SECTION 16460

DRY-TYPE TRANSFORMERS

# GENERAL

## DESCRIPTION

### This section includes materials and installation of transformers.

## RELATED WORK SPECIFIED ELSEWHERE

### Section 16010: General Electrical Requirements.

## SUBMITTALS

### Submit shop drawings in accordance with the General Conditions.

### Submit ratings and characteristics including voltage, phases, connections, enclosure type and dimensions, and conduit entry restrictions.

## MEASUREMENT AND PAYMENT

### Payment for the work in this section shall be included as part of the lump-sum bid amount stated in the Proposal.

# MATERIALS

## GENERAL

### Provide general-purpose, single-phase and three-phase, individually mounted dry-type transformers of the two-winding, self-cooled type. Kva size, voltage, and phase of the transformers are indicated in the drawings.

### Within MCC or electric cabinets, provide core and coil, dry-type transformers.

### Transformers shall have copper windings and shall be UL listed and labeled where listing applies.

### Transformers shall be rated for continuous operation in a 40°C maximum ambient temperature.

### Transformers shall comply with the 2010 Department of Energy Efficiency Standards for Distribution Transformers.

### Outdoor transformer shall be NEMA 3R ventilated enclosure.

## DRY-TYPE TRANSFORMERS (10 KVA AND BELOW)

### Construct transformers in accordance with ANSI C89.2, NEMA ST-20, and UL listed under the requirements of UL 506.

### Transformers 5 kva and larger shall have two 5% FCBN taps on the primary side.

### Transformers rated 2 kva and below shall have 80°C rise, 150°C insulation system. Transformers rated 3 kva through 10 kva shall have 115°C rise, 185°C insulation system.

### Encapsulate core and coil in an insulating resin of the class equal to the temperature rise and embed in a resin and filler system to attenuate the sound level.

### Transformer shall be totally enclosed, nonventilated, suitable for indoor or outdoor installation.

### Transformers shall be Sorgel Electric Division, Square D Company "Quiet Quality"; General Electric Company "QB,” “ML,” or “QMS"; Cutler-Hammer Type Westinghouse "EP” or “EPT"; or equal.

## DRY-TYPE TRANSFORMERS (CORE AND COIL TYPE)

### Transformers shall be constructed in accordance with ANSI C89.1, NEMA ST 1-4 and shall be UL listed.

### Transformer shall have 115°C rise, 185°C insulation system.

## DRY-TYPE TRANSFORMERS (15 KVA AND ABOVE)

### Transformer shall be in accordance with ANSI C89.2 NEMA TR-27, NEMA ST‑20, and UL listed under the requirements of UL 506.

### Transformers shall have two 2-1/2% FCAN and FCBN taps on the primary side.

### Transformers shall have 115°C rise, 150°C insulation system.

### Transformers shall be energy-efficient type complying with NEMA TP-1.

### Sound levels shall be within the requirements of ANSI C89.1-2.7.2.

### Transformers shall be ventilated type.

### Basic impulse level (BIL) shall be 10 kV for transformers less than 300 kva and 30 kV for transformers 300 kva and larger.

### Transformers shall be Sorgel Electric Division, Square D Company "Quiet Quality," General Electric Company "QL," Cutler-Hammer Type Westinghouse "DS-3” or “DT-3," or equal.

## ISOLATION TRANSFORMERS

### Isolation transformers specified here are intended to protect loads sensitive to electrical noise disturbances that might occur on the line side of the transformer from lighting ballasts, utility network switching, or the operation of electric motors. Models are available from 125 volt-amperes through 7.5 kva single phase and from 7.5 through 130 kva 3 phase.

### Provide isolation transformers for use on 60-hertz systems with characteristics identified for transformers above plus shielding to limit coupling capacitance to 0.001 pF and to provide common-mode noise attenuation of 140 dB. Isolation transformers shall be manufactured by Topaz Electronics or equal.

## CONSTANT VOLTAGE TRANSFORMERS

### Transformer shall be a static-magnetic transformer-type device with no moving parts. The main core and coil shall be totally encapsulated.

### Transformer shall maintain output voltage within ±1% of the nominal voltage for input line voltage fluctuations of ±15%.

### Limit output wave form harmonic content to 3% at full load and 5% at no load.

### Load regulation from 20% load to full load at unity power factor and nominal voltage shall be within 1%.

### Transient response from a +15% to a -15% input voltage shall cause no more than a 10% output voltage excursion. Response time shall be within two cycles, and total recovery time required for the output to recover to rated bandwidth limits shall be within three cycles.

### Maximum sound level rating for 5-kva transformers and smaller shall be 55 dB at full load and 60 dB at no load. Maximum sound level rating for 7.5-kva transformers and larger shall be 60 dB at full load and 65 dB at no load. Sound level measurements shall be in accordance with ANSI 689.

### Design transformers for continuous operation for an ambient temperature range of -25°C to 40°C.

### Provide lifting provisions on transformers.

### Provide General Electric Stabiltron I, Type QSF, filtered output; Jefferson Electric Voltgard; or equal.

## FACTORY TESTS

### Perform factory tests in accordance with the latest revisions of ANSI C57.12.91 for dry-type transformers.

# EXECUTION

## GENERAL

### Where shown as part of a motor control, install transformer within a section of the MCC.

### Set taps under load conditions for correct voltage.

### Install transformers, 5 kva and larger, on Korfund Series F or H double-deflection mounts selected for the weight of the transformer, to produce the maximum isolation. Provide seismic restraints designed in accordance with IBC building code.

### Install transformers such that no metal-to-metal, concrete, plaster, or wood contact exists between the transformer and structural members.

### Make conduit connections to transformers with liquid-tight flexible conduit utilizing neoprene gaskets and isolated grounding bushings at the transformer enclosures, to achieve complete metal-to-metal sound and vibration isolation. Install flexible jumpers for grounding continuity from enclosure to conduits.

## TESTS

### Transformers shall have insulation resistance tests made on the windings prior to being connected. The measurements shall be from primary and secondary windings to ground and between primary and secondary windings. The minimum value shall be 10 megohms.

## CONSTANT VOLTAGE TRANSFORMER TESTS

### Verify that output voltage remains within specified tolerance when the taps of the transformer feeding the constant voltage transformer are changed from maximum to minimum tap settings (not to exceed ±15% nominal voltage).

### Verify load regulation is within specified limits by connecting resistive load to the transformer output.

**END OF SECTION**