D. The metal-clad switchgear shall be fully assembled, inspected and tested at the factory prior to shipment. Large line-ups shall be split to permit normal shipping and handling as well as for ease of rejoining at the job site.

2.5 FINISHING

A. All steel parts, except galvanized (if used), shall be cleaned and a zinc-phosphate (outdoor equipment) or iron phosphate (indoor equipment) pre-treatment applied prior to paint application.

B. Paint color shall be ANSI-61 [light grey]; TGIC polyester powder, applied electrostatically through air. Following paint application, parts shall be baked to produce a hard durable finish. The average thickness of the paint film shall be 2.0 mils. Paint film shall be uniform in color and free from blisters, sags, flaking and peeling.

C. Adequacy of paint finish to inhibit the buildup of rust on ferrous metal materials shall be tested and evaluated per paragraphs 5.2.8.1-7 of ANSI C37.20.2-1987. Salt spray withstand tests in accordance with ASTM #D-1654 and #B-117 shall be performed on a periodic basis to provide conformance with the corrosion resistance standard of at least 2500 hours minimum (outdoor equipment) or 600 hours minimum (indoor equipment).

2.6 PROTECTIVE RELAYS

A. Provide a protective relay for each circuit breaker as specified in Section 26 09 17 Protective Relays and Controllers and as indicated on Drawings. Protective relays shall meet the minimum requirements for the circuit breaker application (main, feeder, busbar, capacitor, transformer, generator, etc.) with the protection types (ANSI/IEEE C37.2 device numbers) and protection levels (basic, standard, advanced) specified or shown.

2.7 METERING

A. Provide a power meter for each circuit breaker application as follows:

1. **MV Mains**: The metering device used to monitor the medium voltage mains for network management, energy cost allocation, power quality analysis, asset management, operational efficiency, and compliance reporting, shall be an Advanced Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.

2. **MV Feeders**: The metering device used to monitor the medium voltage feeders for network management, energy cost allocation, power quality analysis, asset management, operational efficiency, and compliance reporting, shall be a Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.
3. **Utility Revenue**: The revenue grade metering device used to monitor incoming utility medium voltage mains for grid revenue, substation automation, network management, energy cost allocation, power quality analysis, asset management, operational efficiency, and compliance reporting, shall be a Utility Revenue Power Quality Meter as specified in Section 26.27.13.16 Power Quality Meters.

4. **Transfer Switches**: The metering device used to monitor transfer switches for purposes of automated generator test documentation such as Emergency Power Supply System (EPSS) Test Automation, shall be a Power Quality Meter as specified in Section 26.27.13.16 Power Quality Meters.

5. **Generators**: The metering device used to monitor generators for purposes of automated generator test documentation[, Emergency Power Supply System (EPSS) Test Automation] shall be an Advanced Power Quality Meter as specified in Section 26.27.13.16 Power Quality Meters.

### 2.8 MARKINGS AND LABELING

**A.** All identification and warning labels and nameplates exterior to the switchgear shall be resistant to weather, UV, and their intended installation environment.

**B.** Equipment shall be provided with an engraved nameplate identifying the project specific equipment tag and service description.

**C.** Warning labels and nameplates shall be present at access locations to advise personnel of possible hazards. The equipment shall be marked in accordance with UL, NFPA 70 NEC, NFPA 70E, and other applicable standards.

### 2.9 ELECTRICAL POWER MANAGEMENT SYSTEM [-NOT USED]

**A.** The equipment specified herein shall provide the necessary communications connectivity and functionality of an Electrical Power Management System (EPMS). This shall include, but not be limited, to the following:

1. Communications connectivity using the specified Ethernet network and protocols of the EPMS and related EPMS connected devices and equipment necessary to provide functionality. Devices may be connected through a communications gateway as shown or specified; otherwise Ethernet and protocol connectivity shall be provided within the equipment. Equipment sections with multiple connected devices and assemblies of bolted adjacent bays shall include an internal interwired communications network for a singular connection to the EPMS network for power monitoring, equipment status and alarms.

2. Compliance with Cyber security requirements.

3. Remote EPMS application functionality for equipment configuration [and operational control]; electrical power monitoring; power quality monitoring, compliance and correction; and alarm monitoring with event log.

4. Refer to the Electrical Power Management System specification section for additional requirements.

**B.** Native software compatibility shall be fully factory-tested, and shall include the following characteristics.

1. Capability for pre-engineered, interactive graphical display screens to view and analyze real-time device data. Data displayed shall include the following:

2. Pre-mapping of registers to standard measurement names without the need for additional configuration or internal device registers.

