**SECTION 26 11 16**

**DRY TYPE SUBSTATION TRANSFORMER**

1. **GENERAL**
	1. **DESCRIPTION**
		1. Furnish and install the dry type substation transformer as shown on the Drawings and as specified herein, indicated as “transformer” in this section.
	2. RELATED WORK
		1. Substation incoming line switchgear and secondary switchboard are included in other Sections of Division 26.
	3. **QUALITY ASSURANCE**
		1. The equipment furnished under this Section shall be the product of a manufacturer who has produced this same type of equipment for a period of at least 10 consecutive years.
		2. Transformers shall be designed, assembled and tested by the manufacturer of the core and coil assemblies used in the transformer.
	4. **FACTORY TESTS**
		1. Perform factory and installation tests in accordance with applicable NEC, NEMA and UL requirements.
	5. **SUBMITTALS**
		1. Product Data: Submit manufacturer's printed product data.
		2. Drawings: Submit shop drawings for approval. Include components, materials, finishes, detailed plan and elevation views, openings, and accessories.
	6. **APPLICABLE PUBLICATIONS**
		1. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
		2. American National Standards Institute (ANSI)/IEEE:

C57.12.01...............Standard General Requirements for Dry-Type Distribution and Power Transformers including those with solid cast and/or Resin-Encapsulated Windings

C57.12.51...............Standard General Requirements for Dry-Type Distribution and Power Transformers including those with solid cast and/or Resin-Encapsulated Windings

C57.12.91...............IEEE Test Code for Dry-Type Distribution and Power Transformers

* + 1. National Electrical Manufacturer's Association (NEMA):

ST-20...................Dry Type Transformers for General Applications

* + 1. National Fire Protection Association (NFPA):

70......................National Electrical Code (NEC)

1. **PRODUCTS**
	1. **CONSTRUCTION REQUIREMENTS**
		1. The Transformer core shall be constructed of quality non-aging silicon steel laminations with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. Core laminations shall be step-lap miter cut at the core corners to reduce hot spots, core loss, excitation current, and sound level. The core laminations shall be clamped together with heavy steel members to minimized gaps.
		2. Transformers shall be dry type with both primary and secondary coils encapsulated with epoxy resin using vacuum pressure impregnation, mounted in a ventilated NEMA 1 enclosure.
		3. Transformer shall be ventilated self-cooled (AA). The transformer shall have provisions for future forced air cooling.
		4. Insulation system shall utilize Class H material in a fully rated 220 degrees C system.
		5. The transformer shall be designed for a temperature rise of 150 degrees C.
		6. Transformer primary winding shall have four full capacity, 2.5 percent taps, two above and two below rated voltage. No load tap connections shall be made by tap links.
		7. Primary terminations shall be designed for close-coupled flange or cable terminal compartment.
		8. Secondary terminations shall be designed for close-coupled flange or cable terminal compartment.
		9. The transformer shall have vibration isolation pads installed between core and coil assembly and enclosure base structures.
		10. The transformer shall be UL labeled.
		11. The transformer sound level shall not exceed the maximum specified by ANSI C57.12.01 for applicable KVA size of dry-type transformer.
		12. The enclosure shall be constructed of heavy gauge sheet steel and shall be finished to match primary and secondary equipment paint color applied using an electrostatically deposited dry powder paint system to a minimum of three mils average thickness.
		13. The transformer shall have Metal-oxide, gapless-type distribution type lightning arrestors mounted and wired inside the primary terminal compartment.
		14. The core shall be grounded to the transformer frame and enclosure.
	2. **GENERAL REQUIREMENTS**
		1. Transformers shall have the following ratings:
			1. KVA rating: 1500kVA, AA
			2. Primary voltage: (2.4/4.16/12.47/13.2/13.8), (WYE/DELTA)
			3. Primary BIL: (30/60/95) kV.
			4. Secondary voltage: (208/480) V, WYE.
			5. Secondary BIL 10kV.
			6. 3 Phase, 60 Hz.
		2. Impedance: 5.75 percent plus or minus 7-1/2 percent.
	3. ACCESSORIES
		1. The transformer shall be furnished with the following accessories:
			1. Transformer shall be provided with a stainless steel diagrammatic nameplate.
			2. Power source for fans shall be provided for forced air-cooling and future forced air cooling.
			3. Temperature thermostats shall be provided, one per phase.
			4. Two ground pads shall be provided.
			5. Provisions for lifting and jacking.
2. **EXECUTION**
	1. INSTALLATION
		1. Install the transformer in accordance with the manufacturer's recommendations.
		2. The transformer shall be factory mounted on a skid as part of the unit substation.
		3. Make sure the transformer is level.
		4. Check for damage and loose connections.
		5. Adjust taps to deliver appropriate secondary voltage.
		6. Check operation of fans, motors, relays and other auxiliary devices.
	2. COMMISSIONING
		1. Install switchgear in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.
		2. Commissioning shall be performed by the substation manufacturer.
		3. Commissioning shall commence once system components are in place and the contractor has indicated the system is ready for activation.
		4. Training shall be performed by the substation manufacturer. The manufacturer shall include training for the owner’s staff. This training shall consist of hands on demonstrations of varying states of the switchgear and the proper sequence of events that should occur with instructions on how to deal with varying scenarios. Include detailed written instructions for the successful operation of the substation.

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