SECTION 16320
MEDIUM VOLTAGE TRANSFORMERS (LIQUID FILLED)

PART I  GENERAL

1.01  SUMMARY

A. Section Includes:
   1. Liquid filled pad mounted transformers.

B. Related Sections:
   1. Section 02200 - Earthwork:  Soil Compaction Requirements
   2. Section 03300 - Cast-in-Place Concrete:  Pads for Transformer Support
   3. Section 16110 – Raceways
   4. Section 09900 – Painting

1.02  REFERENCES

A. All characteristics, definitions and terminology shall be in accordance with the latest revision of applicable ANSI and NEMA standards.

B. American Society of Testing and Materials (ASTM)

C. Institute of Electrical and Electronic Engineers (IEEE)

D. Manufacturer must be ISO 9001 certified.

1.03  SUBMITTALS

A. Require submittals under the provisions of Section 16010 - Basic Electrical Requirements and Section 01300 - Submittals.

B. Submit shop drawings indicating outline dimensions, connection and support points, weight, specified ratings and materials.

C. Submit product data indicating standard model design tests and options.

D. Submit manufacturer’s installation instructions under provisions of Section 01300.

1.04  OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Sections 01700, 01730, 16010 Division I.
B. Include procedures for cleaning unit and replacing components.

C. Submit product data indicating standard model design tests and options.

D. Submit manufacturer’s installation instructions under provisions of Section 01300.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in distribution transformers with three (3) years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under provisions of Sections 01600 and 16010.

B. Protect transformers as instructed by the manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Medium Voltage Transformers:

1. ABB

2. Cooper/Power Systems

3. Square D

2.02 EQUIPMENT

A. Pad Mounted Oil-Filled Transformers:

1. Liquid-filled Transformer, FM labeled, UL listed:

   a. Three phase, pad mounted, self-cooled transformer unit.

   b. Indicate kVA capacity, secondary voltage. Transformers larger than 1000 kVA shall not be used without special written authorization from the Manager of Utilities Distribution.

   c. Primary voltage 13.8 KV Three Phase Delta with wye secondary. Specify with 2-2 1/2% above and 2-2 1/2% below normal primary taps, with externally-operated no load tap changer. Secondary voltage as required.

   d. Impedance: Per ANSI Standards.
Consult with the manager of utilities distributions if the new transformer can be paralleled with an existing transformer.


f. Accessories:

(1) ANSI tank ground pad
(2) 1” filling plug mounted in the cover
(3) 1” drain plug
(4) 1” sampling valve
(5) Tap changer handle
(6) Liquid level gauge
(7) ¼” NPT with vacuum/pressure gauge
(8) Pressure relief valve
(9) Liquid temperature gauge

g. Dielectric fluid shall be non-toxic, non-bioaccumulating and be readily and completely biodegradable per EPA OPPTS 835.3100. The fluid shall have a minimum open cup fire point (ASTM D92) of 350 C and be FM approved, UL Classified less-flammable Envirotanp FR3, all in accordance with current NEC Section 450-23.

h. Primary Terminations:

(1) Specify six (6) ANSI/IEEE 386 600 or 200 AMP dead break bushings as specified by the Manager of Utility Distribution for loop fed application. Parking stands shall be provided. Specify three (3) internal oil immersed, two-position load-break switches to allow alternate circuit service and isolation of transformer. The three (3) switches shall be wired as shown in the diagram at the end of this section. The feeder feed through switches shall be 600 A when 600 A bushings are specified; 200 A feeder feed through switches may be used when 200 A bushings are specified.

i. Primary Overcurrent Protection: Two fuse system consisting of Bayonet-type, oil immersed expulsion fuse in series with current limiting backup fuse. Current limiting backup fuse to be mounted inside the transformer under oil. The current limiting fuse should be located as near as practical to the incoming primary bushing, on the source side of the expulsion fuse. The two fuses shall be coordinated so that the expulsion fuse clears low
energy faults on the secondary system and the current limiting fuse clears only high energy includes overload protection, can be provided as an alternate with approval from the Manager of Utilities Distribution. All transformer fusing shall be coordinated with upstream phase overcurrent devices.

j. Copper windings or aluminum windings, as specified by Manager of Utilities Distribution.

k. NEMA TP1 Design

l. Cabinet to be sized to accommodate 600 AMP bushings.

m. Provide three spare Bayonet fuses.

B. Transformer start-up: The on site test shall be completed after it is set on its permanent pad and grounded. The transformer will not be started until all tests are complete and turned over to Owner and engineer (2 sets) for review and approval.

PART 3 EXECUTION

3.01 INSTALLATION

A. Require installation in accordance with manufacturer’s instructions.

B. Require safety labels per NEMA, and provide code listed and label option for the non-toxic dielectric fluid.

C. Transformer clearances shall comply with Xcel Energy requirements.

D. Transformers shall be looped into the primary electric distribution system.

E. All secondary conductors shall be terminated utilizing compression type 2 hole lugs.

3.02 FIELD QUALITY CONTROL

A. Factory and field testing shall be performed under provisions of Section 01400. All field test shall be witnessed by the University. All test reports shall be turned over to the University. Perform the following tests:

1. Sample insulating liquid in accordance with ASTM 3612 D3613 and perform dissolved gas analysis (DGA) in accordance with ANSI/IEEE C57.104 and ASTM 3612. The oil shall be tested for:

   a. ASTM D-1533B Moisture in oil
   b. ASTM D-971 Inter Facial Tension
c. ASTM D-974 Acid Number
d. ASTM D-1500 Color Number
e. ASTM D-1524 Visual Exam
f. ASTM D-1816 Dielectric Breakdown
g. ASTM D-924 Power Factor 25C

2. Turns ratio test on all taps.

3. Power factor test or dissipation factor test.

4. Excitation.

5. Require oil testing 48 hours after energization. Contractor shall submit reports to University for keeping.

B. Factory test transformer to ANSI/IEEE C57.12.91 and provide University the test results prior to setting the transformer.

C. Field test transformer to ANSI/IEEE C57.12.91. All field tests to be witnessed by Owner. All test reports shall be turned over to Owner.

3.03 ADJUSTING

   A. Adjust primary taps to tap 4 (13,455 volts) on 13,800 volt nominal transformers.

END OF SECTION 16320