

SECTION 26 11 16

SECONDARY UNIT SUBSTATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes secondary unit substation and accessories.
- B. Related Sections:
 - 1. Division 26 - Fuses: Low-voltage fuses.

1.02 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C12.1 - Code for Electricity Metering.
 - 2. ANSI C37.06 - American National Standard for Switchgear - AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis - Preferred Ratings and Related Required Capabilities.
 - 3. ANSI C37.46 - Special Power Fuses & Fuse Disconnecting Switches.
 - 4. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.
 - 5. ANSI C57.12.27 - Conformance Standard for Liquid-Filled Distribution Transformers Used in Pad-Mounted Installations Including Unit Substations.
 - 6. ANSI C57.12.28 - Pad-Mounted Equipment - Enclosure Integrity.
 - 7. ANSI C57.12.55 - Dry Type Transformers in Unit Installations, Including Unit Substations- Conformance Standard.
- B. Institute of Electrical and Electronics Engineers:
 - 1. IEEE 48 - Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV Through 765 kV.
 - 2. IEEE C37.04 - Standard Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
 - 3. IEEE C37.11 - Standard Requirements for Electrical Control for High-Voltage Circuit Breakers Rated on A Symmetrical Current Basis.
 - 4. IEEE C37.20.1 - Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.
 - 5. IEEE C37.20.2 - Standard for Metal-Clad and Station-Type Cubicle Switchgear.
 - 6. IEEE C37.20.3 - Standard for Metal-Enclosed Interrupter Switchgear.
 - 7. IEEE C57.12.91 - Standard Test Code for Dry-Type Distribution and Power Transformers.
 - 8. IEEE C57.13 - Standard Requirements for Instrument Transformers.
 - 9. IEEE C57.94 - Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers.
 - 10. IEEE C57.106 - Guide for Acceptance and Maintenance of Insulating Oil in Equipment.
 - 11. IEEE C57.111 - Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers.
 - 12. IEEE C57.121 - Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers.
 - 13. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- C. National Electrical Manufacturers Association:
 - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
 - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 3. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 4. NEMA PB 2 - Deadfront Distribution Switchboards.

5. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.

D. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.03 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings and materials.

C. Product Data: Submit electrical characteristics and connection requirements, standard model design tests, and options.

D. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.

E. Manufacturer's Field Reports: Indicate activities on site, final adjustments and overcurrent protective device coordination curves, adverse findings, and recommendations.

F. Manufacturer shall provide special seismic certification per with submittal. **Submittals without certification will be returned and not reviewed.**

G. Acceptance or no exceptions taken by the County's Representative on any substitution proposed by the Developer Design/Builder shall not be construed as relieving the Developer Design/Builder from compliance with the project's specifications and performance requirements nor departure there from. The Developer Design/Builder remains responsible for details and accuracy for confirming and correlating quantities and dimensions and for the selection of fabrication processes, techniques and assembly, coordination of his work with that of all other trades and making any needed modifications consequent to the substitution at his own cost and for performing the work in a safe manner.

1.04 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Include copy of manufacturer's certified drawings.

C. Operation and Maintenance Data:

1. Submit instructions for manually and electrically opening and closing circuit breakers.
2. Submit instructions for circuit breaker removal, replacement, testing and adjustment, and lubrication; and procedures for sampling and maintaining transformer fluid.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Testing Agency: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum five years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

- B. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.
- C. Handle switchboard sections in accordance with NEMA PB 2.1.
- D. Lift only with lugs provided. Handle carefully to avoid damage to substation internal components, enclosure, and finish.
- E. Protect products from weather and moisture by covering with plastic or canvas and by maintaining heating within enclosure.
- F. Accept substations on site. Inspect for damage.
- G. Protect products from weather and moisture by covering with heavy plastic or canvas and by maintaining heating within enclosure in accordance with manufacturer's instructions.
- H. Protect switchgear and transformers from moisture by using appropriate heaters as instructed by the manufacturer.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Conform to specified service conditions during and after installation of unit substations.

1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.09 SEQUENCING

- A. Division 01 - Summary: Work sequence.
- B. Sequence work to avoid interferences with building finishes and installation of other products.

1.10 MAINTENANCE MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two each of special tools needed to operate and maintain unit substation.
- C. Furnish two of each key.

1.11 EXTRA MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each size and type fuse.

PART 2 PRODUCTS

2.01 SECONDARY UNIT SUBSTATION

- A. Manufacturers:
 1. Eaton Electric/Cutler Hammer Products
 2. General Electric

3. Siemens/ITE
4. Square D
5. Substitutions: Not Permitted.

B. Product Description: Radial type unit substation.

1. Primary Section: Fused air interrupter switch configured as required to complete the work.
2. Transformer Section: Dry-type transformer (cast-coil).
3. Secondary Section: Medium voltage switchgear or low voltage switchgear secondary section as required to complete the work.

C. Key Interlocks: As required to complete the work.

2.02 UNIT SUBSTATION

A. Manufacturer:

1. Eaton Electric/Cutler Hammer Products
2. General Electric
3. Square D
4. Substitutions: Not Permitted.

B. Description: Secondary unit substation comprising fused air switch primary section, dry-type, cast coil transformer section, low-voltage switchgear secondary section.

