SECTION 16346 MEDIUM VOLTAGE METAL-CLAD SWITCHGEAR

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install the equipment as specified herein and as shown on the contract drawings.

1.02 RELATED SECTIONS

A.

1.03 REFERENCES

A. The metal-clad switchgear and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of ANSI/IEEE 37.20.2.

1.04 QUALITY ASSURANCE

A. Perform a level of Quality Control in conformance with Section XXXXXX.

B. For the equipment specified herein, the manufacturer shall be International Organization for Standardization ISO 9001certified.

C. The equipment shall be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed, in accordance with the best practices of the trade, and operate satisfactorily when installed as indicated.

D. It is the intent of these specifications that all components of the switchgear are provided by one vendor who shall have the sole responsibility of matching all components and providing equipment which functions together as a system.

1.05 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:
   1. Front view elevation
   2. Floor plan
   3. Top view
   4. Single line diagram
   5. Nameplate schedule
   6. Conduit entry/exit locations
   7. Assembly ratings including:
      a. Short-circuit rating
      b. Voltage
      c. Continuous current
      d. Basic impulse level for equipment over 600 volts

8. Major component ratings including:
   a. Voltage
   b. Continuous current
   c. Interrupting ratings
9. Product data sheets

1.06 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:
   1. Final as-built drawings and information for items listed in Paragraph 1.04 and shall incorporate all changes made during the manufacturing process.
   2. Schematic wiring diagrams with terminal numbers

1.07 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided electronically with each assembly shipped

B. Certified production test reports

1.08 DELIVERY, STORAGE, AND HANDLING

A. Shipping groups shall be designed to be shipped by truck, rail, or ship.
B. Switchgear shall be equipped to be handled by crane. Where cranes are not available, switchgear shall be suitable for skidding in place on rollers using jacks to raise and lower the groups.
C. Protection Against Concealed Damage
   1. Include within shipping container, mechanical impact recorder of rating recommended by manufacturer for shipment by railroad and submit impact recorder chart with manufacturer's instructions
   2. Removable circuit breaker elements may be packaged separately.
D. Store switchgear in secure and dry storage facility.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ESS Metron

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 RATINGS

A. The switchgear described in this specification shall be designed for operation on a ___ kV, three-phase, three-wire, [solidly][low-resistance] [high resistance] grounded [50][60]-hertz system.

B. Each circuit breaker shall have the following ratings:

Maximum Voltage	[5][15][38]kV
BIL Rated kV Peak	[60][95][150][170]
Continuous Current Ampere	[1200][2000][3000][4000]

C. Short-Circuit Current at rated

Maximum kV	[63 kA RMS sym 5/15kV] [40 kA RMS sym 38kV]
Rated Voltage Range Factor K	1.0
Rated Interrupting Time	[3][5] Cycle

2.03 CONSTRUCTION

A. The switchgear assembly shall consist of individual vertical sections housing various combinations of circuit breakers and auxiliaries, bolted to form a rigid metal-clad switchgear assembly with exterior panels constructed of [steel] [stainless steel]. Metal side sheets shall provide grounded barriers between adjacent structures and solid removable metal barriers shall isolate the major primary sections of each circuit. [Hinged rear doors] [bolted rear panels] shall be provided.

B. The assembly shall be installed [indoors] [in an outdoor PDC] [in an outdoor non-walk-in enclosure] as shown on the drawings. [The manufacturer of the switchgear assembly shall be the same as the manufacturer of the [PDC] or [outdoor enclosure]]. All assembly and installation shall take place in the same factory as to facilitate ease of customer witness testing.

C. The stationary primary contacts shall be silver-plated and recessed within insulating tubes. A steel shutter shall automatically cover the stationary primary disconnecting contacts when the breaker is in the disconnected position or out of the cell. Provide direct roll-out breakers or rails to allow withdrawal of each circuit breaker for inspection and maintenance without the use of a separate lifting device. A lift truck that connects to the rails is also acceptable.

