PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. Extent of transformer work is indicated by drawings and schedules.

B. Types of transformers specified in this section include the following:

1. ENVIROTEMP FR3 filled pad mounted transformer.

2. Future Forced air ENVIROTEMP FR3 filled pad mounted transformer.

1.02 QUALITY ASSURANCE:

A. NEC Compliance: Comply with NEC as applicable to installation and construction of electrical power/distribution transformers.

B. NEMA Compliance: Comply with applicable portions of NEMA Std Pub Nos. TR 1 and TR 27 pertaining to power/distribution transformers.

C. ANSI Compliance: Comply with applicable ANSI standards pertaining to power/distribution transformers.

D. ANSI/IEEE Compliance: Comply with applicable ANSI/IEEE standards pertaining to power/distribution transformers.

E. ANSI/UL Compliance: Comply with applicable portions of ANSI/UL 506; "Safety Standard for Specialty Transformers".

F. UL Labels: Provide distribution transformers which have been UL-listed and labeled.

1.03 SUBMITTALS:

A. 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 degrees C hot-spot and average temperature rise above 40 degrees C ambient, sound level in decibels, and standard published data.

B. Shop Drawings: Submit manufacturer's drawings indicating above data, dimensions, and weight loadings for transformer installations, showing layout, mountings and supports, spatial relationship to associated equipment, and transformer connections to electrical equipment.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturer: Subject to compliance with requirements, provide products of one of the following (for each type of transformer):

   Eaton/Cooper Power Systems
   ABB
   Siemens
   General Electric Company.
   Square D Company

2.02 POWER/DISTRIBUTION TRANSFORMERS:

A. General: Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for complete installation.

B. Future Forced Air Pad Mounted Transformers

1. General:

    a. Transformers shall be compartment style, self-cooled, tamperproof, loop feed and copper windings with provisions for future forced cooling.

    b. Enclosure shall be designed for outdoor pad mounted installation.
c. The average temperature rise of the transformer windings shall not exceed 65 degree C when the transformer is operated at full name plate rating. The transformers shall be capable of carrying 100% of name plate KVA rating in a 40 degree C max. 30 degree C average ambient as defined by ANSI C57.12.00.

2. Ratings:

a. Transformers as identified on the drawings shall be KVA, rated as indicated on the drawings, OA; Primary voltage, 13.2 KV volts, delta; Secondary voltage 480Y/277-V or 208Y/120-V, as identified on the drawings, wye, 4-wire, 60HZ with two 2-1/2% full-capacity above normal and two 2-1/2% full-capacity below normal primary taps. Impedance shall be ANSI C-57-12 standard impedance. Primary and secondary BIL shall be 95 KV and 30 KV respectively.

b. Coils shall be wound with copper conductors.

3. Construction:

a. Provide full height, air filled, incoming and outgoing terminal compartments with hinged doors, separated by a steel barrier. Construction of unit shall be dead-front. Equip primary section with six 200-ampere bushing wells in accordance with ANSI Standard C119.1. Low voltage bushings shall be tinned, spade-type with 9/16” holes spaced on 1¾” centers, six holes per blade and have vertical bus supports for each bushing. Provisions for grounding shall be provided in both high and low voltage sections.


c. The high voltage terminations and equipment shall be dead front and conform to ANSI C57.12.26 requirements.

d. The bases shall be constructed to permit rolling or skidding in any direction, and shall be equipped with jacking pads designed to be flush with the transformer enclosure.

e. Transformer shall be UL classified for installation per Article 450-23 of
the National Electric code.

f. The core shall be visibly grounded to the frame by means of a flexible grounding strap.

g. Provide lifting eyes and padlocking provisions.

h. Transformer fluid shall be minimum 300 degrees C flame point, Envirotemp FR3 fire-resistant fluid.

i. Transformer shall be factory mutual rated.

k. Transformer’s secondary lugs cable support shall be included in all transformers.

4. Provide accessories as follows:

a. Transformer shall be equipped with oil-immersed current limiting fuse, sized by transformer manufacturer to particular transformer. Provide one complete set of spare fuses for owner. Provide on-off internal load break switch, with handle located in primary compartment. The primary switching scheme provided with the transformer shall be four-position on/off, V-blade, gang operated loadbreak switch. Switch shall be “break before make” and shall have the following positions:
   - Open (all)
   - Line A only to C
   - Line A&B to C
   - Line B only to C

   Switch shall meet IEEE C37.71-2001, 12.5KA fault withstand.

b. Provide 3, dead-front 9/10 KV M.O.V.E. surge arrestors for each transformer.

c. 1" drain valve with sampling device.

d. Dial type thermometer.

e. Magnetic liquid-level gauge.
f. Pressure vacuum gauge.

g. Pressure relief valve.

h. Equip transformer with pressure relief device minimum rated of 35 SCFM at 15 PSI. Transformer tank shall be able to withstand internal pressure of 15 PSI without rupture.

i. Unit shall be equipped with provisions for future forced air cooling. Fans shall be single stage, with power provided from secondary of transformer to self-contained control cabinet. Fans to be low noise, maintenance free, with guards. Cooling shall be automatically activated when top coolant temperature reaches 65 degrees C.