3. Automatic collection and logging of device data by EPMS software without additional configuration. Historical data logged shall include the following.
PART 3 - EXECUTION

3.1 GENERAL

A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of specifications Section [26 00 10][16010], Section [26 08 00][16080] and Drawings.

B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.

C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
   1. Verify that required utilities (e.g., control voltage for heater circuits on outdoor switchgear) are available, in proper location, and ready for use.

D. Pre-Installation Conference: Prior to commencing the installation, an onsite pre-installation conference shall review the material selections, installation procedures, and coordination with other trades. Attendees shall include, but shall not be limited to, the Contractor, the Installer, manufacturer’s representatives, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Engineer

A. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

B. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer’s written instructions and recommendations, and as indicated on the Drawings.

C. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

3.2 FACTORY ACCEPTANCE TESTING [- NOT USED]

3.3 FIELD QUALITY CONTROL [- NOT USED]

A. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory-trained manufacturer’s field service representative. This manufacturer’s field service technician shall provide all material, equipment, labor and technical supervision to perform inspection, testing and adjustments to ensure equipment is installed, adjusted, and tested in accordance with the manufacturer’s recommendations and is ready for operation. The manufacturer’s field service technician shall replace damaged or malfunctioning equipment and report to the Engineer any discrepancies or issues with the installation.

B. The manufacturer’s representative shall, upon satisfactory completion of inspection and testing, attach a label to all serviced devices indicating the date serviced and testing company responsible.

3.4 FIELD TESTING AND COMMISSIONING [- NOT USED]

A. Operational Readiness Testing
   1. The Contractor shall inspect and test furnished equipment and associated systems for conformance to the contract documents, including equipment manufacturer’s recommendations, and readiness for operation. The test shall include the following as a minimum:
      a. Visually inspect for physical damage and proper installation
      b. Perform tests in accordance with manufacturer’s instructions
c. Perform tests to ensure compliance with Contract Documents
d. Perform tests that equipment is ready for operation
e. Touch-up paint all chips and scratches with manufacturer-supplied paint and transfer remaining paint to Owner

2. Contractor shall submit an operational readiness test report documenting all test results, including all assumptions, conditions, allowances and corrections made during the test. The report shall provide a listing of all modifications and adjustments made onsite to include any settings / parameters not identified as factory defaults within the equipment’s O&M documentation. The test report shall include a signed statement from the Contractor, installer(s) and the factory-trained manufacturer’s representative(s) certifying that the furnished equipment and associated system have been installed, configured, and tested in accordance with the manufacturer’s recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.

B. Functional Demonstration Testing
1. Prior to scheduling functional demonstration testing the Contractor shall submit a signed statement from the Contractor, installer(s) and the factory-trained manufacturer’s representative(s) certifying that the furnished equipment and associated system have been installed, configured, and tested in accordance with the manufacturer’s recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.

2. The Contractor shall completely demonstrate the functionality and performance of the equipment and associated systems in the presence of Owner and Engineer, observing and documenting complete compliance with the Contract Documents.

3. The Contractor shall submit a written report documenting successful completion of functional demonstrating testing including all assumptions, conditions, allowances and corrections made during the test.

3.5 TRAINING

A. O&M Training: Onsite training specific to the equipment furnished shall be provided to the Owner’s staff by a factory trained manufacturer’s representative. Training duration shall be sufficiently adequate to cover the operation and maintenance of the equipment and shall consist of not less than [1][2 repeated] session(s) with [4] hours of onsite classroom and hands-on instruction for a minimum of [4] attendees per session.

1. The instructor shall provide sufficient time and detail in each session to cover the following as a minimum:
   a. Theory of operation
   b. Major components of equipment
   c. Operation of equipment
   d. Configurations of equipment
   e. Maintenance, troubleshooting and repair
   f. Replacement of component level parts

2. [The submitted O&M manuals shall be used for training.][Manuals and documentation shall be provided to each participant for training.]
EcoStruxure are trademarks and the property of Schneider Electric SE, its subsidiaries, and affiliated companies. All other trademarks are the property of their respective owners.

DISCLAIMER STATEMENT
This guide specification has been written and is intended to be used by a professionally qualified specifier and/or design professional. The use of this guide specification requires the professional judgment and expertise of the qualified specifier and/or design professional to adapt or revise the information to the specific needs for the Project and is not intended to be used verbatim as a project specification section without appropriate modifications for the specific use intended. The guide specification must be used and coordinated in accordance with the procedures of each design firm, and the requirements of the specific project. This guide specification is subject to change without written notice by the manufacturer and the manufacturer expressly disclaims any warranty, expressed or implied.