

SPECIFICATIONS FOR METAL ENCLOSED SWITCHGEAR

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SWITCHGEAR

SECTION 26 05 00
ELECTRICAL - BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements for electrical systems.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 26 05 19 - Wire and Cable - 600 Volt and Below.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Aluminum Association (AA):
 - a. ADM, Aluminum Design Manual.
 - 2. American Institute of Steel Construction (AISC):
 - a. Steel Construction Manual.
 - 3. American National Standards Institute (ANSI).
 - 4. ASTM International (ASTM):
 - a. A36/A36M, Standard Specification for Carbon Structural Steel.
 - b. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - c. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C2, National Electrical Safety Code (NESC).
 - 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 7. National Electrical Manufacturers Association (NEMA):
 - 8. Underwriters Laboratories, Inc. (UL).
- B. Products to be listed by a Nationally Recognized Testing Laboratory (NRTL) in accordance with applicable product standards.
 - 1. Applicable product standards including, but not limited to, ANSI, FM, IEEE, NEMA and UL.
 - 2. NRTL includes, but is not limited to, CSA Group Testing and Certification (CS), FM Approvals LLC (FM), Intertek Testing Services NA, Inc. (ETL), and Underwriters Laboratories, Inc. (UL).

1.3 DEFINITIONS

- A. For the purposes of providing materials and installing electrical work the following definitions shall be used.
 - 1. Outdoor area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
 - 2. Architecturally finished interior area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
 - 3. Non-architecturally finished interior area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.

4. Highly corrosive and corrosive area: Areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.
5. Hazardous areas: Class I, II or III areas as defined in NFPA 70.
6. Shop fabricated: Manufactured or assembled equipment for which a UL test procedure has not been established.

1.4 SUBMITTALS

- A. Shop Drawings:
 1. See individual specification sections for submittal requirements for products defined as equipment.
 2. General requirements:
 - a. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
 - b. Include data sheets that include manufacturer's name and product model number.
 - 1) Clearly identify all optional accessories.
 - c. Acknowledgement that products are NRTL listed or are constructed utilizing NRTL recognized components.
 - d. Manufacturer's delivery, storage, handling and installation instructions.
 - e. Product installation details.
 - f. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70, include any required calculations.
 - g. See individual specification sections for any additional requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect nameplates on electrical equipment to prevent defacing.

1.6 AREA DESIGNATIONS

- A. Designation of an area will determine the NEMA rating of the electrical equipment enclosures, types of conduits and installation methods to be used in that area.
 1. Outdoor areas:
 - a. Wet.
 - b. Also, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
 2. Indoor areas:
 - a. Dry.
 - b. Also, wet, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, refer to specific Electrical Specification Sections and specific material paragraphs below for acceptable manufacturers.
- B. Provide all components of a similar type by one (1) manufacturer.

2.2 MATERIALS

- A. Electrical Equipment Support Pedestals and/or Racks:
 1. Manufacturers:
 - a. Modular strut:

