

**SECTION 26 12 00 - MEDIUM-VOLTAGE TRANSFORMERS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Liquid-filled pad-mounted distribution transformers.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Pads for transformer support.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

**1.03 REFERENCE STANDARDS**

- A. IEEE 386 - IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV; 2016.
- B. IEEE C57.12.00 - IEEE Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers; 2021.
- C. IEEE C57.12.01 - IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers; 2020.
- D. IEEE C57.12.28 - IEEE Standard for Pad-Mounted Equipment--Enclosure Integrity; 2023.
- E. IEEE C57.12.90 - IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers; 2021.
- F. NEMA 260 - Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas; 1996 (Reaffirmed 2019).
- G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- 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. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.
- D. Manufacturer's Installation Instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Project Record Documents: Include copy of manufacturer's certified drawings.
- G. Maintenance Data: Include maintenance instructions for cleaning methods; cleaning materials recommended ; procedures for sampling and maintaining fluid.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Tools: One each of every special tool required to operate and maintain transformer.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with ANSI C57.12.10, ANSI C57.12.28, IEEE C57.12.70, and IEEE C57.12.80.
- B. Comply with requirements of NFPA 70.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
- D. Testing Agency Qualifications: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.
- E. Products: Listed, classified, and labeled as suitable for the purpose intended.
- F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.06 COORDINATION**

- 1. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Schneider Electric; [www.se.com/#sle](http://www.se.com/#sle).

- B. Howard Power Solutions; [www.howard-ind.com/Power](http://www.howard-ind.com/Power).

## **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: Mineral Oil, complying with ASTM D 3487, Type II, and tested according to ASTM D117.

## **2.03 SERVICE CONDITIONS**

- A. Meet requirements for usual service conditions described in IEEE C57.12.01 and for the specified unusual service conditions.
- B. Maximum Ambient Temperature: 40 degrees C.
- C. Altitude: 2800 feet.

## **2.04 RATINGS**

- A. Capacity: see plans kVA.
- B. Primary Voltage: 12.47 kV delta connected.
- C. Taps: Four nominal 2.5% taps, 2 above and 2 below rated primary voltage..
- D. Secondary Voltage: see plans volts, wye connected.
- E. Impedance: 5.75 percent minimum.
- F. Basic Impulse Level: 95 kV, comply with UL 1062.
- G. Insulation Temperature Rise: 55 deg C when operated at rated kVA output in a 40 deg C ambient temperature. Transformer shall be rated to operate at rated kilovolt ampere in an average ambient temperature of 30 deg C over 24 hours with a maximum ambient temperature of 40 deg C without loss of service life expectancy.
- H. High-Voltage Terminations and Equipment: Dead front with universal-type bushing wells for dead-front bushing-well inserts, complying with IEEE 386 and including the following.
  - 1. Bushing-Well Inserts: One for each high-voltage bushing well
- I. Surge Arresters: Distribution class, one for each primary phase; complying with IEEE C62.11 and NEMA LA 1; support from tank wall within high-voltage compartment. Transformers shall have three arresters for radial feed.

**2.05 ACCESSORIES**

- A. Accessories: IEEE C57.12.00 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: Internal liquid-immersed gang-operated load break switch. Provide two, for primary selective switching.
- E. Secondary Terminations: Spade lugs.
- F. Other Accessories:
  - 1. Drain Valve: 1-inch with sampling device.
  - 2. Dial type thermometer
  - 3. Liquid-level gage

**2.06 FABRICATION**

- A. Comply with the requirements of IEEE C57.12.28.

**2.07 FACTORY FINISHING**

- A. Clean surfaces before applying paint.
- B. Apply corrosion-resisting primer to all surfaces.
- C. Apply finish coat of baked enamel paint to 4 mils thick.
- D. Finish Color: Manufacturer's standard green finish.

**2.08 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:
  - 1. Impedance voltage and load loss.
  - 2. Dielectric tests.
  - 3. Short circuit capability.
  - 4. Temperature rise.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that support pads provided under Section 03 30 00 are ready to receive products.
- B. Verify that field measurements are as indicated on shop drawings.
- C. Examine roughing-in of conduits and grounding systems to verify the following:
  - 1. Wiring entries comply with layout requirements.
  - 2. Entries are within conduit-entry tolerances specified by manufacturer and no feeders will have to cross section barriers to reach load or line lugs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected

### 3.02 INSTALLATION

- A. Install transformers on concrete foundations. Provide required support and attachment in accordance with Section 26 05 29 and manufacturers written instructions.
- B. Install plumb and level.
- C. Install safety labels to NEMA 260.
- D. Maintain minimum clearances and workspace according to manufacturer's written instructions and NFPA 70.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - 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.
- D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each transformer. Open doors so terminations / connections are accessible to portable scanner.
  - 1. Instrument: Use an infrared scanning device designed to measure temperature and detect significant deviations from normal values. Minimum resolution 320x240, 45deg. field of view. Equal to Flir E8-XT or Fluke TiS60. Provide calibration record for device used. Follow instructions of test equipment used.
  - 2. Comply with ASTM E1934-99a. Standard guide for Examining Electrical and Mechanical equipment with Infrared Thermography.
  - 3. Prepare a certified report identifying items checked and describing results of scanning. The infrared thermographer shall provide documentation for all infrared examinations. The following information shall be included in a report to the end user:
    - a. The name, affiliation, address, and telephone number of the infrared thermographer, and his/her certification level and number, if applicable.

- b. The name and address of the end user,
- c. The name(s) of the assistant(s) accompanying the infrared thermographer during the examination,
- d. The manufacturer, model and serial number of the infrared imaging system used,
- e. The inventory list with notations of the items of equipment that were examined and explanations for the items not examined. Also, the items with low-emissivity surfaces should be identified.
- f. The date(s) of the inspection and when the report was prepared.
- g. When performing a qualitative infrared examination, the infrared thermographer shall provide the following information for each item identified:
  - 1) Its exact location.
  - 2) A description, such as its significant nameplate data, phase or circuit number, rated voltage, current rating and/or rotation speed.
  - 3) The measured voltage and measured current.
  - 4) The ambient air temperature and, when relevant, the wind speed and direction and the sky conditions at the time of the examination.
  - 5) The time the item was documented.
  - 6) Hardcopies of the thermal image (thermogram) and of a corresponding visible-light image.
  - 7) The field of view or magnification multiplier of the infrared imager lens, and any imager settings that could affect the accuracy, reliability, or repeatability of the inspection data.
  - 8) Notation of any attenuating media, such as windows, filters, atmospheres, or external optics.
  - 9) A subjective repair priority rating provided by the qualified assistant or end user representative, or both, based on the importance of the exception to the safe and profitable operation of the facility.
  - 10) Any other information or special conditions which may affect the results, repeatability, or interpretation of the exception.
- h. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion

### **3.04 ADJUSTING**

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

END OF SECTION