SECTION 261200 – MEDIUM VOLTAGE TRANSFORMERS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in manufacture of medium voltage transformers of types and ratings required, whose products are Listed and Labeled. Subject to compliance with requirements provide equipment equivalent to that produced by one of the following manufacturers:

ABB
General Electric
Cooper Power Systems

Codes and Standards:

NEC Compliance: Comply with NEC as applicable to installation and construction of electrical transformers.

ANSI Compliance: Comply with applicable requirements of ANSI Standards C57-Series pertaining to power/distribution transformers.

NESC Compliance: Comply with applicable requirements of National Electrical Safety Code (ANSI Std. C2) pertaining to indoor and outdoor installation of transformers.

SUBMITTALS

Submittals shall be made in strict accordance with the requirements of Section 019913. Specific submittal requirements are defined in each section of this Division.

Product Data: Submit manufacturer's technical product data including rated kVA, frequency, primary and secondary voltages, percent taps, polarity, impedance and certification of transformer performance efficiency at indicated loads, percentage regulation at 100% and 80% power factor, no-load and full-load losses in watts, % impedance at 75^{o}C, hot-spot and average temperature rise above 40^{o}C ambient temperature, sound level in decibels, and standard published data.

Shop Drawings: Submit manufacturer's drawings indicating dimensions, and weight loadings for transformer installations, showing layouts, wall bracket mountings and supports, spatial relationship to panelboards and associated equipment, include transformer connections to electrical equipment.

PART 2 - PRODUCTS

OIL FILLED DISTRIBUTION TRANSFORMER

Provide factory-assembled, compartment type, three-phase, oil-filled, self-cooled, outdoor type, dead-front, tamper-resistant, pad-mounted distribution transformer where shown, of size, characteristics, and rated capacities indicated. Transformer shall be 2000 kVA, 3-phase, 60-Hertz, 65 degree C temperature rise rated, with 12.47kV, 60kV BIL primaries, and 480Y / 277 volts, 30kV BIL secondaries with grounded neutral. Transformer impedance shall be consistent with values specified in ANSI Standard C57.12.34.

Construction: Transformer tank shall be of a sealed-tank construction as specified in ANSI Standard C57.12.26. The tank shall be a minimum of 12 gauge sheet metal, capable of withstanding a pressure of 7 psi without permanent distortion. Equip tank with a 1" drain valve with sampling device, liquid level indicator, filter-press connections, magnetic oil gauge with alarm contacts, grounding block, top-oil dial-type thermometer, and an automatic pressure relief device equivalent to a Qualitrol 202-032-01. A removable main cover may be provided over a bolted-on, tamperproof handhole. Handholes shall be provided to permit access to high voltage isolation links, three-phase switches, neutral connections, etc. Grounding provisions shall be in accordance with ANSI standards. Provisions shall be capped before painting the unit.

Transformer tank, high voltage compartment and low voltage compartment shall be constructed as an integral unit that will limit disassembly, breakage, and the prying open of any doors, panels and sills with the doors closed and locked. There shall be no externally removable fastening devices nor openings through which foreign objects might be inserted to contact live parts. Lifting eyes and jacking pads shall be provided and arranged to permit a distributed balanced fit. Each terminal compartment shall be full-height, air-filled, with individual doors constructed of a minimum of 13 gauge sheet metal, and braced as to prevent distortion.

Doors are to be installed using lift-off type stainless steel hinges of a gauge equal to or greater than that of the door. The low voltage door shall be equipped with an automatic three-point latching mechanism that allows access to the high voltage compartment only after the low voltage door is opened. The latching mechanism shall be spring loaded, and shall latch automatically when the door closes with all latch points latching simultaneously. The latching mechanism shall be engaged and disengaged by use of a penta-head spring-loaded captive bolt. The door shall have provisions for padlocking that incorporate a means to protect the padlock shackle from tampering and permit access to the penta-head captive bolt only after removal of the padlock. In addition, there shall be one more fastening device that must be removed before the high voltage door can be opened. Door stops shall be provided to hold the doors open when required. The doors and front sill of the compartments shall be removable. The high and low voltage compartments shall be separated by a steel barrier with the low voltage compartment on the right side of barrier when facing the unit.