- 1) Unistrut Building Systems.
 - 2) B-Line by Eaton.
 - 3) Globe Strut.
 - 4) Superstrut by Thomas & Betts.
 - 5) Or Approved Equal
2. Material requirements:
- a. Modular strut:
 - 1) Galvanized steel: ASTM A123/123M or ASTM A153/A153M.
 - 2) Stainless steel: AISI Type 316.
 - 3) PVC coated galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 mil PVC coating.
 - 4) Aluminum: AA Type 6063-T6.
 - b. Structural members (e.g., I beams, L and C channels):
 - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
 - 2) Aluminum: AA Type 6061-T6 or 6063-T6.
 - c. Mounting plates:
 - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
 - 2) Aluminum: AA Type 6063-T6.
 - d. Mounting hardware:
 - 1) Galvanized steel.
 - 2) Stainless steel.
 - e. Anchorage per industry standards.
- B. Field touch-up of galvanized surfaces.
1. Zinc-rich primer.
 - a. One coat, 3.0 mils, ZRC by ZRC Products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and wire all equipment, including prepurchased equipment, and perform all tests necessary to assure conformance to the Drawings and Specification Sections and ensure that equipment is ready and safe for energization.
- B. Install equipment in accordance with the requirements of:
 1. NFPA 70.
 2. IEEE C2.
 3. The manufacturer's instructions.
- C. In general, conduit routing is not shown on the Drawings.
 1. The Contractor is responsible for routing all conduits including those shown on one-line and control block diagrams and home runs shown on floor plans.
 2. Conduit routings and stub-up locations that are shown are approximate; exact routing to be as required for equipment furnished and field conditions.
- D. When complete branch circuiting is not shown on the Drawings:
 1. A homerun indicating panelboard name and circuit number will be shown and the circuit number will be shown adjacent to the additional devices (e.g., light fixture and receptacles) on the same circuit.
 2. The Contractor is to furnish and install all conduit and conductors required for proper operation of the circuit.

3. The indicated home run conduit and conductor size shall be used for the entire branch circuit.
- E. Do not use equipment that exceed dimensions or reduce clearances indicated on the Drawings or as required by the NFPA 70.
- F. Install equipment plumb, square and true with construction features and securely fastened.
- G. Install electrical equipment, including pull and junction boxes, minimum of 6 inches from process, gas, air and water piping and equipment.
- H. Install equipment so it is readily accessible for operation and maintenance, is not blocked or concealed and does not interfere with normal operation and maintenance requirements of other equipment.
- I. Device Mounting Schedule:
 1. Unless indicated otherwise on the Drawings, mounting heights are as indicated below:
 - a. Light switch (to center): 46 inches.
 - b. Receptacle in architecturally finished areas (to center): 18 inches.
 - c. Receptacle on exterior wall of building (to center): 18 inches.
 - d. Receptacle in non-architecturally finished areas (to center): 46 inches.
 - e. Telephone outlet in architecturally finished areas (to center): 18 inches.
 - f. Telephone outlet for wall-mounted phone (to center): 46 inches.
 - g. Safety switch (to center of operating handle): 54 inches.
 - h. Separately mounted motor starter (to center of operating handle): 54 inches.
 - i. Pushbutton or selector switch control station (to center): 46 inches.
 - j. Panelboard (to top): 72 inches.
- J. Avoid interference of electrical equipment operation and maintenance with structural members, building features and equipment of other trades.
 1. When it is necessary to adjust the intended location of electrical equipment, unless specifically dimensioned or detailed, the Contractor may make adjustments of up to 6 inches in equipment location with the Engineer's approval.
- K. Provide electrical equipment support system per the following area designations:
 1. Dry areas:
 - a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
 - b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
 2. Wet areas:
 - a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
 - b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
 3. Corrosive areas:
 - a. Aluminum system consisting of aluminum channels and fittings with stainless steel nuts and hardware.
 4. Highly corrosive areas:
 - a. PVC coated steel system consisting of PVC coated steel channels and fittings with stainless steel nuts and hardware.
- L. Provide all necessary anchoring devices and supports rated for the equipment load based on dimensions and weights verified from approved submittals, or as recommended by the manufacturer.

1. Do not cut, or weld to, building structural members.
 2. Do not mount safety switches or other equipment to equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.
- M. Provide non-metallic corrosion resistant spacers to maintain 1/4 inches separation between metallic equipment and/or metallic equipment supports and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Basins, Clarifiers, Digesters, Reservoirs, etc.
- N. Do not place equipment fabricated from aluminum in direct contact with earth or concrete.
- O. Screen or seal all openings into equipment mounted outdoors to prevent the entrance of rodents and insects.
- P. Do not use materials that may cause the walls or roof of a building to discolor or rust.
- Q. Identify electrical equipment and components in accordance with industry standards.
- R. Provide field markings and/or documentation of available short-circuit current (available fault current) and related information for equipment as required by the NFPA 70 and other applicable codes.
- S. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
1. Determine the SCCR rating by one of the following methods:
 - a. Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
 - b. Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
 - c. Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
 2. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the equipment or control panel circuit originates.
 3. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

