# GENERAL

## SUMMARY

### This Section includes the following types of transformers with medium-voltage primaries:

#### Pad-mounted, liquid-filled, medium voltage distribution and power transformers.

## ACTION SUBMITTALS

### Product Data: For each type and size of transformer indicated.

### Shop Drawings: Diagrams including power, signal, and control wiring.

### Include complete outline and arrangement drawings showing plan and elevation views. Include overall dimensions, conduit or cable entrance locations, and dimensions and weight.

## INFORMATIONAL SUBMITTALS

### Instruction manual describing orderly assembly, handling, care, inspection, maintenance, operation of transformer and all accessories.

### Include nameplate drawing with connection schematic.

## CLOSEOUT SUBMITTALS

### Operation and maintenance data.

### Warranty documentation.

### Field quality-control test reports.

## QUALITY ASSURANCE

### Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### Comply with IEEE C2 and NFPA 70.

### Comply with ANSI C57.12.28, IEEE C57.12.00, IEEE C57.12.10, IEEE C57.12.70, and IEEE C57.12.80.

### DOE 2016 Standard Compliant Design, tested per ANSI C57.12.90.

### Transformer shall be UL labeled.

### Manufacturer shall be ISO 9001:2000 certified and have a written quality assurance and inspection program. All documentation available upon request.

### Transformer manufacturer shall certify that unit is non-PCB containing no detectable PCBs. Do not provide transformer with nonflammable liquids which contain askarel.

## PROJECT CONDITIONS

### Service Conditions: IEEE C37.121, usual service conditions.

## PROPOSALS

### Proposals shall be complete and fully describe in detail the transformer(s) as proposed by the manufacturer.

### Proposals shall state any and all exceptions to these specifications or the standards listed in this document.

### Prices shall be F.O.B. point of shipment with freight prepaid and allowed to the accessible common carrier point nearest the project site, or as specified by the proposal.

### Manufacturer shall warrant the product for a period of not less than eighteen (18) months from the date of shipment or twelve (12) months from the date of initial energization, whichever occurs earliest. Include warranty information with proposal.

# PRODUCTS

## MANUFACTURERS

### Manufacturer shall be regularly engaged in and have minimum of 10 years’ experience in the production of liquid-filled transformers.

### Manufacturers: Subject to compliance with requirements, provide products by one of the following:

#### ABB Control, Inc.

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

#### Federal Pacific Transformer Company; Division of Electro-Mechanical Corp.

#### GE Electrical Distribution & Control.

#### Hammond Manufacturing; Transformer Group.

#### Howard Industries.

#### WEG Transformers.

#### Siemens Energy & Automation, Inc.

#### Square D/Schneider Electric NA.

#### S&C Electric Company.

## LIQUID-FILLED DISTRIBUTION AND POWER TRANSFORMERS

### kVA Rating: Standard ANSI kVA rating as per specified in proposal request or design documents.

### Description: Comply with IEEE C57.12.00 and UL 1062 for pad-mounted, liquid-filled, 2-winding transformers.

### Insulating Liquid - Standard: Mineral oil, ASTM D 3487, Type II; tested according to ASTM D 117.

### Insulating Liquid - Option 1: Less flammable, edible-seed-oil based (FR3), and listed by a NRTL acceptable to authority having jurisdiction as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92. Liquid shall be biodegradable and nontoxic.

### Insulating Liquid - Option 2: Less flammable, silicone-based dielectric, and listed by a NRTL acceptable to authority having jurisdiction as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92. Liquid shall have low toxicity and be nonhazardous.

### Insulation Temperature Rise: 65 deg C, based on an average ambient temperature of 30 deg C over 24 hours with a maximum ambient temperature of 40 deg C.

### Basic Impulse Level: Comply with UL 1062.

### Full-Capacity Voltage Taps: Four, 2.5 percent taps, 2 above and 2 below rated primary voltage; with externally operable, de-energized tap changer; position indicator; and padlock hasp.