Provide a five-legged design core-coil assembly. When required to assure a safe operating temperature, corrugated cooling panels shall be provided on back and sides of the oil-filled tank. Internal leads shall be insulated, trained and anchored to prevent phase-to-phase flashover.

Primary windings shall have 4 taps, two at 2-1/2% increments above and two at 2-1/2% below full-rated voltage for de-energized tap-changing operations. High voltage compartment shall contain two high voltage bushings per phase and of one piece type for use with loadbreak elbow terminators. Bushings shall be externally clamped and removable. High voltage winding lead lengths shall permit field replacement of bushings or bushing wells. All gasketed joints shall afford a sealed tank, gasket material must be durable and reusable. Parking stands shall be provided for mounting accessory equipment. Provide three M.O.V.E. type lightning arresters, vertically mounted, rated 9.0 kV.

Provide dead front closure covers for un-used high voltage bushings.

Secondary windings shall be provided with bushings for 3-phase, 4-wire operation as indicated on the Drawings. Low voltage bushings shall be molded epoxy and capable of withstanding a vertical load of 800 in-lbs. without deflection sufficient to cause a leak. The bushings shall be externally clamped, blade type spade terminals with four-holed NEMA standard spacing for transformers up to 500kVA and minimum six-holed NEMA standard spacing for transformers rated above 500kVA. Bushings are to be arranged for vertical takeoff. Low voltage winding lengths shall permit field replacement of bushings or bushing wells.

Transformer overcurrent protection shall be a combination of oil-immersed current-limiting fuses in series with bayonet oil-immersed, overload sensing, expulsion fuses coordinated to provide full range protection with the expulsion fuse clearing low-current faults and the current-limiting fuses clearing high current faults up to 50,000 amperes. The fuse assembly shall have an interrupting rating of 3500 amperes at 8.3kV single phase, and a loadbreak rating of 125 amperes at 80% power-factor for 8.3kV single phase. The bayonet fuses must be accessible through the primary compartment and shall be externally removable and field replaceable without having to remove the compartment top. The primary connections shall be protected by a welded-on oil dripshield located under the bayonet fuse.

Provide one spare set of fuses for each oil-filled distribution transformer.

The high voltage neutral shall be connected internally to the low voltage neutral with provisions for disengagement. The neutral bushing shall be fully insulated but connected to an adjacent ground pad on the tank with a strap of sufficient size to carry the maximum fault current available from the transformer.

Transformer Oil: Oil shall be "R-Temp" or any "LISTED less flammable liquid" similar to BIOTEMP, or FR3 as required per NEC 450-23. The manufacturer is responsible for maintaining and providing adequate documentation of the oil furnished in the unit. Manufacturer shall provide copies of this documentation upon request.

Finishes: Coat interior and exterior surfaces of transformer, including bolted joints, with manufacturer's standard color baked-on enamel.

Equipment Nameplate: Manufacturer shall provide a permanently affixed stainless steel nameplate, located inside the low voltage compartment, containing the transformer serial number and style number plus other pertinent information. The transformer must be identified as non-PCB oil cooled unit with the PCB content clearly and permanently marked on the nameplate.

PART 3 - EXECUTION

INSPECTION

Installer must examine area and conditions under which transformer and ancillary equipment are to be installed, and notify A-E in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

INSTALLATION OF TRANSFORMERS

Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NESC, NEMA, ANSI and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.

Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.

Install units on vibration mounts; comply with manufacturer's indicated installation method, if any.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std. 486A and B.

Equipment/System Identification: Provide equipment identification nameplates complying with Section 260533, *ELECTRICAL IDENTIFICATION.*

GROUNDING

Provide equipment grounding connections for transformers as indicated, including ground connection to water pipe and ground connection to grounding rod. Tighten connections to comply with tightening torques specified in UL Std. 486A to assure permanent and effective grounding.

TESTING

Prior to energizing of transformer, check all accessible connections for compliance with manufacturer's torque tightening specifications.

Prior to energizing, check circuitry for electrical continuity, and for short-circuits.

Upon completion of installation of transformer, energize primary circuitry at rated voltage and frequency from normal power source, and test transformer, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new unit or components, and proceed with retesting.

END OF SECTION 261200