C. Configuration: Radial type.

2.03 PRIMARY SWITCH RATINGS

- A. System Voltage: 12 kV, three phase, 60 Hz, 95 kV BIL.
- B. Voltage and Insulation Levels: Conform to ANSI C37.20.
- C. Main Bus Ampacity: as required to complete the work.
- D. Momentary Current Rating: To ANSI C37.20.

2.04 TRANSFORMER RATINGS

- A. Capacity: As required to complete the work.
- B. Primary Voltage: As required to complete the work.
- C. Taps: Standard primary taps.
- D. Secondary Voltage: As required to complete the work.
- E. Impedance: As required to complete the work.
- F. Basic Impulse Level: 95 kV.
- G. Encasement: 12 kV-480/277V transformers shall be encased in epoxy resin.

2.05 INCOMING SECTION EQUIPMENT

- A. Fused air interrupter switch: ANSI C37.20.3, two position.
- B. Configuration: One incoming line as indicated (bottom or top feed), or as required to complete the work.

- C. System Voltage: 12 kV, three phase, 60 Hz.
- D. Maximum Design Voltage: 15 kV.
- E. Basic Impulse Level: 95 KV.
- F. Continuous Rating: As required to complete the work.
- G. Main Bus Ampacity: As required to complete the work.
- H. Short Circuit Rating: 40,000 amp.

2.06 DRY TYPE TRANSFORMERS (CAST COIL)

- A. Manufacturers:
 - 1. Square D.
 - 2. Westinghouse.
 - 3. Siemens ITE.
 - 4. General Electric.
- B. Dry-type Transformers: ANSI C57.12.55; three phase, fan cooled transformer unit with solid-cast. Minimum 33% overload capacity, integral cast coil copper winding on primary and secondary.
- C. Cooling and Temperature Rise: ANSI C57.12.01, 185 degree C insulation class with 80 degree C rise.

2.07 OUTGOING SECTION EQUIPMENT

- A. Description: Power switchgear manufactured to ANSI C37.20.1.
- B. Line and Load Terminations: Accessible from the rear, suitable for the conductor materials used.
- C. Main Section Devices: Individually mounted and compartmented and of drawout type construction.
- D. Distribution Section Devices: Individually mounted and compartmented.
- E. Auxiliary Section Devices: Individually mounted and compartmented.
- F. Bus Material: Tin plated copper.
- G. Bus Connections: Bolted, accessible from rear only for maintenance.
- H. Fully insulated bus bars on load side in rear accessible compartments.
- I. Power Circuit Breakers: UL 489, Solid State molded case circuit breakers. Include electronic sensing, timing and tripping circuits for adjustable current, long-time pickup and long-time delay; adjustable instantaneous pickup; short-time pickup and delay.

2.08 POWER MONITORING UNIT

- A. Multifunction, digital metering and monitoring unit Square 'D' Powerlogic Class 3020 or approved equal complete with all accessories and devices.
- B. Provide power monitoring unit on the main breaker section of 480/277V, 3 phase, 4 wire.

2.09 ACCESSORIES

- A. Incoming Cable Terminations: Tape termination as manufactured by 3M Electrical Products or Raychem.

- B. Accessories: IEEE C57.12.01, standard accessories.
- C. Tap Changer: Externally-operated type.
- D. Safety Nameplate: NEMA 260.

2.10 FABRICATION

- A. Conform to requirements of ANSI C57.12.28.
- B. Construction: Per manufacturer's requirements.
- C. Height: 91 inches, maximum, including auxiliary support members on top and bottom.
- D. It is the responsibility of the Developer Design/Builder to coordinate all equipment arrangement within the room with all affected trades to provide all code clearances and proper arrangements. Switchboards that grossly exceed the space allocated and would require an increase in room size are not acceptable.
- E. Main Bus: Tin plated copper.

2.11 FACTORY FINISHES

- A. Clean surfaces before applying paint.
- B. Apply corrosion-resisting primer to surfaces.
- C. Apply finish coat of baked enamel paint to 2 mils thick.
- D. Finish Color: Manufacturer's standard light gray finish.

2.12 SOURCE QUALITY CONTROL

- A. Provide factory tests to IEEE C57.12.91. Include routine tests as defined in IEEE C57.12.01 and the following other tests:
 - 1. Impedance voltage and load loss.
 - 2. Dielectric tests.
 - 3. Audible sound level.
 - 4. Short circuit capability.
 - 5. Telephone influence factor (TIF).
- B. Make completed substation available for inspection at manufacturer's factory prior to packaging for shipment. Notify County's Representative at least 14 days before inspection is allowed.
- C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify County's Representative at least 14 days before inspections and tests are scheduled.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install transformer in accordance with IEEE C57.94.
- B. Install substation plumb and level and with each section aligned properly.
- C. Make electrical connections between equipment sections using connectors furnished by manufacturer.

D. Install engraved plastic nameplates in accordance with Division 26.

E. Ground and bond substation in accordance with Division 26.

3.02 FIELD QUALITY CONTROL

A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Primary Switch: Perform inspections and tests listed in NETA ATS, Section 7.5.1.2.

3.03 ADJUSTING

A. Division 01 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust protective relays in accordance with recommendations in Overcurrent Protective Device Coordination Study Division 26.

C. Adjust primary taps so secondary voltage is above and within 2 percent of rated voltage.

END OF SECTION