

SECTION 26 13 13 – MEDIUM VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide 5/15 kV switchgear work as shown, scheduled, indicated, and as specified. [Switchgear and relaying shall be submitted to the Power Company for approval.]
- B. Types: The types of switchgear required for the project include, but are not limited to, 5/15 kV metal enclosed power distribution switchgear.

1.3 STANDARDS:

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
 - 1. ANSI C12 Code for Electricity Metering.
 - 2. ANSI C39.1 Requirements for Electrical Analog Indicating Instruments.
 - 3. ANSI C57.13 Requirements for Instrument Transformers.
 - 4. ANSI C37.90a Surge Withstand Capability Test.
 - 5. ANSI 37.20 Metal Clad Switchgear Assemblies.
 - 6. ANSI C37.54 Conformance Test Procedures of A.C. High Voltage Circuit Breakers.
 - 7. ANSI C37.55 Conformance Test Procedures of Metal-Clad Switchgear Assemblies.
 - 8. NFPA-70 Medium Voltage Switchgear.
 - 9. [UL1670 High Voltage AC Breakers and Metal Clad Switchgear].

1.4 QUALITY ASSURANCE:

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
 - 1. General Electric Company.
 - 2. Square D Company.
 - 3. Westinghouse Electric Corporation.
- B. NEMA Compliance: Comply with applicable National Electrical Manufacturers' Association (NEMA) Standards.
- C. Interrupting Ratings: Short circuit analysis and coordination study specified in Section 26 05 73 "Short Circuit Analysis/Coordination Study" shall be completed and submitted with switchboard submittal to confirm interrupting rating of submitted equipment is adequate for the point of application in the electrical distribution.

[VERIFY IF AVAILABLE]

- D. [UL Labels: Provide switchgear which has been UL-labeled for service entrance.]

1.5 SUBMITTALS:

- A. Shop Drawing submittals shall include, but not be limited to, the following:
 - 1. Manufacturer's product data of metal enclosed switchgear and all related components.

2. Dimensioned drawings of metal enclosed switchgear showing accurately scaled basic units including, but not necessarily limited to, auxiliary compartments, unit components and combination units.
3. Schematics and wiring diagrams for metering and controls.
4. Furnish, upon request, manufacturer's certification of rating of the basic breaker, switch and fusing components and the integrated metal-enclosed interrupter switchgear assembly.
5. Short circuit analysis and coordination study specified in Section 26 05 73 "Short Circuit Analysis/Coordination Study" shall be completed and submitted with switchboard submittal to confirm interrupting rating of submitted equipment is adequate for the point of application in the electrical distribution.
6. Additional information as specified in Section 16002.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver switchgear in factory-fabricated water resistant wrapping.
- B. Maintain factory-wrapping or provide an additional heavy canvas or plastic cover.
- C. Store switchgear in a clean and dry space and protected from weather.
- D. Handle switchgear carefully to avoid damage to material components, enclosure and finish.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS:

- A. General: Except as otherwise indicated, provide switchgear manufacturer's standard materials and components as indicated by his published product information, designed and constructed as recommended by the manufacturer, and as required for a complete installation.

2.2 5/15 KV METAL-CLAD SWITCHGEAR:

- A. Indicating Instruments: Provide indicating instruments as specified, scheduled, or as shown on the Drawings.
 1. Electronic Metering Device: Provide electronic metering devices to meter the main **[bus]** **[device]** **[and branch devices]** as scheduled or shown on the Drawings. Device shall be a Square D Class 3020 PowerLogic Circuit monitor with digital output display or equal by General Electric or Westinghouse. The unit shall be Underwriters' Laboratory listed per UL508.
 - a. **The electronic metering device shall have a six digit LED readout which will allow local display of the following electrical parameters:**
 - 1) **Voltmeter, phase to phase and phase to neutral.**
 - 2) **Current, per phase RMS and 3 phase average.**
 - 3) **Demand current, per phase.**
 - 4) **Power factor, per phase and 3 phase total.**
 - 5) **Real power, 3 phase total.**
 - 6) **Reactive power, 3 phase total.**
 - 7) **Apparent power, 3 phase total.**
 - 8) **Energy (MWH).**

