PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Switchgear assembly, including draw-out breaker sections complete with circuit breakers will be provided by Contractor. Contractor is responsible for purchasing, receiving, transporting and installing all equipment.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Site grading: Division 2.
B. Structural concrete pad work: Division 3.
D. Submittals: Division 1.

1.03 QUALITY ASSURANCE

A. Installer qualifications: Minimum 5 years of continuous experience in application, erection, fabrication, installation, or setting of specified (i.e., identical material types) work of similar complexity; experience in application, erection, fabrication, installation, or setting of similar (i.e., non-identical material types) work or work of less complexity are not acceptable. Also refer to specific requirements of this specification.

B. Assembly/system products qualifications:
   1. All equipment to be furnished under these Specifications shall be new and not used prior to delivery, except where necessary for testing, installation, and adjustment of equipment.
   2. All necessary material and equipment not specifically detailed in these Specifications but desirable, necessary, or required to ensure this equipment will perform satisfactory for the intended work shall be itemized and included.

C. Manufacturer shall perform the work included in this Section in strict accord with requirements of manufacturer’s Quality Control Program.

D. Factory tests:
   1. The switchgear shall be completely factory-tested and calibrated as a system prior to shipment.
2. Perform all tests after assembly is complete.
3. Submit certified test results in duplicate.
4. Test shall include, but not be limited to, manufacturer's standard.

E. Switchgear assemblies and major components shall be tested in accord with requirements given in ANSI C29.1, C37.09, C37.20, C37.34, C37.41, C57.13, and C62.1.

F. Requirements of regulatory agencies:
   1. In addition to complying with other legal requirements, switchgear shall conform to or exceed applicable requirements of the latest edition of the following codes and standards:
      a. All portions of American National Standards Institute (ANSI), Institute of Electrical and Electronic Engineers (IEEE), National Electric Code (NEC) as amended by the state of California, and National Electrical Manufacturers Association (NEMA) standards applicable to the basic switch and fuse components.
   2. Bear UL labels.
   4. External doors shall be provided with "CAUTION - HIGH VOLTAGE" permanent signs.

G. Reference specifications and standards:
   1. ANSI: C29.1 Test Methods for Electrical Insulators.
   2. ANSI: C37.04 Rating Structure for AC High-Voltage Circuit Breakers.
   4. ANSI: C37.11 Requirements for Electrical Control for AC High-Voltage Circuit Breakers.
   5. ANSI: C37.20.2 Standard for Metal-Clad and Station-Type Cubicle Switchgear.
   6. ANSI: C37.20.3 Metal-Enclosed Interrupter Switchgear.
   7. ANSI: C37.30 Definitions and Requirements for High-Voltage Air Switches, Insulators, and Bus Supports.
   8. ANSI: C37.31 Indoor Apparatus Insulators.
   9. ANSI: C57.13 Requirements for Instrument Transformers.
12. NEMA: E1 2 Instrument Transformers.
13. NEMA: SG 4 AC High-Voltage Circuit Breakers.

1.04 SUBMITTALS
   A. Procedures: In accord with Division 1 requirements.
   B. Submit detailed shop drawings with:
      1. Manufacturer’s descriptions, catalog data and information, including model numbers or item identification.
      2. Manufacturer’s general arrangement and detail drawings for the switchgear assembly and prime components.
      3. Manufacturer’s schematic wiring and interconnection diagrams.
      4. Protection devices, coordination data curves, and settings available data.
      5. Operation and maintenance manual, including spare parts list.
      6. Factory Production Test Reports.
      7. Field Acceptance Test Reports.

1.05 PRODUCT HANDLING
   A. In accord with manufacturer’s instructions.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS
   A. The following manufacturers are acceptable. No other known equal is acceptable without written consent of the Owner:
      1. General Electric
      2. Siemens
2.02 MATERIALS AND EQUIPMENT

A. Assembly shall be comprised of an integrated line-up of walk-in outdoor metal-clad switchgear. The switchgear assembly shall consist of two mains and a tie circuit breaker with draw-out circuit breakers for branch load distributions systems (bays). Provide surge arresters, bus and connections, instrument transformers, meters, relays, control wiring, and accessory devices as shown on the drawings.