C. Pad Mounted Transformers

1. General:

a. Transformers shall be compartment style, self-cooled, tamperproof, loop feed, and copper windings.

b. Enclosure shall be designed for outdoor pad mounted installation.

c. The average temperature rise of the transformer windings shall not exceed 65 degree C when the transformer is operated at full name plate rating. The transformers shall be capable of carrying 100% of name plate KVA rating in a 40 degree C max. 30 degree C average ambient as defined by ANSI C57.12.00.

2. Ratings:

a. Transformers as identified on the drawings shall be KVA, rated as indicated on the drawings, OA; Primary voltage, 13.2 KV volts, delta; Secondary voltage 480Y/277-V or 208Y/120-V, as identified on the drawings, wye, 4-wire, 60HZ with two 2-1/2% full-capacity above normal and two 2-1/2% full-capacity below normal primary taps. Impedance shall be ANSI C-57-12 standard impedance. Primary and secondary BIL shall be 95 KV and 30 KV respectively.

b. Coils shall be wound with copper conductors.
3. Construction:
   a. Provide full height, air filled, incoming and outgoing terminal compartments with hinged doors, separated by a steel barrier. Construction of unit shall be dead-front. Equip primary section with six 200-ampere bushing wells in accordance with ANSI Standard C119.1. Low voltage bushings shall be tinned, spade-type with 9/16" holes spaced on 1¾” centers, six holes per blade and have vertical bus supports for each bushing. Provisions for grounding shall be provided in both high and low voltage sections.


   c. The high voltage terminations and equipment shall be dead front and conform to ANSI C57.12.26 requirements.

   d. The bases shall be constructed to permit rolling or skidding in any direction, and shall be equipped with jacking pads designed to be flush with the transformer enclosure.

   e. Transformer shall be UL classified for installation per Article 450-23 of the National Electric code.

   f. The core shall be visibly grounded to the frame by means of a flexible grounding strap.

   g. Provide lifting eyes and padlocking provisions.

   h. Transformer fluid shall be minimum 300 degrees C flame point, Envirotemp FR3 fire-resistant fluid.

   i. Transformer shall be factory mutual rated.

   k. Transformer’s secondary lugs cable support shall be included in all transformers.

4. Provide accessories as follows:
   a. Transformer shall be equipped with oil-immersed current limiting
fuse, sized by transformer manufacturer to particular transformer. Provide one complete set of spare fuses for owner. Provide on-off internal load break switch, with handle located in primary compartment. The primary switching scheme provided with the transformer shall be four position on/off, V-blade, gang operated load break switch. Switch shall be “break before make” shall have the following positions:

- Open (all)
- Line A only to C
- Line A&B to C
- Line B only to C

Switch shall meet IEEE C37.71-2001, 12.5KA fault withstand.

b. Provide 3, dead-front 9/10 KV M.O.V.E. surge arrestors for each transformer.

c. 1" drain valve with sampling device.

d. Dial type thermometer.

e. Magnetic liquid-level gauge.

f. Pressure vacuum gauge.

g. Pressure relief valve.

h. Equip transformer with pressure relief device rated minimum 35 SCFM at 15 PSI. Transformer tank shall be able to withstand internal pressure of 15 PSI without rupture.

5. Standards and Tests:

a. The transformer shall comply with all applicable portions of ANSI C57.12.00 and ANSI C57.12.26.

b. Testing shall be done in accordance with ANSI C57.12.90 and shall include, as a minimum, the following tests: Provide Test reports.

  Ratio
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KNOXVILLE, TENNESSEE

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Polarity
Phase Rotation
No-Load Loss
Excitation Current
Impedance
Voltage
Load Loss
Applied Potential
Induced Potential

D. Finish: Coat interior and exterior surfaces of transformer, including bolted joints, with manufacturer's standard color baked-on enamel. Coat shall meet ANSI C57.12.28.

E. Manufacturers: Unit shall be similar and equal to Eaton/Cooper Power pad mounted transformer.

PART 3 - EXECUTION

3.01 INSTALLATION OF TRANSFORMERS:

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

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

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

D. Connect transformer units to electrical wiring system; comply with requirements of other Electrical Work sections.

3.02 GROUNDING:

A. Provide equipment grounding connections, sufficiently tight to assure permanent and effective ground. Provide a separately derived grounding point for each transformer. Extend grounding conductor to an earth electrode and building steel. Where available, connect to a cold water main.
3.03 TESTING:

A. Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformers, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting. Test voltage and connect tap setting for an acceptable no load voltage level.

B. Perform all tests (electrical and mechanical) as stated and specified in NETA ATS. Certify compliance with test parameters. Owner shall approve all testing.

END OF SECTION 16460