SECTION 26 1219 - PAD-MOUNTED, MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 26 0000 - General Electrical Requirements
B. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems
C. Section 26 0553 - Electrical Systems Identification
D. Section 26 0812 - Power Distribution Acceptance Tests
E. Section 26 0813 - Power Distribution Acceptance Test Tables

1.2 REFERENCE

A. Work under this Section is subject to requirements of Contract Documents including General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

1.3 DESCRIPTION OF SYSTEM

A. Specification covers 3-phase, liquid-filled, compartmental type, pad-mounted transformers, including tap changers, fuses, and terminations.

1.4 REFERENCE STANDARDS

A. ANSI C57.12.22 Standard for Transformers - Pad-Mounted, Compartmental-Type, Self-Cooled, 3-Phase Distribution Transformers with High-Voltage Bushings, 2500 kVA and Smaller: High Voltage, 34,500Grd/19,920 V and Below; Low-Voltage, 480 V and Below - Requirements.
B. ANSI C57.12.28 Pad-Mounted Equipment - Enclosure Integrity.
C. DOE 10CFR 431 Energy Efficient Program for Certain Commercial and Industrial Equipment
E. IEEE C57.12.00 Standard General; Requirements for Liquid - Immersed Distribution, Power, and Regulating Transformers.
F. NEMA TR-1 Transformers, Regulators and Reactors
G. NFPA 70 National Electric Code (NEC)
H. UL 340 Tests for Comparative Flammability of Liquids.

1.5 SUBMITTALS

A. Submit shop drawings for equipment provided under this Section.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: ABB, Cooper Power Systems Division of Eaton, Virginia Transformer Corporation

2.2

A. Ratings:

1. kVA
2. Primary Voltage Delta
3. Primary BIL 95 kV
4. Frequency 60Hz
5. Secondary Voltage 480/277 Wye
6. Secondary BIL 30kV
7. Impedance 5% - 7% (5.75% Nominal)
8. Temperature Rise 65°C (over 30°C average ambient temperature)
9. Cooling KNAN
10. Coolant Fluid Less Flammable, Biodegradable Oil

2.3 CONSTRUCTION

A. Transformer(s) shall:

1. Be compartmental type, self-cooled, tamper-resistant and weatherproof.
2. Include sealed tank construction to withstand pressure of 7 psi without deformation and 15 psi without rupture.
3. Include welded cover with bolted handhole.
4. Be constructed to ANSI C57.12.28 requirements.

B. High and low voltage cabinet bolted to tank and sealed, weather tight.

C. High and low voltage compartments shall be located side by side, separated by a steel barrier. Cabinet is to be 24” deep minimum.

D. Cooling panels will be provided on back of tank.

E. High voltage compartment shall not be accessible until low voltage door has been opened.

F. Low voltage door shall have 3-point latching mechanism with vault type handle having provisions for single padlock. Doors shall be removable.

2.4 FINISH:

A. Provide paint finish with total film thickness of 3.0 mil.

B. Corrosion inhibitor metal prep with DTM epoxy primer and Olive Green, Munsell 7GY3.29/1.5 finish.

C. Finish shall meet requirements of ANSI C57.12.28.
2.5 CORE AND COIL CONSTRUCTION

A. Coils shall be wound with Copper windings.
B. Core shall be high grade, grain oriented silicon steel laminations.
C. Core and coil assembly shall be of wound core type 5-legged construction.
D. Internal leads shall be insulated.
E. Manual Tap Changer:
   1. Taps are to be full capacity, high-voltage for de-energized operation.
   2. Provide tap changer, externally operated with hotstick-operable handle.
   3. Tap changer handle shall have provisions for padlocking.
   4. Tap changer shall be 4-position with four 2-1/2% full capacity taps, 2 above and 2 below rated voltage.
F. Efficiency complies with DOE 10 CFR 431, Subpart K.
G. Sound level complies with NEMA TR-1.
H. Dual primary voltage series selector, where applicable.

