GENERAL

## RELATED DOCUMENTS

### Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this Section.

## DESCRIPTION OF WORK

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

### Types of transformers specified in this Section include the following:

#### Single-phase and three-phase, two-winding, individually mounted dry-type transformers per DOE 2016 Efficiency Standards.

#### Shielded, Isolation Type Transformers

#### Rated 600 volts and less

#### Capacity up to 2,500kVA

### Refer to other Division 26 sections for electrical wiring connections required in conjunction with transformers; not work of this Section.

## QUALITY ASSURANCE

### Manufacturers: Firms regularly engaged in the manufacture of power distribution transformers of types and ratings required, whose products have been in satisfactory use in similar service for not less than five (5) years.

### Installer: Qualified with at least three (3) years successful installation experience on projects with electrical power/distribution transformer work similar to that required for this project.

### For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

## REFERENCES

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

### NEMA Compliance: Comply with applicable portions of the NEMA Std. Pub. Nos. TR1 and TR27 pertaining to power/distribution transformers.

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

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

### ANSI/NEMA Compliance: Comply with NEMA Std. ST 20 "Dry-Type Transformers for General Applications".

### Transformers shall meet the requirements of federal law 10 CFR Part 431 "Energy Efficiency Program for Certain Commercial and Industrial Equipment" and NEMA Premium® Efficiency Transformer program.

### ANSI/UL Compliance: Comply with applicable portions of ANSI/UL 506 "Safety Standard for Specialty Transformers". For 60 Hz service and temperature ratings. Enclosure shall meet UL 506 requirements for ventilation openings, corrosion resistance, cable bending space, surface temperature rise, wiring compartment temperature rise, and terminations.

### UL Labels: Provide transformers that have been UL listed and labeled.

## SUBMITTALS

### Product Data: Submit manufacturer's technical product data including KVA rating, frequency, primary and secondary voltages, percent taps, % impedance, insulation class, sound level data, and certification of transformer performance per DOE 2016 Efficiency Standards at indicated loads, no load and full load losses in watts, hot spot and average temperature rise above 40 degrees C ambient, sound level in decibels, and standard published data.

### Shop Drawings: Submit manufacturer's drawings indicating dimensions and weight loading for transformer installations.

### The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.

#### The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.

#### The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.

#### The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

# PRODUCTS

## Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of transformer):

### Eaton Corporation; Cooper Power Systems Division. ~~G~~

### GE Electrical Distribution & Control.

### Square D./Schneider Electric NA.

### Siemens Energy & Automation, Inc.

### ABB Control, Inc.

### WEG Transformers.

## EQUIPMENT

### Furnish and install dry-type transformers as shown on the drawings.

### Dry-type transformers shall have metallic enclosures designed to provide for air cooling and to prevent accidental contact with live conductors. The materials and final performance of the product must conform to applicable IEEE and NEMA standards. Transformer wiring compartment shall be located below the core and coil, and shall be cooled by air circulation, or the wiring compartment shall be insulated from the core and coil by means of a suitable thermal insulation barrier.The maximum temperature of the enclosure shall not exceed 50 degrees C rise above a 40 degree C maximum ambient (90 degrees C).

### Transformer core shall be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage.

### Transformer will be well ventilated to prevent excess humidity and moisture entering enclosure. Include NEMA 2 drip-proof construction, with lifting provisions. All ventilation openings shall be protected against falling dirt.

### Enclosures shall be finished with ANSI 61 color, weather-resistant enamel.

### Coils shall be wound of electrical grade aluminum or copper with continuous wound construction.

### Transformers shall operate at 100% nameplate KVA rating continuously, with normal life expectancy as defined in ANSI C57.96, while in a 40 degrees C ambient environment without exceeding the rated average winding temperature rise of the ANSI insulated system used. Specific KVA and voltage ratings required shall be as shown on the drawings.

### Transformers shall meet or exceed the efficiency levels specified in the NEMA Premium® Efficiency Transformers Program. Efficiencies are measured at 35% loading and 75 degrees C.

### Transformers rated above 30 KVA shall have a 220 degrees C insulation system with 150 degrees C average temperature rise or 180 degrees C hot spot rise in a 40 degrees C ambient. Transformers rated 30 KVA and below shall have a 200 degrees C insulation system with 115 degrees C average temperature rise or 145 degrees C hot spot rise in a 40 degrees C ambient.

### All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635

### Sound levels must fall within ANSI-NEMA Standard levels according to KVA size. Expected ANSI and NEMA sound levels for self-cooled units as follows:

#### 0 to 50KVA - 45 dB or less

#### 51 to 150KVA - 50 dB or less

#### 151 to 300KVA - 55 dB or less

#### 301 to 500KVA - 60 dB or less

#### 501KVA or greater - 65 dB or less

### All transformers shall be supplied with clamp-type solderless connectors suitable for use with copper connecting cables.

### All transformers shall have neoprene rubber pads between the high-grade core and coil assembly and the transformer enclosure to isolate sound and vibration and prevent metal-to-metal contact between the core and the mounting base. Flexible conduit connections to the transformer may be used.

### On three-phase units the core and coil assembly shall be impregnated with non-hydroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture. Enameled conductors may also be used.

### Terminal boards shall be provided on all transformers. High-voltage and low-voltage terminals must be held in a fixed position, thus removing any need for taping of cable-terminal connections.

### The core of all transformers shall be grounded to the enclosure with a flexible copper strap that is fully rated as a grounding electrode conductor.

### Single phase transformers and three-phase transformers shall have the following high voltage load tap arrangements: ~~f~~

#### 25 KVA transformers and smaller shall have four 2-1/2” full capacity taps, 2 above and 2 below normal rated voltage.

#### 26-500 KVA transformers shall have six 2-1/2% full capacity taps, 2 above and 4 below normal rated voltage.

#### 501-750 KVA transformers shall have four 3.1% full capacity taps, 2 above and 2 below normal rated voltage.

#### 751-2500 KVA transformers shall have four 3.6% full capacity taps, 2 above and 2 below normal rated voltage.

### Where indicated on the drawings, provide electrostatically shielded, noise isolation transformers ". Each transformer shall have an electrostatic shield consisting of a one-turn strip aluminum or copper winding placed between the transformer primary winding and secondary winding. Ends of the shield shall be run to the transformer enclosure for grounding. Each transformer shall provide the following:

#### Minus 80 dbA minimum common mode noise rejection at 0.1 kHz to 1.5 kHz.

#### Minus 55 dbA minimum at 1.51 kHz to 100 kHz normal (transverse) mode noise rejection.

#### Minus 35 dbA minimum at 1.5 kHz to kHz.

# EXECUTION

## Install transformers as indicated in compliance with the manufacturers' written instructions, applicable requirements of the NEC, 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 transformers on vibration mounts; comply with manufacturers recommended installation methods, if applicable.

## The transformers shall be installed so there is a minimum of six inches clearance between ventilation openings and any obstruction. This in includes both sides, front, and back of the unit.

## Transformers will generally be pad mounted on a four inch minimum concrete pad. Hang transformers with manufacturer approved hanger kits for sizes up to 150KVA where noted on the plans.

## Ground the secondary of all transformers per the NEC and details provided on the plans.

# WARRANTY

## Manufacturer warranted equipment to be free of defects in materials and workmanship for 1 year from data of installation or 18 months from data or purchase.

END OF SECTION 262200