3.2 FIELD QUALITY CONTROL

- A. Verify exact rough-in location and dimensions for connection to electrified equipment, provided by others.
- B. Replace equipment and systems found inoperative or defective and re-test.
- C. The protective coating integrity of support structures and equipment enclosures shall be maintained.
1. Repair galvanized components utilizing a zinc rich paint.
 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the component.
 4. Repair surfaces which will be inaccessible after installation prior to installation.
- D. Replace nameplates damaged during installation.

END OF SECTION

SECTION 26 08 13
MEDIUM VOLTAGE EQUIPMENT ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Basic requirements for acceptance testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 400, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems.
 - b. 400.2, Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF) (less than 1 Hz).
 2. InterNational Electrical Testing Association (NETA):
 - a. ATS, Standard for Acceptance Testing Specifications for Electric Power Equipment and Systems.
 3. Nationally Recognized Testing Laboratory (NRTL).
 4. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
 - a. 455-78-B, Optical Fibres - PART 1-40: Measurement Methods and Test Procedures - Attenuation.
 - b. NEMA WC 74/ICEA S-93-639, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.
- B. Qualifications:
1. Testing firm:
 - a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration, and adjusting of systems.
 - b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
 2. Field personnel:
 - a. Minimum of one year field experience covering all phases of electrical equipment inspection, testing, and calibration.
 - b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
 - c. Supervisor certified by NETA or NICET.
 - 1) As an alternative, supervising technician may be certified by the equipment manufacturer
 3. Analysis personnel:
 - a. Minimum three years combined field testing and data analysis experience.
 - b. Supervisor certified by NETA or NICET.
 - 1) As an alternative, supervising technician may be certified by the equipment manufacturer.

1.3 SUBMITTALS

- A. Shop Drawings:

1. Equipment Monitoring and Testing Plan.
- B. Informational Submittals:
 1. Cable test reports from the manufacturer in accordance with ANSI/NEMA WC 74/ICEA S-93-639 and NETA ATS:
 - a. Voltage Withstand Tests
 - b. Partial Discharge Tests
 - c. Insulation/Conductor Resistance Tests
 2. Prior to energizing equipment:
 - a. Coordinated phasing diagram.
 - b. Photocopies of continuity tests.
 - c. VLF Medium Voltage Test Report.
 3. Within two weeks after successful completion of Demonstration Period (Commissioning Period):
 - a. Single report containing information including:
 - 1) Summary of Project.
 - 2) Information from pre-energization testing.
 - 3) Testing and monitoring reports.

PART 2 - PRODUCTS

2.1 FACTORY QUALITY CONTROL

- A. Provide Electrical equipment with all factory tests required by the applicable industry standards or NRTL.

PART 3 - EXECUTION

3.1 SPECIFIC EQUIPMENT TESTING REQUIREMENTS

- A. Switchgear and Switchboards:
 1. Perform inspections and tests per NETA ATS 7.1.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
- B. Transformers - Small Dry Type:
 1. Perform inspections and tests per NETA ATS 7.2.1.1.
 2. Perform the following additional tests:
 - a. Record phase-to-phase, phase-to-neutral, and neutral-to-ground voltages at no load after energizing, and at operating load after startup.
 3. Adjust tap connections as required to provide secondary voltage within 2-1/2% of nominal under normal load after approval of Engineer.
 4. Record as-left tap connections.
- C. Transformers - Large Dry Type:
 1. Perform inspections and tests per NETA ATS 7.2.1.2.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 3. Perform the following additional tests:
 - a. Record phase-to-phase, phase-to-neutral, and neutral-to-ground voltages at no load after energizing, and at operating load after start-up.
 4. Adjust tap connections as required to provide secondary voltage within 2-1/2% of nominal under normal load.