- 9) **Reactive Energy (MVARH).**
 - 10) **Frequency.**
 - 11) **Average demand real power.**
 - b. **The electronic metering device shall have the following additional features and characteristics.**
 - 1) **Built-in communications capability which will allow multipoint communication to a remote PC via an RS 485/RS 422 communications port.**
 - 2) **Adjustable demand interval (5 60 minutes).**
 - 3) **Nonvolatile memory for storing all historical data.**
 - 4) **[A "waveform capture" function to store voltage and current waveforms in memory for analysis via the communications port.]**
 - c. **Setup of the electronic metering device shall be accomplished from the front of the device. It shall not be necessary to open the front of the enclosure to reach rear-mounted dip-switches. Setup parameters shall include CT ratio, PT ratio, system type (3 wire or 4 wire) and demand interval.**
 - d. **All setup and reset functions shall be key switch or password protected to prevent unauthorized or accidental change of value.**
 - e. **The accuracy of the electronic metering device in percent of full scale for various readouts shall be as follows:**
 - 1) Current and voltage measurements ±1%.
 - 2) Power and energy ±2%.
 - 3) Frequency ±0.5%.
 - 4) Power factor ±4%.
 - 5) Data update time 0.817 S (4 wire).
 - f. **[External contact monitoring shall be provided for [four] [eight] digital contact inputs. Contacts shall be factory-wired to monitor main and tie breaker position. The remaining contacts shall be spare for future use.]**
 - g. **[The electronic metering device shall be monitored by the Building Control and Automation System (BCAS) provided under Division [15] [17] via the unit RS 485 port. Monitoring shall include analog kWh usage, analog demand, digital position of main and tie breakers, and digital alarms for [_____]. The BCAS PC interface shall also be able to access the metering device waveform capture and analysis functions.]**
- [2, 3, 4 and 5 not required with electronic metering device.]
- 2. Ammeters: ANSI C39.1; indicating ammeter with 4.5" square recessed case and 250 degree scale, white dial with black figures and pointer, 5 amperes, 60 Hz movement, one percent accuracy. Full scale shall be consistent with equipment bus capacity.
 - 3. Voltmeters: ANSI C39.1; indicating voltmeter with 4.5" square recessed case and 250 degree scale, white dial with black figures and pointer, 120 volt, 60 Hz movement, one percent accuracy. Full scale shall be next standard rating above equipment voltage.
 - 4. Ammeter Transfer Switch: Rotary multistage snap-action type with 600 volt ac dc silver-plated contacts, engraved escutcheon plate, oval type handle, and four positions including "OFF".

5. Voltmeter Transfer Switch: Rotary multistage snap-action type with 600 volt ac-dc silver-plated contacts, engraved escutcheon plate, oval type handle, and seven positions including "OFF".
6. Watthour Meter: Kilowatt-hour demand meter with dial integrating demand register with electronic pulse initiator as indicated on drawings. Demand interval to be 15 minutes.
- B. Lightning Arrestors: Provide distribution class lightning arrestors mounted in the switchgear enclosure and connected to the incoming service leads.
- C. Interlocks: Provide [kirk-key] [electrical] interlock on circuit breakers as indicated. [Provide one key for locks.] [Use auxiliary contacts located on circuit breakers for interlock.]
- D. Control Wiring: The switchgear shall be wired with Type SIS #14 AWG, except where larger size wire is required. The switchgear shall be provided with terminal blocks for outgoing control connections.
- E. [Space Heaters: Provide space heaters in all outdoor metal-clad switchgear to prevent condensation.]

2.3 FACTORY TESTING:

- A. General: The switchgear including overcurrent devices, relays, meters, controls, and interlocks shall be factory-tested to certify proper operation.

2.4 OVERCURRENT DEVICE CONFIGURATION:

[insert detailed listing of overcurrent device components as applicable. see additional examples at end of master.]