2.6 HIGH VOLTAGE COMPARTMENT (LEFT)

A. Terminations:
   1. Terminations shall be dead front construction.
   2. Provide 6 universal load break type, 200A or 600A bushing wells and parking stands, for loop feed and mounting accessory equipment.
   3. Bushing wells shall be externally clamped and externally removable.
   4. Provide 1 set of load break bushings and 1 load break feed-thru insert for each phase.
   5. Provisions for distribution class arrestors.
B. High Voltage Switch:
   1. Provide load break, gang operated, oil immersed switch, with eye for hot stick operation.
   2. Switch. Arrangement shall consist of (3) three (2) two positon switches, one for line A, one for line B and one for transformer ON/OFF switch.
   3. Switch shall be stacked deck, spring loaded cam, rotary operated.
C. High Voltage Fusing:
   1. Provide Bay-O-Net fuses for both primary voltages, where applicable.
   2. Fuses shall have continuous current ratings sized per manufacturer’s recommendations for indicated kVA, impedance, and primary voltage.
   3. Provide drip tray below fuse access.
D. Surge Arrestors:
   1. Provide 3 distribution class metal oxide varistor type surge arrestors, installed in high voltage compartment and grounded to structure. Connect to incoming load break elbows.
   2. For loop feed terminations, provide 3 surge arrestors for loop feed bushings in addition to the incoming load break bushings.
E. Grounding Lug:
1. Provide (1) 2-hole NEMA stainless steel ground pads and one (1) (CU) ground bar.

2.7 LOW VOLTAGE TERMINATIONS AND EQUIPMENT (RIGHT)

A. Externally clamped, tin-plated copper, blade type spade terminals with 10-hole NEMA configuration with spacing for use with two-hole, long barrel compression lugs, quantity and size as indicated on drawings. Provide insulated spade supports attached to cabinet sides.

B. Low voltage neutral bushing:
   1. Connect to adjacent ground pad on tank with detachable strap. Strap ampacity is to comply with NEC 250.66.

C. Accessories:
   1. Each transformer shall be equipped with the following:
      a. Dial type thermometer for indicating top liquid temperature.
      b. Globe valve to serve as drain valve, bottom filler plug connection, and liquid sampling valve.
      c. Globe valve for top filter plug connection and vacuum pump connection.
      d. Pressure vacuum gauge.
      e. Magnetic liquid-level indicator.
      f. Spare fuse pocket with 1 complete set of fuses.

   2. Pressure relief device. Please specify if PRD is to be cover mounted PRD, or PRD to comply with FM approval for clarification.

   3. Stainless steel nameplate mounted inside the low-voltage compartment and on the outside of the low voltage door, with the following information:
      a. Manufacturer name and address.
      b. Serial number and style number.
      c. Graphic representation of high-voltage and low-voltage connections.
      d. kVA ratings at all cooling class ratings and temperature rises.
      e. Actual tested impedance at 65°C base kVA rating.
      f. Tap changer positions, voltages and full load currents at each tap setting.
      g. Low voltage rating and full load current.
      h. Gallons of liquid in tank and radiators.
      i. Maximum allowable pressure on tank.
      j. Transformer weight with and without oil.
      k. Listing as non-PCB transformer.
      l. Coolant type and FM classification as applicable.
      m. Winding material.

D. Labeling:
   1. Provide warning labels on outside high voltage compartment door and danger label on inside low voltage compartment door.
   2. UL Label and Classification
   3. OSHA required shock warning labels
   4. Tap changing and dual voltage selection switch operating restrictions label
   5. DOE compliance label.
   6. FM approval label

E. Grounding Lug:
   (1) Provide (1) 2 –hole NEMA stainless steel ground pad and (1) one ground bar.
2.8 HARDWARE

A. Provide hardware, including bolts, fasteners, caps, plugs, etc. of corrosion resistant materials or plated with corrosion resistant materials.

