

SECTION 26 22 13 01
LOW-VOLTAGE DRY TYPE DISTRIBUTION TRANSFORMERS - DOE 2016

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish and install dry type isolation transformers of the types, sizes and quantities indicated on the contract drawings. Provide all lugs, accessories and mounting hardware necessary for proper installation and operation.

1.2 RELATED DOCUMENTS

- A. All drawings and general provisions of the Contract including General and Supplementary Conditions apply to this section.

1.3 SUBMITTALS

- A. Provide product information prior to fabrication and installation. Product data shall include all dimensions, weights, electrical ratings, wiring diagrams and required clearances.
- B. When requested, provide additional product data and certifications necessary to show conformance with this specification.
- C. Provide information for record purposes including field test reports and maintenance data as required.

1.4 RELATED STANDARDS

- A. Provide transformers in accordance with the following standards, where applicable:
1. Underwriter's Laboratory 1561, Standard for Safety for Dry-Type General Purpose and Power Transformers
 2. Underwriter's Laboratory 506, Standard for Safety for Specialty Transformers
 3. NEMA ST 20, Dry Type Transformers for General Applications
 4. NEMA 250, Enclosures for Electrical Equipment (1000 V Max)
 5. ANSI / IEEE C57.12.91, Standard Test Code for Dry-Type Distribution and Power Transformers
 6. U.S. Department of Energy 10 CFR Part 431 Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule, dated April 18, 2013. These efficiency standards shall take effect January 1, 2016. All transformers covered in the scope of this document and this specification, manufactured after December 31, 2015, shall be compliant with the new standard.
- B. *[Manufacturer Seismic Qualification: The low voltage general purpose dry type transformer (1000kVA max.) shall meet and be certified to seismic requirements specified in the IBC 2009 International Building Code.*
1. *The low voltage general purpose dry type transformer shall be complaint with IBC 2009 parameters.*
 - a. *Ip – Importance Factor: 1.5 – Components must function after an earthquake for life safety purposes (Building Occupancy Code IV).*
 - b. *Sds – For ventilated transformers Sds is $\leq 2.00g$ as standard up to 1000kVA. Encapsulated transformers Sds is 2.00g*
 - c. *z/h – Height factor ratio: 1.00 Note: Ratio is a calculated value equal to the floor the gear is installed on divided by 12. A 6th floor installation is a 0.5 value. A basement or ground floor installation is a 0.0 value.*
 2. *Equipment shall be designed to be located in a concrete and steel, moment-resisting frame building not exceeding 12 stories in height with a minimum story height of 10 feet.]*

1.5 QUALITY ASSURANCE

- A. Manufacturer shall have produced similar electrical equipment for a minimum period of 10 years.
- B. Products shall be listed by Underwriters Laboratories, Inc.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Handle transformers in accordance manufacturer's recommendations. Utilize factory provisions for all lifting, rigging, or hoisting.
- B. Store transformers prior to installation in a temperature and humidity controlled space. If such a space is not available, apply temporary heat in accordance with the manufacturer's instructions within each ventilated type transformer case to exclude moisture and condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The low voltage, dry type transformer(s) shall be supplied by Siemens or pre-approved equal. Approved manufacturers are as follows:
 - 1. SIEMENS
 - 2. []
- B. Transformers specified in this Section and power distribution equipment feeding and being fed by the transformers shall be warranted and serviced by the same manufacturer. Manufacturer shall have a local field service organization available on an as needed basis.

2.2 GENERAL REQUIREMENTS

- A. Transformers shall be of the general purpose, self cooled, two winding, dry type designed for 60 Hz operation. Transformers shall be designed, manufactured and tested in accordance with the latest ANSI, NEMA and IEEE Standards and shall be listed and labeled in accordance with UL 1561.
- B. Insulation System
 - 1. Transformers 15 KVA and larger shall be of the ventilated type and have a UL recognized 220°C insulation system. The temperature ratings shall be based on an allowable [80°C] [115°C] [150°C] winding temperature rise above a 30°C hot spot and 40°C ambient.
 - 2. Transformer design KVA rating shall be suitable for a 30°C average, 40°C maximum ambient temperature.
- C. Core And Coil
 - 1. Core construction shall be of non-aging electrical grade grain-oriented silicon steel with high permeability, low hysteresis and low eddy current losses as needed to achieve these efficiency levels. Core laminations shall be tightly assembled and magnetic flux densities shall be kept well below the saturation point.
 - 2. Windings shall be wound of high quality [aluminum] [copper].
 - 3. Ventilation of windings shall be accomplished by insulated spacers installed and arranged to brace coil layers and provide maximum ventilation. Core and coil assemblies shall be constructed to provide short circuit withstand capability as defined by ANSI and NEMA standards. The complete assembly shall be installed on vibration dampening pads to reduce noise and securely bolted to the enclosure base. A flexible grounding conductor shall be installed between the core and coil assembly and the transformer enclosure.
 - 4. Core and coil sealing process:
 - a. The complete core and coil assembly shall be impregnated with non-hydroscopic thermo-setting polyester varnish to provide a high dielectric and flame retardant seal.
 - b. The shield of varnish to the coils shall effectively impregnate the entire core and coil assembly that results in a unit which is virtually impermeable to moisture, dust,

- dirt, salt air, other industrial contaminants and provide high dielectric seal as well as fungus resistant.
5. Core lamination clamping angle shall be of adequate thickness and hardness to insure a tight and rigid core assembly to eliminate movement of core plates. Welded core designs shall include multiple beads as necessary to insure a tight and rigid core assembly to eliminate core plate movement.
 6. Provide full capacity taps in the high-voltage windings as follows: **The preferred tap arrangement for 15kVA thru 1000kVA is Option 1 below. Option 2 and Option 3 are acceptable for 150 kVA thru 1000kVA, however, they must be noted as exceptions.**
 - a. **Option 1: [Standard - 2 taps @ 2½% full capacity above normal and 4 taps @ 2½% full capacity below normal] Option 2: [Exception - 2 taps @ 2½% full capacity above normal and 2 taps @ 2½% full capacity below normal] Option 3: [Exception - 1 tap @ 5% full capacity above normal and 1 tap @ 5% full capacity below normal].**
- D. Enclosures
1. Ventilated enclosures shall be of heavy gauge steel construction of NEMA 3R construction for outdoor use with the addition of weather shields. Front and rear covers shall be removable to provide access to terminal compartment(s). Terminals shall be fully sized to carry the transformer full load current and shall be arranged to accept UL listed cable connectors.
 2. Enclosure wiring space and positioning of terminals shall allow for adequate cable bending space.
 3. Finish enclosures in ANSI 61 gray paint.
 4. Each transformer shall have a securely attached nameplate providing complete electrical ratings, wiring diagram, tap connections and catalog number, as applicable.
- E. Sound
1. Unless otherwise specified, sound levels shall be in accordance with values allowed by NEMA ST-20.
- F. Accessories
1. Provide weather shields for ventilated transformers installed outdoors conforming to the requirements of NEMA 250, Type 3R

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install per manufacturer's recommendations and contract documents.
- B. Install units plumb, level and rigid without distortion

3.2 ADJUSTMENTS AND 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.
- 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.

3.3 TESTING

- A. 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.
- B. 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.

- C. 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.

3.4 WARRANTY

- A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

END OF SECTION