B. Ratings: The double-ended switchgear with the tie circuit breaker assembly shall have the following ratings:
   1. kV, nominal: 12.47kV and 4.16 kV. Voltage as shown on plans.
   2. kV, maximum: 15kV and 4.76 kV. Voltage as shown on plans.
   3. kV, BIL: 95 for 15kV equipment.
   5. Short-circuit ratings:
      a. Amperes, RMS symmetrical maximum: 23K.
      b. MVA three-phase symmetrical at rated nominal voltage: 500.
      c. Duty-cycle fault-closing amperes, RMS asymmetrical: 37K.

C. Construction stationary structure:
   1. In establishing requirements for the enclosure design, consideration shall be given to all relevant factors such as controlled access; tamper resistance; corrosion resistance; protection from ingress of rodents, insects, and weeds; and the possibility of arcing faults within the enclosure.
      a. The switchgear line-up shall be comprised of the required number of metal-clad sections, assembled together to form a rigid self-supporting structure with barriers of painted steel between units.
      b. Each metal-clad section shall consist of the required number of structures; segregated by grounded metal barriers into separate compartments for circuit breakers, instrument transformers, main bus, instruments and relays, and incoming service connections.
   2. Doors and panels:
      a. Each circuit breaker and voltage transformer compartment shall be provided with a formed, hinged front door with handle and three-point lockable latch. Each door shall be furnished with a stop to hold the door in the open
position. Circuit breaker and instrument transformer compartment doors shall not hinder withdrawal of the element from the compartment when the door is open and door-stop set.

b. Relays, instruments, meters, and secondary control devices shall be mounted on formed front-hinged panels and provided with handle lockable latch, and stop to hold panel in the open position. Equipment mounted on the panel shall be isolated by grounded metal barriers from all primary circuit elements.

c. Access to main bus, incoming service connections, feeder cable terminations, current transformers, bushings, and other stationary devices shall be provided with hinged, bolted panels.

3. Circuit breaker compartment:
   a. Circuit breaker compartment shall be designed to house a draw-out type circuit breaker element. Welded guide rails for positioning the circuit breaker shall be provided as an integral part of the compartment.
   
b. Automatic shutters shall be provided in the compartment to prevent accidental contact with the stationary primary disconnecting contacts when the circuit breaker element is withdrawn from the Connected position.
   
c. A ground bus shall extend into the compartment to automatically ground the circuit breaker frame in the Connected and Test positions. The ground bus shall maintain the circuit breaker frame grounded during the transition between all positions.
   
d. Means shall be provided for positively holding the circuit breaker element in place when it is in either the Connected or Test/Disconnected position within the compartment. Mechanical interlocks shall also prevent incorrect movement of a closed circuit breaker to or from the designated positions within the compartment, and prevent electrical closing of the circuit breaker within the compartment unless it is in the Connected or Test position. Provision shall be made for padlocking the circuit breaker element in the Test/Disconnected position with a 1/4 in. diameter x 1 in. shackle padlock.
   
e. Circuit breaker compartments shall only permit the interchange of circuit breaker removable elements of the same type and rating.

4. Voltage transformer compartment: Designed to house the specified transformer assembly. Compartment door shall be furnished with interlock to prevent access to the transformer and primary fuses unless they are disconnected from the
primary circuit. The Connected/Disconnected positions shall be clearly visible when the compartment door is closed. Means shall be provided to prevent accidental access to the stationary primary contacts when the transformer and fuses are not in the Connected position.

5. Main bus:
   a. The main three-phase bus shall be comprised of electrical grade copper. Bus shall be fully insulated over its entire length with flame-retardant, non-hygroscopic, track-resistant insulation. All bus tap connections, including bus taps and circuit breaker connections, shall be silver-plated, with current density equal 1000A per sq. in. (155a.cm2) of cross-section for said copper.
   b. The main bus and connections shall be braced to withstand the mechanical stresses associated with rated short-circuit momentary currents without deformation or damage to supports.
   c. Bus compartments with the metal-enclosed sections shall be isolated to metal-clad switchgear standards and that all bus bars within the metal-enclosed sections shall be insulated per metal-clad standards.