- A. General Purpose Feeder (GPF): The metal clad switchgear for control of a feeder circuit shall include, but not be limited to:
 1. One **[4160 volt] [7200 volt] [12,470 volt] [13,800 volt] [vacuum] [or] [SF6]** power circuit breaker, **[1200] [2000]** amperes continuous **[60] [95]** kV BIL, **[250] [500] [750]** MVA interrupting capacity, 3 pole, with electrically-operated, stored-energy mechanism.
 2. One set of insulated bus, 3 phase, 3 wire, **[1200] [2000] [3000]** amperes.
 3. Three relays, phase overcurrent, [General Electric Type IFC], Westinghouse Type CO-9 [or Basler solid state] [or equal approved by the Engineer [and Power Company]].
 4. Three **[single] [multi-ratio]** secondary current transformers with rated current: 5 ratio.
 5. One breaker control switch.
 6. Two indicating lamps, breaker open-close, red and green.
 7. One breaker closing 2 pole pull-out type fuse block.
 8. One breaker tripping 2 pole pull-out type fuse block.
 9. One provision for power conductor terminations as shown on the Drawings.
 10. One time-delay type ground sensor overcurrent relay with accuracy class C100 or better.
 11. One current test block.
 12. One voltage test block.
 13. One breaker disagreement indicating lamp.
 14. One ground sensor current transformer with 50:5 ratio.
 15. Three surge arresters.
 16. [One voltage/current circuit monitor.]
 17. [One ammeter transfer switch.]

- 18. [One ammeter.]
- 19. [One electronic metering device.]

PART 3 - EXECUTION

3.1 INSTALLATION OF SWITCHGEAR:

- A. General: Install switchgear where shown, in accordance with the manufacturer's written instructions and recognized industry practices, to ensure that the switchgear complies with the requirements and serves the intended purposes.
- B. Standards: Comply with the requirements of NEMA and NEC standards and applicable portions of NECA's "Standard of Installation", for installation of switchgear.
- C. Tightness: Torque bus connections and tighten mechanical fasteners.
- D. Fuses: Install fuses, of the ratings shown, in each load interrupter switch.
- E. Concrete Pads: Install switchgear on a reinforced concrete housekeeping pad. The housekeeping pad shall extend 3" beyond the housing of the switchgear unless shown otherwise. Furnish the exact position of any block outs, dimensions, and location of the housekeeping pads in a timely manner so as to prevent delay of the concrete work. Pad shall be configured for use of a portable breaker lifting device. Refer to Section 16100, "Basic Materials and Methods", for additional requirements.
- F. Adjustment: Adjust operating mechanisms for free mechanical movement.

3.2 TESTING:

- A. Pre energization Checks: Prior to energization, check switchgear for continuity of circuits and for short circuits.
- B. Switchgear Insulation Resistance Test: Each switchgear line up bus shall have its insulation resistance tested after the installation is complete except for line and load side connections. Tests shall be made using a Biddle Megger Earth Tester or equivalent test instrument at a voltage of not less than 1000 volts dc. Resistance shall be measured from phase to-phase and from phase to-ground.
- C. Overcurrent and Ground Fault Protection System Test: Following completion of the construction work and prior to final acceptance testing, the overcurrent ground fault protection systems shall be field-tested with a test-set checking the calibration of each relay and reset to the manufacturer's settings for both current and time by a representative of the manufacturer's engineering service department. Manufacture shall furnish a time current coordination study. Submit the results on a 11" x 17" log-log paper showing coordination with down stream devices. Contractor shall submit two copies to the power company for their use. Contractor shall notify the Engineer one week in advance of the test so that the Engineer may be present. Coordinate final overcurrent and time setting with the Power Company.
- D. Submittals: Contractor shall furnish all instruments and personnel required for tests. Submit four copies of certified test results to Engineer for review. Test reports shall include switchboard tested, date and time of test, relative humidity, temperature, and weather conditions.
- E. Thermographic Testing: Refer to Section 16020, "Electrical Testing", for thermographic testing.

3.3 IDENTIFICATION:

- A. General: Refer to Section 16100 for nameplates, identification and warning signs.

END OF SECTION 26 13 13