

**SECTION 26 1116
SECONDARY UNIT SUBSTATIONS**

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Pads for substation support.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.02 REFERENCE STANDARDS

- A. ANSI C12.1 - Electric Meters Code for Electricity Metering; 2008.
- B. IEEE C37.04 - IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis; 2005 (R2007).
- C. IEEE C57.12.00 - IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers; 2010.
- D. IEEE C57.12.01 - IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers; 2015.
- E. IEEE C57.12.28 - IEEE Standard for Pad-Mounted Equipment -- Enclosure Integrity; 2014.
- F. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2008.
- G. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers; 1982 (R2006).
- H. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products[<>]: www.schneider-electric.us/#sle.
- B. Eaton Corporation[<>]: www.eaton.com/#sle.

2.02 UNIT SUBSTATIONS

- A. Description: Secondary unit substation comprising air terminal primary section, transformer section, and medium-voltage switchgear secondary section.
- B. Configuration: Radial type , with indoor-outdoor arrangement.

2.03 SERVICE CONDITIONS

- A. Meet requirements for usual service conditions and for the specified unusual service conditions.

2.04 PRIMARY CIRCUIT BREAKER RATINGS

2.05 TRANSFORMER RATINGS

2.06 INCOMING SECTION EQUIPMENT

2.07 LIQUID-FILLED TRANSFORMERS

- A. Liquid-Filled Transformers: IEEE C57.12.00, three phase, pad mounted, self-cooled transformer unit.
- B. Cooling and Temperature Rise: IEEE C57.12.00; Class OA. 55 degrees C, self-cooled.
- C. Insulating Liquid: Oil.
- D. Liquid-Filled transformers to be standa for all hospital locations

2.08 DRY TYPE TRANSFORMERS

- A. Dry-Type Transformers: Single phase, pad-mounted, self-cooled transformer unit with solid-cast windings.

- B. Cooling and Temperature Rise: IEEE C57.12.01; Class AA. 220 degree C insulation class with 150 degree C rise over 40 degree C ambient.
- C. Corewell base design is liquid filled transformers. Dry type transformers to be considered as alternate option only in outpatient (non-hospital) locations.

2.09 OUTGOING SECTION EQUIPMENT

- A. Description: Switchboard manufactured to NEMA PB 2.
- B. Line and Load Terminations: Accessible from the front only, suitable for the conductor materials used.
- C. Main Section Devices: Panel mounted.
- D. Distribution Section Devices: Panel mounted.
- E. Auxiliary Section Devices: Individually mounted.
- F. Bus Material: Copper.
- G. Bus Connections: Bolted, accessible from front for maintenance.
- H. Fully insulate bus bars throughout, with reduced bus spacing. Insulate using _____.
- I. Molded Case Circuit Breakers: Inverse time automatic tripping.
- J. Field-Adjustable Trip Circuit Breaker: Provide circuit breakers with frame sizes 200 amperes and larger with mechanism for adjusting long time continuous current short time pickup current setting for automatic operation.
- K. Solid-State Circuit Breaker: Provide circuit breaker as indicated with electronic sensing, timing and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing instantaneous trip; and adjustable short time trip.
- L. Power Circuit Breakers: IEEE C37.20.1, factory-assembled electrically-operated low-voltage air circuit breakers, stationary mounting. Include electronic sensing, timing and tripping circuits for adjustable current, long-time pickup and long-time delay; ground-fault pickup and delay; adjustable instantaneous pickup; short-time pickup and delay. Ground fault sensing shall be integral with circuit breaker.

2.10 POWER CIRCUIT BREAKERS AND CIRCUIT BREAKER SWITCHGEAR

- A. Circuit Breaker: IEEE C37.04.
- B. Circuit Breaker Operator: Spring-charged stored energy with electric operator.
- C. Rated Maximum Voltage: 15.0 kV.
- D. Rated Voltage Range Factor: 1.3.
- E. Rated Frequency: 60 Hz.
- F. Provide 20% spare breakers on all large projects with new gear.