### Cooling System: Class ONAN (Oil-immersed, self-cooled transformer).

### Impedance: Standard per ANSI tolerances +/- 7.5%.

### Copper primary & secondary windings.

### Standard hardware & cabinet partitions.

### Standard green finish (Munsell 7GY3.29/1.5).

### Tamper resistant enclosure, welded construction, with lockable, rugged 3-point latching door(s).

### 60 Hz operation.

### Standard winding configuration: High-Voltage Delta, Low-Voltage Grounded WYE with Xo bushing and fully rated neutral.

### Sound level shall comply with NEMA TR 1 requirements.

### Transformer Bushings:

#### HV Bushings: ~~s~~Four-hole (minimum) spades.

#### LV Bushings: Eight-hole (minimum) spades. ~~P~~ Provide fiberglass bushing supports affixed to the forward facing end of the bushing (away from the tank) and secured to the cabinet and sidewalls, not to the tank wall, with galvanized hardware.

### Tank and Radiator:

#### Transformer tank base, and any bushing enclosures, shall be made of cold rolled mild steel. Minimum bushing enclosure material thickness shall be 13 gauge (standard).

#### Radiators, if required, shall be of the flat panel type (standard).

### Accessories:

#### Grounding pads, lifting lugs and provisions for jacking under base.

#### Insulated, low-voltage, neutral bushing with removable ground strap.

#### Liquid-level gage.

#### Pressure-vacuum gage.

#### Liquid temperature indicator.

#### Drain and filter valves. Sampler included with drain valve.

#### Pressure relief device.

#### Penta head style bolts for doors and access panels.

#### Vibration isolation pads, springs, etc. if necessary based on site specifics or user requests.

## IDENTIFICATION DEVICES & WARNING LABELS

### Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws.

### High-Voltage Warning Labels: Provide self-adhesive warning signs on outside of high-voltage compartment door(s). Sign legend shall be “DANGER HIGH VOLTAGE” printed in two lines of nominal 2-inch- ((50-mm)-) high letters. The word “DANGER” shall be in white letters on a red background and the words “HIGH VOLTAGE” shall be in black letters on a white background.

### Install warning signs as required to comply with 29 CFR 1910.269.

# EXECUTION

## INSTALLATION

### Install and anchor transformers on concrete bases according to manufacturer's written instructions and per University Design Guidelines for transformer bases. Base requirements can be found at the UNL Design Guidelines website (link: http://facilities.unl.edu/design-guidelines)

#### Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both directions than supported unit and 4 inches high, minimum.

#### Use 3500-psi (24.1-MPa), 28-day compressive-strength concrete.

#### Anchor equipment with epoxy-embedded anchor bolts that extend through concrete base and anchor into structural concrete floor.

### Maintain minimum clearances according to manufacturer's written instructions, NFPA 70, and UNL Design Guideline requirements (linked in above paragraph).

## FIELD QUALITY CONTROL

### Perform electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.2. Certify compliance with test parameters.

### Test and adjust controls and safeties.

## FOLLOW-UP SERVICE

### Voltage Monitoring and Adjusting: Perform the following voltage monitoring after Substantial Completion but not more than six months after Final Acceptance:

#### During a period of normal load cycles, perform seven days of continuous three-phase voltage recording at secondary terminals of each transformer. Voltage unbalance greater than 1 percent between phases, or deviation of any phase voltage from nominal value by more than plus or minus 5 percent during test period, is unacceptable.

#### Corrective Actions: If test results are unacceptable, perform the following corrective actions, as appropriate:

##### Adjust transformer taps.

##### Prepare written request for voltage adjustment by electric utility.

#### Retests: After corrective actions have been performed, repeat monitoring until satisfactory results are obtained.

#### Report: Prepare written report covering monitoring and corrective actions performed.

**END OF SECTION**