5. Record as-left tap connections.
- D. Cable - Low Voltage:
1. Perform inspections and tests per NETA ATS 7.3.2.
- E. Cable – 15 kV Medium Voltage:
1. Perform inspections and tests per manufacturer’s recommendations.
 2. Prior to energization, perform a Very low frequency (VLF) test following IEEE 400.2 Guide for Field Testing of Shielded Power Cable systems for baseline data for future VLF maintenance testing:
 - a. VLF testing shall include:
 - 1) Withstand test to evaluate whether the cable can handle the test voltage (See IEEE 400.2 Table 3).
 - a) Cable System Testing Voltage: 15kV (Phase to Phase).
 - b) Installation Test Voltage: 19kV RMS (Phase to Ground).
 - c) Withstand Test Duration: 30 minutes.
 - 2) Tangent delta test, including differential tangent delta and tangent delta stability, for baseline comparison:
 - a) Line to Ground Voltage: 7.2kV.
 - b) Applies Test Voltages: 3.6kV, 7.2kV, 10.8kV, 14.4kV.
 - c) Test Duration: 3 Minutes at each voltage.
 - b. VLF testing shall be completed by technicians trained to use testing equipment with at least three years of experience in performing VLF testing on medium voltage cables.
 3. Results for new cable shall be compared to Table G.2 in IEEE 400.2.
 - a. Acceptable Condition:
 - 1) Tangent Delta Stability at 7.2kV: <0.1
 - 2) Tip Up: <5
 - 3) Tangent Delta at 7.2kV: <10
 - b. Discrepancies between field test results and Table G.2 shall be notated and discussed with testing equipment manufacturer to determine validity of results.
 4. Grounding:
 - a. Perform inspections and tests per manufacturer’s recommendations.
 - b. Components: Test all components per applicable paragraphs of this Specification Section and manufacturer’s recommendations.
- F. Grounding:
1. Perform inspections and tests per NETA ATS 7.13.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.

END OF SECTION

SECTION 26 13 16
MEDIUM VOLTAGE METAL ENCLOSED LOAD INTERRUPTER SWITCHGEAR

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Load interrupter switchgear.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 - Electrical - Basic Requirements.
 - 2. Section 26 08 13 – Medium Voltage Equipment Acceptance Testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American National Standards Institute (ANSI).
 - 2. Institute of Electronic and Electronics Engineers, Inc. (IEEE):
 - a. C37.20.3, Standard for Metal-Enclosed Interrupter Switchgear (1 kV–38 kV).
 - b. C37.20.4, Standard for Indoor AC Switches (1 kV–38 kV).
 - c. C57.12.01, Standard Requirements for Dry-Type Dist & Power Transformers.
 - d. C62.11, Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1 kV).
 - 3. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 4. Underwriters Laboratories, Inc. (UL):
 - a. The entire assembly shall be UL (Underwriters Laboratories) listed and shall bear UL Labels.

1.3 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The medium voltage metal-enclosed switchgear is manufactured and/or assembled in the United States.
- D. The manufacturer shall employ a dedicated team including legal resources whose responsibility is to review and respond to domestic preference requirements and federal mandates.

1.4 REGULATORY REQUIREMENTS

- A. Domestic Preference
 - 1. The medium voltage metal-enclosed switchgear shall meet the requirements of the Build America, Buy America Act (BABA).
 - 2. Manufacturer's dedicated domestic preference resources shall provide all supporting documentation to the soliciting entity to certify compliance with the above domestic preference requirement.