2.11 PROTECTIVE RELAYS AND INSTRUMENTS

- A. Protective Relays: Provide relaying instruments as indicated for each circuit breaker.
- B. Current Transformers: IEEE C57.13, 5 ampere secondary, wound type, with single secondary winding and secondary shorting device, primary/secondary ratio as required, burden consistent with connected metering and relay devices, 60 Hertz.
- C. Potential Transformers: IEEE C57.13, 120 volt single secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.
- D. Watt-Hour Meters and Wattmeters: ANSI C12.1, three phase induction type with two stators, each with current and potential coil, rated 5 amperes and 120 volts at 60 Hertz. Meter suitable for connection to 3- and 4-wire circuits. Include potential indicating lamps; adjustments for light and full load, phase balance, and power factor; four-dial clock register; integral demand indicator; ratchets to prevent reverse rotation; removable meter with draw-out test plug; semi-flush mounted case with matching cover. Provide appropriate multiplier tags.

1. Product: Shark 200 manufactured by Electro Industries/GaugeTech.

2.12 ACCESSORIES

- A. Surge Arrestors: Station class; mount in incoming line compartment.
- B. Circuit Breaker Lifting Device: Portable, floor supported, elevating carriage with a roller base, for movement of circuit breakers in and out of switchboard structure.
- C. Circuit breaker test kit to be provided with new substations
- D. Remote racking device with minimum 20 feet cord to be provided with new substations

2.13 FABRICATION

- A. Enclosure: Comply with requirements of IEEE C57.12.28.
- B. Construction: Indoor.
- C. Main Bus: Copper.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that support pads furnished under Section 03 3000 are ready to receive products.
- B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install in accordance with IEEE C57.94.
- B. Provide required support and attachment in accordance with Section 26 0529.
- C. Install substation plumb and level and with each section aligned properly.
- D. Make electrical connections between equipment sections using connectors furnished by manufacturer.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- 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
- D. Primary Circuit Breaker: Perform inspections and tests listed in NETA ATS, Section 7.6.
 1. Air Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.3. Tests listed as optional are not required.
 2. Vacuum Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.3. Tests listed as optional are not required.
 - a. Perform trip/close coil current signature analysis.
 - b. Perform mechanism-motion analysis.
 - c. Perform insulation-resistance tests on all control wiring with respect to ground.
- E. Transformer: Perform inspections and tests listed in NETA ATS, Section 7.2. Tests listed as optional are not required.
 1. Dry-Type Transformers:
 - a. Verify that control and alarm settings on temperature indicators are as specified.
 - b. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV.
 - c. Perform excitation-current tests on each phase.
 - d. Measure the resistance of each winding at each tap connection.
 - e. Perform an applied voltage test on all high- and low-voltage windings-to-ground.
 2. Liquid-Filled Transformers:
 - a. Test dew point of tank gases.
 - b. Perform sweep frequency response analysis tests.
 - c. Perform leakage reactance three phase equivalent and per phase tests.

- d. If core ground strap is accessible, remove and measure core insulation resistance at 500 volts dc.
- e. If applicable, measure the percentage of oxygen in the gas blanket.

END OF SECTION 26 1116

**SECTION 26 1200
MEDIUM-VOLTAGE TRANSFORMERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Liquid-filled pad-mounted distribution transformers.
- B. Dry-type pad-mounted distribution transformers.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Pads for transformer support.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IEEE 386 - IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V; 2011.
- B. IEEE C57.12.00 - IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers; 2010.
- C. IEEE C57.12.01 - IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers; 2015.
- D. IEEE C57.12.91 - IEEE Standard Test Code for Dry-Type Distribution and Power Transformers; 2020.
- E. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers; 1982 (R2006).
- F. NEMA 260 - Safety Labels for Padmounted Switchgear and Transformers Sited in Public Areas; 1996 (2004).
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings and materials.
- B. Product Data: Provide electrical characteristics and connection requirements, standard model design tests, and options.
- C. Project Record Documents: Include copy of manufacturer's certified drawings.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect dry-type transformers from moisture by using appropriate heaters as instructed by the manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products[<>]: www.schneider-electric.us.
- B.

