

**SECTION 26 12 16**  
**DRY TYPE MEDIUM-VOLTAGE TRANSFORMERS**

**PART 1 GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Dry-type, medium-voltage transformers, with primary and secondary bushings within or without air-terminal enclosures.
2. Control network.
3. Warning labels and signs.

**B. Related Requirements:**

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

**1.2 DEFINITIONS**

- A. VPI: Vacuum Pressure Impregnation.**

**1.3 ACTION SUBMITTALS**

**A. Product Data:**

1. For each type of product.
  - a. Include rated capacities, operating characteristics, and furnished specialties and accessories.

**B. Shop Drawings:**

1. For dry-type, medium-voltage transformers.
  - a. Include plans and elevations showing major components and features.
    - 1) Include plan view and cross section of equipment base, showing clearances, manufacturer's recommended workspace, and locations of penetrations for grounding and conduits.

- b. Include details of equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
- c. Include single-line diagram.
- d. Include list of materials.
- e. Include nameplate legends.

C. Field Quality-Control Submittals:

- 1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For transformers, signed by product manufacturer.
- B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Schneider
- B. ABB
- C. GE or approved equal

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Comply with IEEE C2.
- C. Comply with IEEE C57.12.01.

2.3 PERFORMANCE REQUIREMENTS

- A. Windings Material: [Copper].
- B. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, connected in each phase of incoming circuit and ahead of disconnecting device.
- C. Cooling Systems: Comply with IEEE C57.12.01 for cooling class.
  - a. Make provision for future addition of forced-air-cooling equipment. Transformer bushings, leads, and related components must be sized for

future equipment. Provide fan mounts, conduit supports, and terminal boxes.

D. Coils Insulation Systems:

1. Primary and secondary coil assemblies must be manufactured using polyester VPI system.

E. Winding Connections: Connection of windings and terminal markings must comply with IEEE C57.12.70.

F. Bushings must comply with IEEE C57.19.01 requirements for impulse and low-frequency insulation levels.

G. Tap Changer: External, for de-energized operation.

1. Taps: Two 2-1/2 percent, full-capacity taps above and two 2-1/2 percent, full-capacity taps below rated voltage. Comply with IEEE C57.12.36 requirements.
2. Additional IEEE Standards: Comply with [IEEE C57.12.50]
3. Comply with UL 1562 listing requirements.
  - a. Primary: [Air-filled terminal cabinet for cable connection] [
  - b. Secondary: [Air-filled terminal cabinet for cable connection]
4. Transformer Ratings.
  - a. Impedance: Not less than [5.75] percent.
  - b. Temperature Rise: [150 deg C]
  - c. Coils Connection:
    - 1) Line-Side Winding: [Delta] .
    - 2) Load-Side Winding: [Wye]
5. Taps: Two 2-1/2 percent, full-capacity taps above and two 2-1/2 percent, full-capacity taps below rated voltage. Comply with IEEE C57.12.51 requirements.
6. Transformer Accessories:
  - a. Dial-type analog thermometer with alarm contacts.
  - b. At least four stainless steel ground connection pads.
  - c. Provisions for jacking, lifting, and towing.
  - d. Machine-engraved nameplate made of anodized aluminum or stainless steel.

## 2.4 WARNING LABELS AND SIGNS

A. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

1. Warning signs must be made of baked enamel.
2. Equipment Identification Labels: [Engraved, laminated-acrylic or -melamine label]

## 2.5 SOURCE QUALITY CONTROL

- A. Testing Administrant: [Owner will engage] qualified electrical testing agency to evaluate transformer.
- B. Testing: Test and inspect transformer in accordance with IEEE C57.12.91.
- C. Factory Tests and Inspections: Perform the following factory-certified routine tests by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, before delivering to site. Affix label with name and date of [manufacturer's] certification of system compliance on control units.
  - 1. Tests for transformers 500 kVA and smaller:
    - a. Turns ratio, polarity, and phase relation on rated voltage connection.
    - b. Transformer no-load losses and excitation current at 100 percent of ratings. This test may be based on a statistical sample.
    - c. Applied voltage and induced voltage.
    - d. Partial discharge.
- D. Nonconforming Work:
  - 1. Equipment that does not pass tests and inspections will be considered defective.
- E. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Pre-Installation Checks:
  - 1. Verify removal of shipping bracing after placement.
- B. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Ground resistance at transformer location may not be greater than 5  $\Omega$ .
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install transformers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
- B. Transformer must be installed level and plumb and must tilt less than 1.5 degrees while energized.

- C. Maintain minimum clearances and workspace at equipment in accordance with manufacturer's published instructions and NFPA 70.

### 3.3 CONNECTIONS

- A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
  - 1. For grounding to grounding electrodes, provide bare copper cable not smaller than 4/0 AWG. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode system with bare copper conductors. Keep leads as short as practicable, with no kinks or sharp bends. Make joints in grounding conductors and loops by exothermic weld or compression connector.
  - 2. Terminate grounding and bonding conductors on common equipment grounding terminal on transformer enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate number of conductors for termination.
  - 3. Complete transformer tank grounding and lightning arrester connections prior to making other electrical connections.
- B. Terminate medium-voltage cables in incoming section of substations in accordance with Section 260513 "Medium-Voltage Cables."

### 3.4 SIGNS AND LABELS

- A. Comply with installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."
- B. Install warning signs as required to comply with 29 CFR 1910.269.

### 3.5 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by [authorities having jurisdiction]
- B. Tests and Inspections:
  - 1. General Field-Testing Requirements:
    - a. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B.
    - b. After installing transformer but before primary is energized, verify that grounding system at substation is tested at specified value or less.
- C. Nonconforming Work:
  - 1. Equipment and devices will be considered defective if they do not pass tests and inspections.
  - 2. Remove and replace malfunctioning units and retest.

- D. Assemble and submit test and inspection reports. Record as-left set points of adjustable devices.
- E. Manufacturer Services:
  - 1. Engage factory-authorized service representative to [support] field tests and inspections.

END OF SECTION 261216