B. Lifting provisions: Provide external permanently fixed lifting eyes or hooks suitable for sling lifting full weight of transformer, oil, and all accessories by crane. Provisions are to be rated for 133% of unit weight.

C. Mounting provisions: Provide suitable mounting attachment points for use in bolting transformer to concrete housekeeping pad.

2.9 DIELECTRIC FLUID

A. Listed Less Flammable meeting requirements:
   1. NEC 450-23
   1. IEEE C2 Section 15
   2. EPA OPPTS 835.3100 Biodegradable
   3. Factory Mutual Approved
   4. UL Classified (UL-EOUV) and (UL-EOVK)

2.10 TESTING

A. Report of transformer tests shall be submitted for each transformer:
   1. Standard ANSI tests.
   2. Resistance measurements of windings on rated voltage tap of each transformer and at tap extremes of 1 transformer only of given rating on order.
   3. Ratio tests on rated voltage connections and on tap connections.
   4. Phase-relation and polarity tests on rated voltage connections.
   5. No load losses and excitation current at rated voltage on rated voltage connections.
   6. Impedance and load losses at rated current on rated voltage connections of each transformer and on extremes of 1 unit only of given rating on order.
   7. Applied and induced potential tests.
   8. Regulation and efficiency at rated load and voltage.
   9. Insulation resistance tests (high voltage to ground, low voltage to ground, high voltage to low voltage).
   10. NEMA TR-1 sound levels

B. Temperature test or tests shall be made on 1 unit only of transformers covered by these specifications of given rating, provided that test data is not available from records of temperature tests on duplicate or essentially duplicate transformer.
   1. Average winding temperature rise above ambient temperature shall not exceed 65°C when tested at 112% of the base rating.

2.11 QUALITY ASSURANCE

A. Transformer is to be manufactured in an ISO 9001:2000 certified facility.

B. Transformer is to be designed to, approved, tested, classified and listed by the following organizations:
   1. Underwriters Laboratory
   2. Factory Mutual
3. NEMA
4. ANSI/IEEE C57.12.00, C57.12.26, C57.12.28, C57.12.90
5. DOE 10 CFR 431 Subpart K
6. Other standards as listed in this specification

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install components as indicated and in accordance with manufacturer's instructions and recommendations.

B. Provide precast or cast-in-place concrete equipment pad with conduit openings. Size equipment pad 12” larger than transformer base in all directions. Chamfer pad top edge perimeter. Set pad level on compacted fill. Protect pad edges during site construction to prevent damage. Repair pad damage to the satisfaction of the Owner.

C. Grout conduit openings in pad to prevent varmint infiltration into transformer termination compartments.

D. Conduit stubs into pad are to be made with GRSC. Space conduits to allow access to conduit fittings and ground bushings. Bond grounding bushings to grounding lug in termination compartment.

E. Install transformer level and plumb.

F. Provide means for lifting complete transformer.

G. Bearing surfaces of lifting means shall be free from sharp edges.

H. Provide facilities for guying transformer.

I. Provide lifting means for untanking transformer.

J. Base shall permit rolling (or sliding) in directions of both center lines of transformer and provision shall be made for pulling transformer in these directions.

K. Locate jacking facilities near extreme ends of junction of base segments.

L. Jack ports or lugs shall be so designed that lifting members of jack can be inserted.

M. If liquid filling of any part of transformer is required at job site, supplier shall furnish liquid and job site supervision, and shall furnish or make available suitable filter press and vacuum pump.

N. Low voltage terminations are to be made using two-hole, long barrel compression lugs only. Torque lugs bolts per manufacturer’s specifications.

O. High voltage cable terminations are to be made per termination elbow manufacturer’s directions. Bond arrestor ground connection to high voltage compartment ground lug.
3.2 ACCEPTANCE TESTING

A. Testing by Electrical Contractor.

B. Acceptance testing to be performed in accordance with Section 26 0812 – Power Distribution Acceptance Tests and Section 26 0813 – Power Distribution Acceptance Test Tables.

3.3 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.

END OF SECTION