

SECTION 16460
TRANSFORMERS

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

- A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.
- B. Requirements of Section 16050, "Basic Electrical Materials and Methods," apply to this Section.

1.02 SUMMARY

- A. This section includes general purpose and specialty dry type transformers with windings rated 600 V or less.
- B. Related Work Specified in Other Sections:
 - 1. Electrical Identification, Section 16075.
 - 2. Grounding, Section 16060.
 - 3. Hangers and Supports, Section 16070.

1.03 SUBMITTALS

- A. Product data: For each transformer, including dimensional plans, sections, and elevations showing minimum clearances, installed devices, and materials lists. Provide temperature rise, efficiency and sound level data for each transformer type.
- B. Shop Drawings: Submit wiring diagrams showing primary taps.

1.04 REFERENCED CODES AND STANDARDS.

- A. NEMA ST-20.
- B. UL 1561.
- C. NFPA-70: National Electric Code (NEC).
- D. ANSI/IEEE Compliance: Comply with applicable requirements of ANSI/IEEE Standards including C2, "National Electrical Safety Code," and C57.12.80, "Terminology for Power and Distribution Transformers.
- E. UL Listing and Labeling: Items provided under this section shall be listed and labeled by UL.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. General Electric Co.
 2. Cutler-Hammer.
 3. Siemens Energy & Automation, Inc.
 4. Square D Co.

2.02 TRANSFORMERS, GENERAL

- A. Transformers: Factory assembled and tested, air cooled units of types specified, having characteristics and rating as indicated. Units shall be designed for 60-Hz service.
- B. Cores: Grain oriented, nonaging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
- D. Internal Coil Connections: Brazed or pressure type.

2.03 GENERAL PURPOSE, DRY-TYPE TRANSFORMERS

- A. Comply with NEMA Standard ST 20 "Dry-Type Transformers for General Applications."
- B. Transformers shall be low loss type with minimum efficiencies per NEMA TP1.
- C. Windings: 2-Winding type. Three phase transformers shall use one coil per phase in primary and secondary.
- D. Sound levels shall be guaranteed by the manufacturer not to exceed 45dB for transformers 15 to 45kVA, and 50dB for transformers 75 to 150 kVA.
- E. Transformers shall have the following features and ratings:
 1. Enclosure: Indoor, ventilated, fabricated of heavy gauge sheet steel. The coating color shall be ANSI 49 gray.
 2. Insulation Class: 185 deg C or 220 deg C class for transformers 15kVA or smaller; 220 deg C for transformers larger than 15 kVA.
 3. Insulation Temperature Rise: 115 deg C maximum rise above 40 deg C. Transformer shall be capable of carrying a 15 percent continuous overload without exceeding 150 deg C rise in 40 deg C ambient.
 4. Transformers 15 kVA and larger shall have a minimum of four 2 1/2 percent full capacity primary taps, two above and two below rated high voltage.
 5. Transformer shall be furnished for non-linear load operation at K-factor value 13 per UL 1561 when indicated on the drawings.

- F. Accessories: The following accessory items are required where indicated:
1. Electrostatic shielding: Insulated metallic electrostatic shield between primary and secondary windings, resulting in a minimum effective coupling capacitance between primary and secondary. Under normal loaded operating conditions, the attenuation of line noise and transients shall equal or exceed: common mode 1.5 kHz to 10 kHz - 90dB.
 2. Wall mounting brackets: Manufacturers standard brackets for transformers sized up to 45 kVA where wall mounting is indicated.

2.04 CONTROL AND SIGNAL TRANSFORMERS

- A. Comply with NEMA Standard ST 1 “Specialty Transformers”, and UL Standard 506, “Specialty Transformers.”
- B. Ratings: As indicated and for continuous duty. Where ratings is not indicated, provide capacity in excess of load.
- C. Type: Self-cooled, two-winding dry type.
- D. Enclosure: Indoor, except as indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install equipment to provide adequate spacing for cooling air circulation.
- B. Identify transformers in accordance with Section 16075.
- C. Tighten electrical connectors and terminals in accordance with manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not indicated, use those specified in UL 486A.
- D. Transformers shall be supported on approved vibration and noise dampening supports.
- E. All conduits connections to the transformers shall be made with flexible metallic raceway.

3.02 GROUNDING

- A. Ground transformer with grounding conductor sized in accordance with NEC requirements.

3.03 FIELD QUALITY CONTROL

- A. Test Objectives: To assure transformer installation is operational within industry and manufacturer’s tolerances, is installed in accordance with Contract Documents, and is suitable for energizing.
- B. Procedures: Upon satisfactory completion of tests, attach a label to tested components.

- C. Schedule tests and notify Architect at least once week in advance of schedule and of test commencement.
- D. Reports: Contractor shall make a written report of observations and tests. Report defective materials and workmanship and retest corrected defective tests.
- E. Contractor shall submit written test reports to the Architect.
- F. Testing for transformers shall include insulation resistance test, taps verification and excitation test.
- G. Test Failures: Correct deficiencies identified by test and make ready for retest. Verify that equipment meets the specified requirements.

3.04 ADJUSTING AND CLEANING

- A. Upon completion of installation, inspect interiors and exteriors of accessible components. Remove paint splatters and other spots, dirt, and construction debris. Touch up scratches and mars of finish to match original finish.
- B. Adjust transformer taps to provide optimum voltage conditions at utilization equipment.

END OF SECTION 16460