- C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LIQUID-FILLED TRANSFORMERS

- A. Liquid-Filled Transformers: IEEE C57.12.00, three phase, pad-mounted, self-cooled transformer unit.
- B. Cooling and Temperature Rise; IEEE C57.12.00; Class OA. 55 degrees C, self-cooled.
- C. Insulating Liquid: Oil.

2.03 DRY-TYPE TRANSFORMERS

- A. Dry-Type Transformers: IEEE C57.12.01; single phase, pad-mounted, self-cooled transformer unit with solid-cast windings.
- B. Cooling and Temperature Rise: IEEE C57.12.01; Class AA. 220 degree C insulation class with 150 degree C rise over 40 degree C ambient.

2.04 ACCESSORIES

- A. Accessories: IEEE C57.12.00 standard accessories, IEEE C57.12.01 standard accessories, IEEE C57.12.00 standard accessories, and IEEE C57.12.01 standard accessories.
- B. Tap Changer: Externally-operated type.
- C. Primary Terminations: Bushing wells to IEEE 386; provide three for radial feed. Include bushings for insulated loadbreak connectors.
- D. Primary Switching: Fused air switch, gang operated.
- E. Secondary Terminations: Spade lugs.

2.05 SOURCE QUALITY CONTROL

- A. Provide factory tests to IEEE C57.12.90 and IEEE C57.12.00. Include the routine tests as defined in the standards and the following other tests:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that support pads provided under Section 03 3000 are ready to receive products.
- B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install in accordance with IEEE C57.94.
- B. Provide required support and attachment in accordance with Section 26 0529.
- C. Install plumb and level.
- D. Install safety labels to NEMA 260.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.2. Tests listed as optional are not required.
 - 1. Dry-Type Transformers:
 - a. Verify that control and alarm settings on temperature indicators are as specified.
 - b. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV.
 - c. Perform excitation-current tests on each phase.
 - d. Measure the resistance of each winding at each tap connection.
 - e. Perform an applied voltage test on all high- and low-voltage windings-to-ground.
 - 2. Liquid-Filled Transformers:
 - a. Test dissolved gas analysis te
 - b. Perform sweep frequency response analysis tests.

- c. Perform leakage reactance three phase equivalent and per phase tests.
- d. If core ground strap is accessible, remove and measure core insulation resistance at 500 volts dc.
- e. If applicable, measure the percentage of oxygen in the gas blanket.
- f. Measure insulating liquid's specific gravity and dissipation factor or power factor.

3.04 ADJUSTING

- A. Adjust primary taps so that secondary voltage is above and within 2 percent of rated voltage.

END OF SECTION 26 1200

**SECTION 26 1300
MEDIUM-VOLTAGE SWITCHGEAR**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Circuit breaker switchgear.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Pads for transformer support.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ANSI C12.1 - Electric Meters Code for Electricity Metering; 2008.
- B. IEEE C37.04 - IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis; 2005 (R2007).
- C. IEEE C37.20.1 - IEEE Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear; 2002 (R2007).
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for 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: Provide electrical characteristics and connection requirements, standard model design tests, and options.
- D. Manufacturer's Installation Instructions.
- E. Project Record Documents: Include copy of manufacturer's certified drawings.
- F. Maintenance Data: Include maintenance instructions for cleaning methods; cleaning materials recommended; instructions for circuit breaker removal, replacement, testing and adjustment, and lubrication.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products[<>]: www.schneider-electric.us
- B. Eaton Corporation[<>]: www.eaton.com.

2.02 DESCRIPTION

- A. Switchgear: IEEE C37.20.1, metal-clad switchgear assembly including horizontal draw-out circuit breakers in free-standing cubicles formed into an integrated structure.

2.03 SERVICE CONDITIONS

- A. Meet requirements for usual service conditions described in IEEE C37.20.1 and for the specified unusual service conditions.
- B. Meet requirements for use as service disconnecting means.