6. Ground bus: A copper ground bus, not less than 2 in. x 1/4 in., shall extend the length of the switchgear sections with all bolted joints silver-plated. In each switchgear unit, where power buses enter or leave the switchgear at the top, a copper ground bus, not less than 1 in. x 1/8 in., shall be extended from the main ground bus up to the top of the unit. All joints in the ground bus shall be made with a minimum of two bolts.

7. Bus transition units: Provided with the switchgear assembly as required by manufacturer’s design of line-up. The transition unit structures shall be full-height with front and rear bolted panels. Front panel shall be in line with those of the adjacent switchgear sections.

D. Medium-voltage AC circuit breakers:
   1. Circuit breakers shall comply with requirements given in ANSI C37.04, C37.11, and NEMA SG 4.
   2. Type: The circuit breakers shall be indoor, three-pole, draw-out type, with sealed vacuum, AC motor-charged spring-operated mechanisms. Circuit breakers of the same rating shall be physically and electrically interchangeable.
a. The Siemens Type GMI circuit breaker for use in Upper Substation shall be keyed to match the existing cells. The breaker controls and control voltages shall match the existing upper switchgear.

b. The GE PowerVac circuit breakers for the new Lower Substation switchgear shall be keyed to match the existing circuit breakers in the Middle Substation.

3. Acceptable Manufacturers, No known equal:
   a. General Electric PowerVac for Lower Substation. Quantity as shown on plans.
   b. Siemens Type GMI Vacuum Breaker for Upper Substation. Quantity one (1).

4. Ratings: The circuit breakers shall be rated on a symmetrical current basis and have the following ratings and required related capabilities and defined in ANSI C37.04:
   a. General Electric Circuit Breakers:
      1) Nominal operating voltage, kV, RMS: 12.47 kV or 4.16 kV. Voltage as shown on plans.
      2) Rated maximum voltage, kV, RMS: 15kV or 4.76 kV. Voltage as shown on plans.
      3) Rated continuous current at 60 Hz amperes, RMS: 1200.
      4) (4) Nominal MVA Class: 500
      5) Required symmetrical current interrupting capability at nominal operating voltage, kilo-amperes, RMS, minimum: 23.
      6) Required closing and latching capability, kilo-amperes, RMS, minimum: 37.
      7) Rated interrupting time, cycles, maximum: 5.
      8) Rated permissible tripping delay, seconds: 2.
   b. Siemens Type GMI Vacuum Breaker:
      1) Nominal operating voltage, kV, RMS: 12.47 kV.
      2) Rated maximum voltage, kV, RMS: 15kV.
      3) Rated continuous current at 60 Hz amperes, RMS: 1200.
      4) Nominal MVA Class: 500
      5) Required symmetrical current interrupting capability at nominal operating voltage, kilo-amperes, RMS, minimum: 23.
6) Required closing and latching capability, kilo-amperes, RMS, minimum: 37.

7) Rated interrupting time, cycles, maximum: 5.

8) Rated permissible tripping delay, seconds: 2.

5. Insulation structure: Materials used for circuit breaker insulation shall be of a type that are noncombustible, non-hygroscopic and tracking resistant. The mechanical strength and physical characteristics of the insulation structure shall match the stresses imposed by the circuit breaker required closing and latching current capability.

6. Removable assembly:
   a. The circuit breaker removable elements shall be truck-mounted or cradle-mounted with pull-bar or handles suitable for manual removal and insertion of the element out of and into the stationary compartment.
   b. The removable element shall be provided with a fully interlocked, manually-operated racking mechanism to move the circuit breaker between the Test/Disconnected, and Connected positions. A clearly-visible position indicator shall be provided.
   c. It shall be impossible to insert a circuit breaker of incorrect rating in any bay.
   d. The removable element frame shall be provided with a full front metal shield to prevent access to any live primary bus or load terminals when the circuit breaker is in the Connected position.
   e. The circuit breaker removable element’s primary disconnecting contacts shall be provided with heavy-duty, self-aligning, spring-loaded, silver-plated, copper disconnect fingers that engage with the line- and load-side stationary disconnecting contacts.
   f. The circuit breaker interrupters shall be provided with means for determining contact wear without dismantling.
   g. Control wiring connections, from circuit breaker compartment to the removable element, shall have provisions for maintaining or automatically reinstating circuit continuity when the removable element is moved between the Connected and Test positions. Suitable means shall be provided for simultaneous disconnection of control wiring connections when the removable element is fully withdrawn from the compartment.
h. Circuit breakers shall be provided with auxiliary switches for functions specified and as indicated, plus two spare switches wired to control compartment.

