SECTION 16460
DRY TYPE POWER TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and supplementary Conditions apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Dry-type distribution and specialty transformers rated 1,000 V and less.

B. RELATED SECTIONS: The following sections contain requirements that relate to this section:
   1. Section 16120, “Building Wire and Cable, 600 V and Below.”
   2. Section 16196, “Electrical Identification.”

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI C57.12.28-1988: Switchgear and Transformers-Pad Mounted Equipment-Enclosure Integrity.

B. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE C2-1993: National Electrical Safety Code (ANSI).
   2. IEEE C57.12.91-1995: Test Code for Dry-Type Distribution and Power Transformers (ANSI).

C. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250-91: Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. NEMA ST 1-88: Specialty Transformers (except General Purpose Type).
   3. NEMA ST 20-92: Dry-Type Transformers for General Applications.

D. National Fire Protection Association (NFPA):
   1. NFPA 70-1999: National Electrical Code.

E. Underwriters Laboratories Inc. (UL):
   1. UL 486A-91 (Rev. 95): Wire Connectors and Soldering Lugs for Use with Copper Conductors.
   2. UL 506-94: Specialty Transformers.
   3. UL 1561-93: Dry-Type General Purpose and Power Transformers.

1.4 SUBMITTALS

A. Product Data: Include data on features, components, ratings and performance for each type of transformer specified. Include dimensioned plans, sections, and elevation views. Show minimum clearances and installed devices and features.

B. Wiring Diagrams: Detail wiring and identify terminals for tap changing and connecting field-installed wiring.

C. Product Certificates: Signed by manufacturers of transformers certifying that the products furnished comply with requirements.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

E. Factory Test Reports: Certified copies of manufacturer's design and routine factory tests required by referenced standards.

F. Sound Level Test Reports: Certified copies of manufacturer's sound-level tests applicable to equipment for this Project.

G. Field Test Reports: Indicate and interpret test results for tests specified in Part 3.

H. Maintenance Data: for all transformers.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide transformers specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with IEEE C2.

C. Comply with NFPA 70.

1.6 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 is not in a space that is continuously under normal control of temperature and humidity.

PART 2 - PRODUCTS

2.1 Dry type power transformers are included as part of the directed procurement program for this project. The Construction Manager is administering the program and equipment shall be purchased in accordance with program requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine space allocated for placement of the transformers. Verify that space conforms to manufacturer's recommendations for cooling and maintenance space around the unit.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with safety requirements of IEEE C2.

B. Arrange equipment to provide adequate spacing for access and for circulation of cooling air.

C. Identify transformers and install warning signs according to Section 16960 "Electrical Identification."

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 GROUNDING

A. Separately Derived Systems: Comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to steel structure or metallic piping near the transformer.

B. Comply with Section 16450 "Grounding" for materials and installation requirements.

3.4 FIELD QUALITY CONTROL

A. Test Objectives: To ensure transformer is operational within industry and manufacturer's tolerances, is installed according to the Contract Documents, and is suitable for energizing.

B. Test Labeling: On satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to tested component.

C. Schedule tests and provide notification at least 7 days in advance of test commencement.

D. Report: Submit a written report of observations and tests. Report defective materials and installation.

E. Tests: Include the following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.
   1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
   2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 486B.
   3. Insulation Resistance: Perform megohm-meter tests of primary and secondary winding to winding and winding to ground.
      a. Minimum Testing Voltage: 1,000 V, dc.
      b. Minimum Insulation Resistance: 500 megohms.
      c. Duration of Each Test: 10 minutes.
      d. Temperature Correction: Correct results for test temperature deviation from 20 deg C standard.

F. Test Failures: Compare test results with specified performance or manufacturer's data. Correct deficiencies identified by tests and retest. Verify that transformers meet specified requirements.

3.5 CLEANING

A. On completion of installation, inspect components. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars on finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

3.6 ADJUSTING

A. After installing and cleaning, touch up scratches and mars on finish to match original finish.

B. Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility. Record primary and secondary voltages and tap settings and submit with test results.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in readjusting transformer tap settings to suit actual occupied conditions. Provide up to 2 visits to Project site for this purpose without additional cost.
   1. Voltage Recordings: Contractor performed. Provide up to 48 hours of recording on the low-voltage system of each medium-voltage transformer.
   2. Point of Measurement: Make voltage recordings at load outlets selected by Owner.

END OF SECTION 16460