PART 1 GENERAL

1.1 SECTION INCLUDES

A. Liquid-filled pad-mounted distribution transformers.

1.2 REFERENCE STANDARDS

A. IEEE 386 - IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV.
B. IEEE C57.12.00 - IEEE Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
C. IEEE C57.12.01 - IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers.
D. IEEE C57.12.28 - IEEE Standard for Pad-Mounted Equipment -- Enclosure Integrity.
E. IEEE C57.12.91 - IEEE Standard Test Code for Dry-Type Distribution and Power Transformers.
F. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers.
G. IEEE C57.111 - IEEE Standard Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers.
H. NEMA 260 - Safety Labels for Padmounted Switchgear and Transformers Sited in Public Areas.
I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.
J. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings and materials.
B. Product Data: Provide electrical characteristics and connection requirements, standard model design tests, and options.
C. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.
D. Manufacturer's Installation Instructions.
E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
F. Manufacturer's Field Reports: Indicate activities on site, final adjustments and overcurrent protective device coordination curves, adverse findings, and recommendations.
G. Project Record Documents: Include copy of manufacturer's certified drawings.
H. Maintenance Data: Include maintenance instructions for cleaning methods; cleaning materials recommended ; procedures for sampling and maintaining fluid.
I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. Extra Fuses: One of each type and size.
    2. Tools: One each of every special tool required to operate and maintain transformer.

1.4 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
C. Testing Agency Qualifications: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.
D. Products: Listed, classified, and labeled as suitable for the purpose intended.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect dry-type transformers from moisture by using appropriate heaters as instructed by the manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB.
B. Cooper Power Systems, a division of Eaton Corporation.
C. General Electric Company.
D. Schneider Electric; Square D Products.
E. Siemens Industry, Inc.

2.2 LIQUID-FILLED TRANSFORMERS

A. Liquid-Filled Transformers: IEEE C57.12.00, three phase, pad-mounted, self-cooled transformer unit.
B. Cooling and Temperature Rise; IEEE C57.12.00; Class OA. 55 degrees C, self-cooled.
C. Insulating Liquid: Oil.
D. Provide a tank ground pad in both the high voltage and low voltage sections.
E. Wind coils with copper conductors.

2.3 SERVICE CONDITIONS

A. Meet requirements for usual service conditions described in IEEE C57.12.01 and for the specified unusual service conditions.
B. Maximum Ambient Temperature: 86.3 degrees F.
C. Altitude: 4200 feet.

2.4 RATINGS

A. Capacity: 1500 kVA.
B. Primary Voltage: 12.47 kV delta connected.
C. Taps: Double primary taps.
D. Secondary Voltage: 480V volts, wye connected.
E. Impedance: 5.75 percent maximum.
F. Basic Impulse Level: 30 kV.

2.5 ACCESSORIES

A. Accessories: IEEE C57.12.00 standard accessories and IEEE C57.12.01 standard accessories.
B. Tap Changer: Externally-operated type.
C. Primary Terminations: Bushing wells to IEEE 386; provide three for radial feed. Include bushings for insulated loadbreak connectors.
D. Primary Overcurrent Protection: Internally-mounted, liquid-immersed, expulsion fuses.
E. Secondary Terminations: Spade lugs.
F. Secondary Switching and Overcurrent Protection: Molded case circuit breaker; UL listed.
G. Other Accessories: Primary lightning arrestors and secondary current transformers to IEEE C57.13.
H. Drain Valve.
I. External, Lockable, Sampling Device.
J. Filling Connection.
K. Filter Press Connection.
L. Liquid Level Gauge with alarm contacts.
M. Liquid Temperature Gauge with alarm contacts.
N. Pressure-Vacuum Gauge with alarm contacts.
O. Pressure Relief Diaphragm.

P. Pressure Test Connection.
Q. Ground Pad, Both High and Low Voltage Compartments.
R. Diagrammatic Nameplate.
S. Provisions for Lifting and Jack Pads.
T. Low Voltage Door: Latch with provisions for a padlock.

2.6 FABRICATION

A. Comply with the requirements of IEEE C57.12.28.

2.7 FACTORY FINISHING

A. Clean surfaces before applying paint.
B. Apply corrosion-resisting primer to all surfaces.
C. Apply finish coat of baked enamel paint to 2 mils thick.
D. Finish Color: Manufacturer's standard dark gray finish.

2.8 SOURCE QUALITY CONTROL

A. Provide factory tests to IEEE C57.12.90 and IEEE C57.12.00. Include the routine tests as defined in the standards and the following other tests:
   1. Impedance voltage and load loss.
   2. Dielectric tests.
   3. Audible sound level.
   4. Short circuit capability.
   5. Telephone influence factor (TIF).
   6. Zero-phase-sequence impedance voltage.
   7. Temperature rise.
B. Test insulating liquid samples in accordance with IEEE C57.111.
C. Make completed unit substation available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least 7 days before inspection is allowed.
D. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify Owner at least 7 days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

3.2 INSTALLATION

A. Surround transformer by a concrete dike of sufficient size to completely contain the transformer fluid.
B. Provide ground grid around the pad, ground transformer to ground grid and to the building ground system, cold water service, and structural steel system.
C. Adjust taps of the transformer to produce the full rated voltage of the transformer at the service switchboard which is connected to the transformer secondary with full load.
D. Install plumb and level.
E. Install safety labels to NEMA 260.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.
B. Perform inspections and tests listed in NETA ATS, Section 7.2. Tests listed as optional are not required.
   1. Liquid-Filled Transformers:
      a. Test dew point of tank gases.
      b. Perform sweep frequency response analysis tests.
      c. Perform leakage reactance three phase equivalent and per phase tests.
      d. If core ground strap is accessible, remove and measure core insulation resistance at 500 volts dc.

e. If applicable, measure the percentage of oxygen in the gas blanket.
f. Measure insulating liquid's specific gravity and dissipation factor or power factor.
g. Verify that control and alarm settings on temperature indicators are as specified.
h. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV.
i. Perform excitation-current tests on each phase.
j. Measure the resistance of each winding at each tap connection.
k. Perform an applied voltage test on all high- and low-voltage windings-to-ground.

3.4 ADJUSTING

A. Adjust primary taps so that secondary voltage is above and within 2 percent of rated voltage.

END OF SECTION