7. Operating mechanism:
   a. The circuit breaker operating mechanism shall be of the motor-charged, spring-operated type. The design of the mechanism shall prevent overcharging and ensure that the release of stored energy for closing the circuit breaker main contacts is prevented unless the mechanism has been fully charged. The design shall be mechanically trip-free. Energy storage shall be sufficient for an opening-closing-opening operation at the maximum symmetrical current interrupting capability of the circuit breakers.
   b. The spring-operated mechanism shall be automatically recharged within 15 seconds after each circuit breaker closing operation. Mechanism shall have provisions for manually charging the closing springs.
   c. The stored-energy mechanism shall be provided with a mechanical indicator to show the Charged and Discharged status of the closing springs. An interlock shall be provided to prevent the complete withdrawal of the circuit breaker removable element from the stationary compartment when the mechanism is in a fully charged state; or alternatively, automatically discharge the stored energy when the removable element is withdrawn from or inserted into the compartment.
   d. Each mechanism shall be provided with four-digit, non-resettable mechanical register type operation counter to record each circuit breaker close/open cycle.
   e. The mechanism shall be provided with Open and Close mechanical control pushbuttons, mounted on the removable element escutcheon plate, for test purposes and for use in emergency. The mechanism shall also be furnished with an easily readable mechanical position indicator, mounted on the removable element, to indicate the Open and Closed positions of the main moving contacts.

8. Circuit breaker control:
   a. The circuit breakers shall be designed for local electrical operation at 48 volts DC nominal control power supply.
b. The closing mechanism shall be provided with spring release coil, anti-pump relay, and spring charging motor suitable for operation over a voltage range of 38V to 56V. The tripping mechanism shall be provided with a shunt trip coil suitable for operation over a voltage range of 28V to 56V.

E. Surge Arresters:

1. Type: Surge arresters shall comply with requirements of ANSI C62.1 and C62.2, as applicable, and shall be intermediate-class, gapless, meta-oxide type, suitable for mounting inside a separate metal enclosure. Arresters shall be provided with a pressure relief diaphragm.

2. Ratings: Arrester rating, kV, RMS, shall be suitable for use at nominal service voltages of 12.47kV and 4.16 kV, three-phase, 60 Hz as indicated. Required arrester ratings are as follows:

<table>
<thead>
<tr>
<th>Nominal System Voltage-kV, RMS</th>
<th>Arrester Voltage Rating-kV, RMS</th>
<th>MCOV*</th>
<th>Maximum 0.5 Microsecond Discharge Arrester kV-Crest**</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.16</td>
<td>6</td>
<td>5.10</td>
<td>22.0</td>
</tr>
<tr>
<td>12.47</td>
<td>12</td>
<td>10.2</td>
<td>44.0</td>
</tr>
</tbody>
</table>

* Maximum continuous operating voltage.

** Equivalent of a fast front 10 kA current producing a voltage wave crested in 0.5 microsecond.

3. Arrangement:
   a. Arrester pressure relief diaphragm shall be arranged in the enclosure so that the vent ports are directed away from all adjacent apparatus. Preferably, the generated ionized gases during normal operation shall be vented to the outside of the switchgear enclosure.
   b. Arrester ground terminals shall be directly connected to the switchgear main ground bus.

