

1.0 SCOPE

This specification covers single-phase, 60-Hz, loop-feed, dead-front, oil immersed, self-cooled, 65° C rise, pad-mounted, outdoor, distribution transformers.

2.0 APPLICABLE PUBLICATIONS AND STANDARDS

All items characteristic, definitions and terminology, except as specifically covered in this specification, shall be in accordance with the latest revisions of ANSI/IEEE Standard C57.12.38, Department of Energy and NEMA standards, including US Department of Energy National Efficiency Standard 78 FR 2335.

3.0 PRODUCT REQUIREMENTS

3.1. General

- 3.1.1. All insulating components, oil, paper and wire enamel, shall be made of thermally upgraded materials, which are all compatible at today's industry standard 65 degrees Celsius temperature rise.
- 3.1.2. Transformers shall conform to latest issue of ANSI/IEEE Standard C57.12.38 except as specified herein.

3.2. Nameplate

- 3.2.1. In addition to the information specified in ANSI/IEEE C57.12.00 (Nameplate A), latest edition, the nameplate shall contain a PCB statement, the total volume of oil in gallons, and the DIV ID #.
- 3.2.2. Nameplate shall be 300-series stainless steel and affixed to the transformer with 300-series stainless steel or silicon bronze fasteners and readable with cables in place.
- 3.2.3. Lettering to be etched or engraved.
- 3.2.4. Two nameplates shall be provided total – one nameplate attached inside of door and one nameplate attached outside of door.

3.3. kVA Ratings

Standard kVA ratings shall be 25, 50, 75, 100, and 167.

3.4. **Primary Voltage Ratings and Basic Impulse Levels**

The primary voltage ratings and BIL are shown in Table 1. Transformers shall all be of a loop feed design.

Table 1: Standard Single-Phase Pad-Mounted Transformer Voltages

Voltage Configuration	Voltage (V)	BIL (kV)	Number of Primary Bushings
E / E1 Y	7200/12470Y	95 kV	4
E1 Grd Y / E	14400 Grd Y/8320	95 kV	2

3.5. **Secondary Voltage**

The secondary voltage ratings shall be 240/120 V and 480/240 V.

3.6. **Primary Voltage Terminals**

- 3.6.1. Transformers shall be provided with two loop-feed, externally clamped and externally removable bushing wells with removable stud and molded shields.
- 3.6.2. Bushing wells shall conform to ANSI/IEEE 386.
- 3.6.3. Provide and install bushing well inserts, Cooper LBI 215 or approved equal. Bond per manufacturer’s instructions.
- 3.6.4. The high voltage bushing shall maintain a minimum distance of 15” between the center of the lowest bushing and the bottom of the enclosure. The parking stands shall be provided close to the bushings.

3.7. **Secondary Voltage Terminals**

- 3.7.1. Transformers shall be provided with three bushings.
- 3.7.2. Low voltage bushings shall be tinned, spade type with four (4) 9/16” holes spaced on 1-3/4” centers. Two (2) line bushings shall be provided; an insulated low voltage neutral bushing shall be supplied and shall be equipped with an externally removable ground strap.

3.8. **Taps**

- 3.8.1. The high voltage section shall be equipped with a tap changer for de-energized operation only, and must be externally operable with a hot-stick and must require at least two (2) operator actions to change taps.
- 3.8.2. Taps shall be 2-2½% above and 2-2½% below rated voltage.

3.9. **Neutral and Tank Grounding**

- 3.9.1. Primary Winding: The H2 end of the primary winding shall be securely grounded internally to the tank and adequate connection shall be made between the tank and handhole cover when provided.
- 3.9.2. Ground Connections: Clamp-type tank grounding connections shall be provided in accordance with ANSI C57.12.38.
- 3.9.3. Tank ground connectors shall be provided in both the low voltage and high voltage sections for tank grounding.
- 3.9.4. All grounding provisions shall be treated with an oxide-inhibiting compound.

3.10. **Tank and Terminal Compartment**

- 3.10.1. This type transformer shall be the low profile design and shall be designed for vertical feed. The cabinet shall include a flip top hood which shall open 180 degrees and rest securely on the tank top to provide full access to transformer terminals and cable connections. The sill shall be removable to permit sliding of the transformer unit on or off the pad without disturbing the cables.
- 3.10.2. Enclosure integrity shall conform to ANSI/IEEE C57.12.28. Doors shall have provision for locking with one padlock (minimum 1/2" hole for shackle) in accordance with ANSI/IEEE C57.12.28. The enclosure hood and/or doors shall be secured by a recessed, penta head bolt and suitable for padlocking.
- 3.10.3. Manufacturer shall furnish two removable combination lifting attachments/hold down cleats, including 5/8" x 11NC, 2-1/2" long high strength bolts. Hold down cleats and transformer flange shall be designed to secure transformer with bolt holes 28 inches on center.
- 3.10.4. The tank coating shall meet all requirements in ANSI/IEEE C57.12.28 and shall be painted pad-mount green (Munsell 7GY 3.29/1.5).
- 3.10.5. The base dimensions for all kVA sizes, shall conform to Figure 1.