D. For outdoor enclosures, space heaters shall be provided in each vertical section to prevent condensation. A thermostatically controlled heater bus, protected by a properly sized molded case circuit breaker shall be provided in each switchgear assembly to provide control power to space heaters.

2.04 BUS

A. The main bus shall be copper with [fluidized bed epoxy] [heat shrink] flame-retardant and track-resistant insulation. The bus supports between units shall be flame-retardant, track-resistant, glass polyester. The switchgear shall be constructed so

that all buses, bus supports and connections shall withstand stresses that would be produced by currents equal to the momentary ratings of the circuit breakers. Main bus shall be as noted on drawings and as listed previously under continuous current. All bus joints shall be silver washed, bolted and insulated with easily installed boots. The bus shall be braced to withstand fault currents equal to short circuit current at rated maximum voltage. The temperature rise of the bus and connections shall be in accordance with ANSI standards and documented by design tests. [Ground studs w/ boots shall be provided at all incoming [and outgoing] connections]

B. A copper ground bus shall extend the entire length of the switchgear [with ground studs at incoming [and outgoing] cubicles.]

2.05 WIRING/TERMINATIONS

A. The switchgear manufacturer shall provide suitable terminal blocks for secondary wire terminations and a minimum of 10% spare terminals shall be provided. One control circuit cutout device shall be provided in each circuit breaker housing. Switchgear secondary wire shall be #14 AWG, type SIS rated 600 volt, 90 degrees C, furnished with wire markers at each termination. Wires shall terminate on terminal blocks with marker strips numbered in agreement with detailed connection diagrams.

2.06 CIRCUIT BREAKERS

A. The circuit breakers shall be horizontal drawout type, capable of being directly withdrawn or withdrawn on rails. The breakers shall be operated by a motor-charged stored energy spring mechanism, charged normally by a universal electric motor and in an emergency by a manual handle. The primary disconnecting contacts shall be silver-plated copper.

B. Each circuit breaker shall contain three vacuum interrupters separately mounted in a self-contained, self-aligning pole unit, which can be removed easily. The vacuum interrupter pole unit shall be mounted on glass polyester supports.

C. A contact wear gap indicator for each vacuum interrupter (if applicable) shall be easily visible when the breaker is removed from its compartment. The breaker front panel shall be removable when the breaker is withdrawn for ease of inspection and maintenance.

D. The secondary contacts shall be silver-plated and shall automatically engage in the breaker operating position, which can be automatically or manually engaged in the breaker test position.

E. Interlocks shall be provided to prevent closing of a breaker between operating and test positions, to trip breakers upon insertion or removal from housing and to discharge stored energy mechanisms upon insertion or removal from the housing. The breaker shall be secured positively in the housing between and including the operating and test positions.

F. The breakers shall be electrically operated by the control voltage shown on the contract drawings. Each breaker shall be complete with control switch and red and green indicating lights to indicate breaker contact position.

G. If AC control voltage is specified it shall be derived from a control power transformer mounted internal or external of the switchgear.

H. If DC control voltage is specified it shall be supplied from a DC battery system as shown on the contract drawings.

2.07 PROTECTIVE RELAYS

A. The switchgear manufacturer shall furnish and install, in the metal-clad switchgear, the quantity, type and rating of protection relays as indicated on the drawings.

B. Coordination studies and entering of relay settings shall be the responsibility of the contractor.

2.08 AUXILIARY DEVICES

A. Ring type current transformers shall be furnished as indicated on the contract drawings. The thermal and mechanical ratings of the current transformers shall be coordinated with the circuit breakers. Their accuracy rating shall be equal to or higher than ANSI standard requirements. The standard location for the current transformers on the bus side and line side of the 5, 15 and 38 kV breaker units shall be front accessible to permit adding or changing current transformers without removing high-voltage insulation connections. Shorting terminal blocks shall be furnished on the secondary of all the current transformers.