4. Two sets of arresters shall be installed, one set on each side of the tie breaker bus.

F. Relays and Instruments:

1. All relays shall be GE Multilin F650 or Basler relays, no acceptable equal.

2. Relays: Switchgear assembly shall be furnished with protection by relays and indication. The following is a description of the required operating characteristics:
Medium Voltage Switchgear

a.  
   *Ground fault       50G/51G  
   *Instantaneous overcurrent  50  
   *Time Overcurrent     51  
   *Lockout relay      86  

b.  The relay shall be solid-state microprocessor-based multi-functional type that operates from the secondary output of current transformers. The relay shall provide ANSI 50/51 protective functions for each of the three phases, and ANSI 50/51N or 50/51G ground fault protection functions. The relay shall be true RMS sensing of each phase and ground. Ground element shall be capable of being utilized in residual, zero sequence, or ground source connection schemes, or deactivated.

c.  Both the phase and ground protection curves shall be independently field selectable and programmable with or without load. Curves shall be selected from the following:
   1)  IEEE: Moderately inverse, very inverse, extremely inverse.
   2)  Thermal: Flat, It, I²t, I⁴t.

Thermal curves shall be similar to those on low-voltage trip units for close coordination with downstream devices. Selectable short delay pick-up and short delay time settings shall also be provided. The phase instantaneous overcurrent trip shall have field programmable pick-up points from 1 to 25 times current transformer primary rating or none.

d.  The relay shall have a built-in alphanumeric display capable of displaying the following information with metering accuracy of ±1% of full-scale (In) from 0.04 Iₙ to 1 x Iₙ, and ±2% of full scale (Iₙ) from 1 x Iₙ to 2 x Iₙ:
   1)  Individual phase currents.
   2)  Ground current.
   3)  Cause of trip.
   4)  Magnitude and phase of current causing trip.
   5)  Peak current demand for each phase and ground since last reset.
   6)  Current transformer primary rating.
   7)  Programmed phase and ground setpoints.

e.  Relay shall have the following features:
1) Integral manual testing capability for both phase and ground.
2) Continuous self-testing of internal circuitry.
3) Unit failure alarm contact for Owner use.
4) Programmable inputs, such as current transformer ratios.
5) Access to program and test modes shall be via sealable cover for security.
6) Internal memory to store 20 event report summaries and 12 fifteen-cycle event reports.

f. Relay shall be suitable for operating temperatures from -10°C to 60°C. Relay shall be suitable for operating with humidity from 0 to 95% relative humidity.

g. Relay Alarm and/or Trip contacts shall not change state if power is lost or an undervoltage occurs. These contacts shall only cause a trip upon detection of an overcurrent or fault condition based upon programmed settings.

h. The relay shall be suitable for operating on control power with a nominal input voltage of 12 to 240 volts AC, 60 Hz. The power source will be from potential transformers. The relay shall be the dual source type. If the control voltage is lost, the unit will be capable of self-powering from the current monitored circuit. The power supply for the close and motor charge circuits shall be derived from an internal power transformer.

i. The same relay shall be used on all 15 kV and 5 kV circuit breakers. Provide local control switch to open and close each circuit breaker with two 6-volt indication lights. Control transformer (CT) ratios for the main breaker shall be as shown on the drawings. The feeder circuit breakers shall have CT ratios as shown on the drawings. All spare feeder and tie sections shall have CTs, control switches, and lights installed and wired for future use.

j. Communication Capabilities:
   1) Front RS232 communications port
   2) Rear redundant RS485 or plastic fiber optic or glass fiber optic async port
   3) Rear Ethernet 10/100 Base T sync port

3. Programmable digital AC metering:
   a. All meters shall be GE Multilin PQM II, no acceptable equal.
b. The meter shall be True RMS, with a sampling rate of 64 samples/cycle. The meter shall measure and record the following:
   1) Amperes, Volts, Watts, VAR, VA, VARh, Wh, Power Factor, Frequency, and Unbalance per phase.
   2) Amperes, Watts, VAR, VA demand.
   3) Harmonic Analysis through 63rd Harmonic with THD and TIF.
   4) Wh, VARh, Vah, W Cost

c. A 40-character illuminated display and keypad shall be included for programming and operation.

d. An event recorder capable of storing 150 events shall be included.

e. A data logger capable of storing 98,000 events shall be included.

f. A Voltage Disturbance Recorder (VDR) capable of storing 500 events shall be included.

g. Communications:
   1) COM1/COM2: RS485 2-wire half duplex, isolated.
   2) COM3: RS232, 9 pin
   3) Baud rate: 1,200-19,200 bps
   4) Protocol: ModBus RTU and DNP 3.0 level 2
   5) Functions: Read/write setpoints, Read actual values, Execute Commands.
   6) The meter shall be able to connect to a DCS or SCADA system.

h. Four analog outputs for interface to a PLC shall be provided. Output signals shall be selected from any of the measured parameters.