1.5 SUBMITTALS

- A. Shop Drawings:
 - 1. Shop drawings shall be issued to Owner for review and approval prior to a release for manufacturing.
 - 2. Product technical data including:

- a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. Nameplate data for all equipment.
 - c. Mounting details and loading information for concrete foundation design.
 - d. Installation instructions and procedures.
 - e. See Specification Section 26 05 00 for additional requirements.
3. Fabrication and/or layout drawings:
- a. General arrangement plan view showing door swings, cable entrance locations, shipping splits, etc.
 - b. Cross sections, elevations and details.
 - c. Complete single-line diagram.
 - d. Auxiliary and control system wiring diagrams (e.g., heaters).
4. Test reports:
- a. Certified reports of all factory production tests.
 - b. No product shall be delivered to site prior to factory witness testing by Owner's engineer and/or approval of issued Certified Test Report.
- B. Informational Submittals:
- 1. Service equipment marking and documentation.
 - 2. Record of test results, inspections and procedures witnessed or performed by factory service representative.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect nameplates on electrical equipment to prevent defacing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. ABB.
 - 2. S&C Electric Company.
 - 3. Square D by Schneider Electric.
 - 4. Siemens Corporation.
 - 5. Eaton.
 - 6. Approved Equal

2.2 LOAD INTERRUPTER SWITCHGEAR

- A. Ratings:
 - 1. Voltage: 12,470 V.
 - 2. Amperage: 1200 A.
 - 3. Number of phases: Three.
 - 4. Number of wires: Three.
 - 5. Frequency: 60 Hz.
 - 6. Grounding system: High Resistance.
 - 7. Short circuit:
 - a. Fault closing and momentary: 40 kA.
 - b. Short time (2 second): 25 kA.
 - 8. Basic impulse level: 95 kV.
- B. Construction:

1. Standards: IEEE C37.20.3.
 2. Completely metal enclosed vertical sections housing load interrupter switches with or without fuses.
 3. Front and rear access.
 4. Rear door latched closed by padlockable latches for cable installation and maintenance.
 5. Hinged, full-length or split interlocked front doors with latching padlockable handles.
 6. Vertical sections with switches:
 - a. High impact viewing window to view switch blades through the closed door.
 - b. Door interlocked with switch.
 - c. Grounded, meshed metal barrier in front of switch.
 - d. Provisions to padlock switch in open or closed position.
 - e. OPEN-CLOSED switch position indicators.
 - f. Grounding point to allow grounding cables to be installed with the switch in the open position and the switch door closed and locked.
 - g. Fuse storage provisions when section contains fuses.
 7. Enclosure:
 - a. NEMA 12 non-walk-in, for humid and dusty indoor locations.
 - 1) Sloped roof with top cable entrance hub removable plates.
 - 2) Screened and filtered ventilation openings to prevent entrance of rodents and dust.
 - 3) Thermostatically controlled space heaters powered by an external 120VAC source.
 - b. Enclosure Alternate: Where approved by Owner, NEMA 1, gasketed with filtered openings.
 8. External nameplate with switchgear ratings, manufacturer name and date of manufacture.
 9. Interior and exterior steel surfaces cleaned and painted with rust inhibiting primer and manufacturer's standard paint.
 - a. Finish color: Light gray (ANSI-61).
- C. Buses:
1. Material: Tin-plated aluminum or copper.
 2. Bus supports, stand-off insulators and sleeves: Porcelain, glass polyester or epoxy.
 3. Ground bus: Sized to carry the rated 2-second short circuit current.
 4. Provisions for future extension.
- D. Load Interrupter Switches:
1. Configuration as indicated on the Drawings.
 2. Three-pole gang operated.
 3. Two-position (open/closed).
 4. Mechanical quick-make, quick-break utilizing a heavy-duty coil spring to provide openings and closing energy.
 5. Switch spring mechanism shaft is driven by a metal-to-metal or chain and sprocket linkage from the spring charge motor or manual operating handle.
 6. The opening and close of the switch shall be independent of the speed at which the handle is moved.
 7. One main contact per phase or a separate main and auxiliary break or arcing contacts per phase
 8. Circuit interruption shall take place within an arc compressor or chute.
 9. Insulating barriers between each phase and/or enclosure per manufacturer standards.
- E. Fuses:

1. Current limiting.
 2. E-rated, standard speed.
 3. Size as indicated on the Drawings.
- F. Surge Arresters:
1. Standards: IEEE C62.11.
 2. MCOV rating: 15.3kV (18kV)
 3. Metal oxide type, distribution class.
- G. Auxiliary Equipment Control Power Transformer:
1. Indoor, dry type.
 2. Number of phases: Single-phase.
 3. Rated primary voltage: As indicated on the Drawings.
 4. Continuous capacity: As indicated on the Drawings.
- H. Heavy-duty (Utility) Terminal Blocks:
1. General:
 - a. Ratings: 600 V, 30 A.
 - b. Molded one-piece thermoplastic body.
 - c. Washer head terminal screws to accommodate up to a #10 AWG wire.
 2. Non-shorting terminal blocks:
 - a. GE Type EB-25 or approved equal.
- I. Control Wire:
1. Conductor shall be copper with 600 V rated insulation.
 2. Conductors shall be stranded.
 3. Minimum #12 AWG.
 4. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
 5. Conform to UL 44 for type SIS or MTW insulation.
- J. Wire Terminators:
1. Ratings: 600 V.
 2. Tin plated high strength copper alloy.
 3. Solderless, non-insulated, ring type.
 4. One (1) terminal pad per phase to accommodate maximum of two (2) conductor per phase with size as indicated in drawings.
 5. Space allowance for electrical stress relief termination devices.
- K. Thermograph viewing windows:
1. Provide IR ports at manufacturer's recommended locations to view cable connections and bus connections for infrared surveys without opening doors.
- L. Zero Voltage Indicators:
1. Provide George Jordan Capacitive Voltage Detection System or approved equal.
 2. Three (3) coupling capacitors (ZV Sensor), one (1) per phase, connected to monitored bus within each switchgear section as indicated on the Drawings.
 3. One (1) display (ZV Indicator) for each set of ZV sensors mounted to exterior door (front and/or rear) as indicated on the Drawings.
- M. Motor Operated Switches:

1. Equip with an electric linear actuator with linkage or electric motor with chain to operate the quick-make quick-brake mechanism and open or close the switch within 2 seconds.
2. Open/close to be initiated by:
 - a. Remote control signal.
3. Manual operation during loss of control power.
4. Manual charging capability during loss of control power.
5. Operator to be housed in a low voltage compartment or barrier to separate it from the high voltage.
6. Operator shall be easily removable for maintenance.
7. Control power from a 125V DC remote source .
8. Equipped with an operation counter.
9. Equipped with dry contacts to monitor operator/switch position.

2.3 SOURCE QUALITY CONTROL

- A. Switchgear factory tests in accordance with IEEE and ANSI standards.

2.4 MAINTENANCE MATERIALS

- A. One set of fuses for each size utilized in switchgear with fuse handling tools
- B. One set of three grounding jumpers with storage bag.
- C. Touch-up paint.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Arrange as shown on the Drawings.
- C. Indoor Locations:
 1. NEMA 12 non-walk-in enclosure (drip proof & filtered louvers).
 - a. Enclosure Alternate: Where approved by Owner, NEMA 1, gasketed with filtered openings.
 2. Install on concrete housekeeping pad.
 - a. Align front of switchgear with top edge of pad chamfer and securely bolt to pad or weld to floor sills (C channels) set level (within 1/8 inches) and embedded in the concrete.
- D. Miscellaneous:
 1. Paint any scratched surfaces with touch-up paint.
 2. Tag switchgear and all switches and components.

3.2 FIELD QUALITY CONTROL

- 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. Acceptance Tests: See Specification Section 26 08 13.

3.3 TRAINING

- A. A qualified factory-trained manufacturer's representative shall provide the Owner with 4 hours of on-site training in the operation and maintenance of the switchgear and its components.

END OF SECTION