B. Voltage and control power transformers of the quantity and ratings indicated in the detailed specification shall be supplied. Voltage transformers shall be mounted in drawout drawers contained in an enclosed auxiliary compartment. [Control power transformers up to 15 kVA, single-phase shall be mounted in drawout drawers in 5/15 kV switchgear]. [Control power transformers shall be fixed mounted internal or external to 38kV switchgear]. Rails shall be provided as applicable for each drawer to permit easy inspection, testing and fuse replacement. Shutters shall isolate primary bus stabs when drawers are withdrawn.

C. A mechanical interlock shall be provided to require the secondary breaker to be open before the CPT drawer or CPT primary fuse drawer can be withdrawn.

D. Manufacturer shall install all communication interface devices as shown, I/O modules and necessary wring to facilitate communication requirements to customer SCADA

2.09 OWNER METERING

A. Provide microprocessor-based owner metering devices where shown on the drawings. Where indicated, provide a separate owner metering compartment with front hinged doors. Include associated instrument transformers.

B. Provide current transformers for metering as shown on the drawings. Current transformers shall be wired to shorting type terminal blocks.

C. Provide potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.

2.10 UTILITY METERING

A. Where shown on drawings, provide separate barriered-off utility metering compartment complete with hinged sealable door. Bus work shall include provisions for mounting utility company current transformers and potential transformers as

required by the utility company. Additional provisions as required by Additional provisions such as PT

2.11 Enclosures

A. The switchgear described in these specifications shall be [indoor] [outdoor] construction.

2.12 NAMEPLATES

A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, white characters on black background, and secured with screws. Furnish master nameplate for each switchgear lineup giving information in accordance with IEEE Std. C37.20.2-1999, Section 7.4.1. Circuit nameplates shall be provided with circuit designations as shown on purchaser's single-line diagrams.

B. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

2.13 FINISH

A. The finish shall consist of a coat of gray (ANSI-61), thermosetting, polyester powder paint applied electrostatically to pre-cleaned and phosphatized steel and stainless steel for internal and external parts.

2.14 ACCESSORIES

A. The switchgear manufacturer shall furnish the necessary accessories for test, inspection, maintenance and operation, including but not limited to:
   1. Maintenance tool for manually charging the breaker closing spring
   2. Racking handle for moving the breaker between test and connected positions
   3. [Test jumper for electrically operating the breaker while out of its compartment]
   4. [Test cabinet for testing electrically operated breakers outside housing]
   5. [Lift truck & yoke for removing breaker from cell]
   6. [Electric racking device w/ cord for remote positioning of breaker; Provisions at each breaker]
   7. [Portable breaker operator w/ cord for remote breaker operation; receptacle at each breaker cubicle]
   8. [[Manual][Electric] Ground and Test Device [w/ heated storage cubicle]]

3.01 FACTORY TESTING

A. The following standard factory tests shall be performed on the circuit breaker element provided under this section. All tests shall be in accordance with the latest version of ANSI standards.

B. The manufacturer shall provide three (x) certified copies of factory test reports.

C. Factory tests shall be witnessed by the owner's representative.
   1. The manufacturer shall notify the owner two (3) weeks prior to the date the tests are to be performed.
   2. The cost of transportation, meals and incidental expenses shall be the owner's responsibility for witnessed tests.

3.02 FIELD QUALITY CONTROL

A. The Contractor shall provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section for a period of 5 working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.03 [MANUFACTURER'S CERTIFICATION

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.04 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for 2 normal workdays at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the assembly, circuit breaker, protective devices, and other major components.

3.05 INSTALLATION

A. The Contractor shall install all equipment per the manufacturer's recommendations and contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

3.06 FIELD ADJUSTMENTS

1. The relays shall be set in the field by a qualified third-party NETA certified testing company, retained by the Contractor, in accordance with settings designated in a coordinated study of the system as required elsewhere in the contract documents.