4. Space heaters:

   a. Space heaters with sheaths of high-temperature chrome steel shall be provided to maintain temperature in accordance with manufacturer’s tolerances inside the enclosure.

   b. There shall be a space heater in each bay.

   c. Space heaters shall be wired and controlled by thermostats. Circuiting shall not cross the tie breaker section. Independent circuiting shall be provided on each side of the switchgear.
5. Bus voltage transformers:
   a. Voltage transformers shall be molded rubber or epoxy-encapsulated, with
current limiting primary fuses.
   b. Voltage transformers shall be Group 2 class for line-to-line or line-to-neutral
connections as appropriate for the insulation class required. Primary voltage
ratings and transformation ratios shall be as indicated. Voltage transformers
shall have accuracy rating of not less than 0.3 class at the standard burden
imposed by the connected devices.
   c. Cubicles shall house instrument transformers and energy meters.
   d. Fuses shall protect primary of transformers with breakers on the secondary.

G. Finish:
   1. The enclosure finish shall conform to or exceed applicable requirements of ANSI
C57.12.28.
   2. During fabrication, the areas of structural parts which may later become
inaccessible, such as folded edges and overlapping members, shall be given an
iron-oxide zinc-chromate anticorrosion primer to ensure that all surfaces are
protected.
   3. Full coverage at joints and blind areas shall be achieved by processing enclosures
independently of components such as doors and roofs before assembly into the
unitized structures.
   4. To remove oils and dirt, to form a chemically and anodically neutral conversion
coating to improve the finish-to-metal bond, and to retard underfilm propagation
of corrosion, all surfaces shall undergo a thorough pretreatment process
comprised of a fully automated system of cleaning, rinsing, phosphatizing, sealing,
drying, and cooling before any protective coatings are applied. By utilizing an
automated pretreatment process, the enclosure will receive a high consistent
thorough treatment, eliminating fluctuations in reaction times, reaction
temperature, and chemical concentrations.
   5. After pretreatment, protective coatings shall be applied that shall help resist
corrosion and protect the steel enclosure. To establish the capability to resist
corrosion and protect the enclosure, representative test specimens coated by
enclosure manufacturer’s finishing system shall satisfactory pass the following
tests:
a. 600 hours of exposure to salt-spray testing in accord with ASTM B117 with:
   1) Underfilm corrosion not to extend more than 1/32 in. from the scribe.
   2) Loss of adhesion from bare metal not to extend more than 1/8 in. from the scribe.

b. 1000 hours of humidity testing in accord with ASTM D2247 with no blistering as evaluated in accord with ASTM D714.

c. 500 hours of ultraviolet accelerated weathering testing in accord with ASTM G53 with no chalking as evaluated in accord with ASTM D659, and no more than a 15% reduction of paint gloss as evaluated in accord with ASTM D523.

d. Cross-hatch adhesion testing in accord with ASTM D3359 Method B with no loss of paint.

e. 160-in.-lb. impact adhesion testing in accord with ASTM D2794 with no paint chipping or cracking.

f. Scab corrosion testing for 35 cycles with exposure to specific salt mist, temperature and relative humidity conditions for designated time intervals followed by the air blow-off adhesion test in accord with ASTM D1654 with creepage from the scribe not to extend more than 1-1/6 in. and no unusual surface failure.

g. Oil resistance testing consisting of a 72-hour immersion bath in mineral oil with no shift in color, no streaking, no blistering, and no loss of hardness.

h. 3000 cycles of abrasion testing in accord with ASTM D4060 with no penetration to the substrate.