2.04 CIRCUIT BREAKERS

- A. Circuit Breaker: IEEE C37.04, air-magnetic type.
- B. Circuit Breaker Operator: Spring-charged stored energy with electric operator.
- C. Provide 20% spare breakers with new equipment orders

2.05 PROTECTIVE RELAYS AND INSTRUMENTS

- A. Protective Relays: Provide relaying instruments as indicated for each circuit breaker.
 - 1. Schweitzer Engineering Laboratories (SEL) to be base bid
- B. Watt-Hour Meters and Wattmeters: ANSI C12.1, three phase induction type with two stators, each with current and potential coil, rated 5 amperes and 120 volts at 60 Hertz and with the following features:
 - 1. Suitable for connection to 3- and 4-wire circuits.
 - 2. Integral demand indicator.
 - 3. Removable meter with draw-out test plug.
 - 4. Appropriate multiplier tags.
 - 5. Product: Nexus 1500 or Shark 250. Verify model with Facilities Engineering. Manufactured by Electro Industries/GaugeTech.

2.06 ACCESSORIES

- A. Surge Arrestors: Station class, Mount in incoming line compartment.
- B. Provide 4" Infrared (IR) windows at all viewable terminations
- C. Circuit Breaker Lifting Device: Portable, floor supported, elevating carriage with a roller base, for movement of circuit breakers in and out of switchboard structure.
- D. Powered breaker test station to be provided for new equipment with cord to connect breaker

2.07 FABRICATION

- A. Construction: Indoor.
- B. Main Bus: Copper.

2.08 FACTORY FINISHES

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

2.09 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Test in accordance with IEEE C37.20.1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that support pads furnished under Section 03 3000 are ready to receive products.
- B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install in accordance with IEEE C37.20.1.
- B. Provide required support and attachment in accordance with Section 26 0529.

- C. Install switchgear plumb and level and with each section aligned properly.
- D. Make electrical connections between equipment sections using connectors furnished by manufacturer.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.1 .
- D. Air Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.3. Tests listed as optional are not required.

3.04 ADJUSTING

- A. Adjust protective relays in accordance with recommendations in Owner's coordination study.
- B. Adjust protective relays as directed.
- C. Set all breakers according to power study

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate operation of circuit breakers.
- B. Fuses to be labeled inside doors of all bays
- C. Interior of all equipment to be thoroughly cleaned prior to turning over to Facilities.

END OF SECTION 26 1300

**SECTION 26 1321
AIR INTERRUPTER SWITCHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Medium-voltage air interrupter switches.
- B. Medium-voltage fuses.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete pads and foundations.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

- A. IEEE C37.20.3 - IEEE Standard for Metal-Enclosed Interrupter Switchgear (1 kV-38 kV); 2013.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate outline dimensions, enclosure construction, shipping splits, lifting and supporting points, electrical single line diagram, and equipment electrical ratings.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 AIR INTERRUPTER SWITCHES

- A. Description: IEEE C37.20.3, switchgear assembly of individual air interrupter switches in free-standing cubicles, securely bolted together to form an integrated structure, suitable for installation where accessible by general public.
- B. Enclosure: Indoor.
 - 1. Include continuous ground bus through switchgear assembly, securely connected to frame of each cubicle.
 - 2. Finish: Manufacturer's standard baked enamel paint 2 mils thick.

2.03 COMPONENTS

- A. Interrupter Switch: Nonfused two position load interrupter switch.

2.04 ACCESSORIES

- A. Surge Arrestors: Station class, rated ____ kV; mount in incoming line compartment.
- B. Incoming Cable Terminations: Clamp-type.
- C. Electric Switch Operator: 48 volts AC; operable manually with removable handle or through motor and gear train. Interlock fuse compartment door to prevent opening with switch in CLOSED position.
- D. Provide 4" IR windows at all viewable termination points.

2.05 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide factory inspection and testing in accordance with IEEE C37.20.3.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide required support and attachment in accordance with Section 26 0529.
- C. Install on concrete pad as indicated on Drawings.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

END OF SECTION 26 1321