

SECTION 16461

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA
 - 1. Distribution transformers
 - 2. Buck-boost transformers

1.3 SUBMITTALS

- A. In accordance with Section 01340
- B. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated
- C. Field quality-control test reports
- D. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each transformer type through one source from a single manufacturer
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use
- C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers"

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods

during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity

1.6 COORDINATION

- A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3
- B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
 - 1. Powerware
 - 2. Square-D
 - 3. Eaton/Cutler-Hammer
 - 4. Siemens
 - 5. General Electric

2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service
- B. Cores: Grain-oriented, non-aging silicon steel
- C. Coils: Continuous windings without splices except for taps
 - 1. Internal Coil Connections: Brazed or pressure type
 - 2. Coil Material: Copper

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561
- B. Cores: One leg per phase
- C. Enclosure: Ventilated, NEMA 250, Type 2
 - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air
- D. Transformer Enclosure Finish: Comply with NEMA 250
 - 1. Finish Color: Gray

- E. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity
- F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity
- G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity
- H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 80 deg C rise above 40 deg C ambient temperature
- I. Energy Efficiency for Transformers Rated 15 kVA and Larger
 - 1. Complying with NEMA TP 1, Class 1 efficiency levels
 - 2. Tested according to NEMA TP 2
- J. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91

2.4 BUCK-BOOST TRANSFORMERS

- A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561
- B. Enclosure: Ventilated, NEMA 250, Type 2
 - 1. Finish Color: Gray

2.5 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 16075

2.6 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions

- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed
- D. Verify that ground connections are in place and requirements in Section 16060 have been met. Maximum ground resistance shall be 5 ohms at location of transformer
- E. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 CONNECTIONS

- A. Ground equipment according to Section 16060
- B. Connect wiring according to Section 16120

3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters
- B. Remove and replace units that do not pass tests or inspections and retest as specified above
- C. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections
 - 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration
 - 2. Perform 2 follow-up infrared scans of transformers, one at 4 months and the other at 11 months after Substantial Completion
 - 3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action
- D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component

3.4 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results

- B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals
- C. Output Settings Report: Prepare a written report recording output voltages and tap settings

3.5 CLEANING

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning

END OF SECTION