Certified test abstracts substantiating the above capabilities shall be furnished upon request.

6. A heavy coat of insulating “no-drip” compound shall be applied to the inside surface of the roof structure to prevent condensation of moisture thereon.

7. After the enclosures are completely assembled and the components (switches, fuses, bus, etc.) are installed, the finish shall be inspected for scuffs and scratches. Blemishes shall be touched up to restore the protective integrity of the finish.

8. Touch-up materials - with complete instructions - shall be included with each shipment section of metal-enclosed switchgear for touch-up in the field.

9. The finish shall be light gray, satisfying the requirements of ANSI 61 with a final color coat of Plochere 1244.
H. Indoor features:
   1. Enclosure ventilation:
      a. Ventilation openings shall be provided at the top and bottom on the front
         and rear of each bay.
      b. Vents shall be corrosion-resistant.
      c. Each vent shall have an inside screen, baffle, and filter to exclude insects and
         to protect against insertion of foreign objects.
   2. Lifting eyes shall be removable. Sockets for lifting eyes shall be blind-tapped.
   3. Gasketing and sealing:
      a. Door openings and opening for hinged bolted panels (and bolted panels
         providing access to low-voltage components) shall have resilient compression
         gasketing to prevent water from entering the enclosure.
      b. Gasket seals shall be provided at the top and side edges of adjoining bays to
         prevent water entry between the double walls.
   4. Enclosure and equipment: Rated for seismic zone 4.

I. Warranty: Manufacturer shall warrant equipment to be free from defects in materials
   and workmanship for no less than 2 years from date of acceptance test.

PART 3 – EXECUTION

3.01 INSPECTION
   A. Examine area to receive switchgear to provide adequate clearance for switchboard
      installation.
   B. Check that concrete pads are level and free of irregularities.
   C. Start work only after unsatisfactory conditions are corrected.

3.02 INSTALLATION
   A. Install switchgear in accord with manufacturer’s written instructions and NEC. Install
      each section level and plumb and in straight horizontal alignment.
   B. Anchor to pad with adequate concrete inserts and minimum of 5/8 in. stainless steel
      bolts and as directed by manufacturer’s written instructions to meet seismic zone 4
      forces in accord with Section 1630 of the CBC and Section 16071.
3.03 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement in accord with manufacturer’s specifications.

B. Tighten bolted bus connections in accord with manufacturer’s instructions.

C. Relay settings: Set, test, and adjust protective relays associated with the equipment and its auxiliary systems. Testing shall be in accordance with Section 26 05 53. Set relays in accord with settings furnished by Owner.

3.04 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Field testing shall be performed under provisions of NETA ATS (International Electrical Testing Associations). Refer to Section 26 05 53 for requirements.

C. Check tightness of accessible bolted bus joints using calibrated torque wrench in accord with manufacturer’s recommend torque values.

D. Physically test key interlock systems to check for proper functionality.

E. Make field test on all equipment, materials, and systems in accord with manufacturer’s recommendations, NETA, testing standards of IEEE and ANSI, upon completion of installation.

F. Conduct tests in the presence of Owner for the purpose of demonstrating equipment or systems’ compliance with specifications. Demonstrate all electrical and mechanical test to Owner that the entire installation is functioning properly and that all circuits, including power, control, instrumentation, relaying and communication will function properly and as specified.

G. Furnish, install, and maintain all tools, instruments, material, test equipment, test connections, and power. Furnish all personnel including supervision and “standby” labor required for testing, setting, and adjusting of all electrical facilities and component parts including putting the above into operation.

H. Make tests with proper regard for the protection of equipment and personnel.

I. Record all test values of equipment, giving both “as-found” and “as-left” conditions.

J. The witnessing of any test by Owner does not relieve Contractor of warranties for material, equipment, and workmanship, as specified in the General Conditions and Specifications.
K. Check control circuits for conformance with wiring diagrams.

L. Minimum tests:
   1. Perform the tests in Section 26 05 53 applicable to the equipment installed.
   2. All manufacturer’s recommended testing.

M. Equipment test values: Submit three certified copies of start-up and test data to Owner.

3.05 CLEANING
   A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 26 13 23