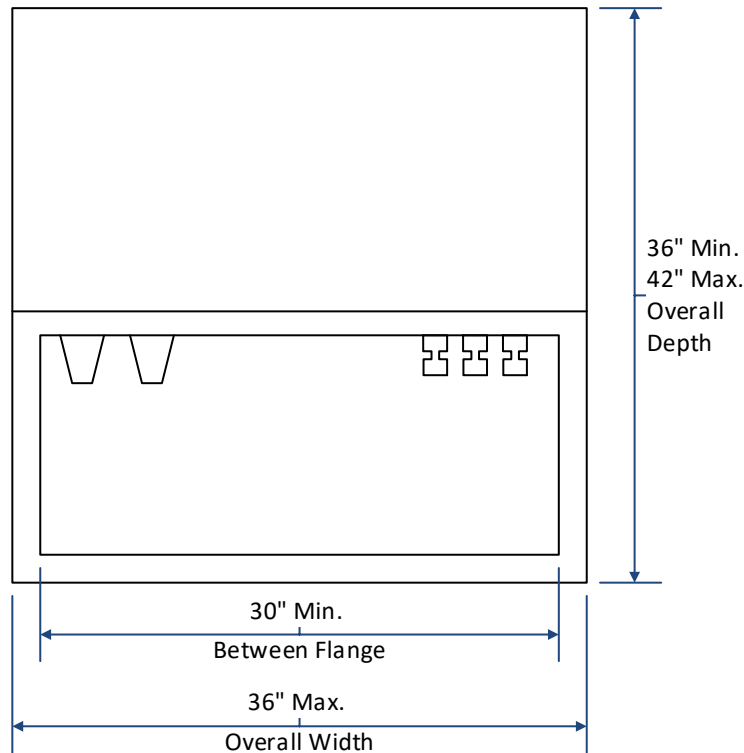


Figure 1: DOP Single-Phase Transformer Dimensions

3.11. High Voltage Fuses

3.11.1. Transformers shall be equipped with a Cooper Bay-O-Net current sensing fuse in series with a partial range current limiting fuse under oil. The current limiting fuse shall be inaccessible and electrically located on the source side of the Bay-O-Net fuse. The Bay-O-Net assembly shall be equipped with a flapper valve and drip cup to minimize oil spillage.

3.11.2. Fuse link, fuse cartridge and end plug are to be placed in a plastic bag and attached to the fuse handle.

3.11.3. The transformer manufacturer shall size the partial range current limiting fuse to coordinate with the listed Cooper current sensing Bay-O-Net fuse.

3.12. Integrated Primary Switches

3.12.1. Three (3) internal oil immersed, gang operated, two position load break switches (3 total) for loop feed operation with a continuous current rating of 200 amps shall be provided.

Single-Phase – Conventional

Revised 11/2019

Specification

- 3.12.2. The switches must be capable of switching the continuous rated current to permit sectionalizing of the primary loop. Make-and-latch and momentary ratings shall 10,000 amps symmetrical.
- 3.12.3. The switches (3) controls shall be located in the primary compartment, convenient for hot stick operation.
- 3.12.4. The switches shall provide for:
 - a) Feed right
 - b) Feed left
 - c) Feed through with coil on / Feed through with coil off
- 3.12.5. Switch positions shall be permanently marked for identification, such as welded, embossed, engraved, or stamped.
- 3.13. **Automatic Pressure Relief Valve**
 - 3.13.1. An automatic pressure relief valve shall be provided per ANSI/IEEE C57.12.20, Section 7.2.5.1 with the following clarifications:
 - 3.13.2. Indicator shall include an orange or red indicator that becomes visible only after the valve has vented.
 - 3.13.3. Cap and pull ring shall cover the valve that separates from the assembly during venting, revealing the orange or red indicator and hanging down from the valve via a chain or strap.
 - 3.13.4. Valve threads shall be sealed with a liquid pipe thread compound such as Rectorseal, liquid Teflon, or similar, not Teflon tape.
- 3.14. **Efficiency**

Transformers manufactured under this specification shall meet both of the following (where applicable):

 - 3.14.1. The efficiency requirements as directed by the Department of Energy (DOE) per its Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards, Final Rule – 72 Fed. Reg. 58,191 (2007).
 - 3.14.2. The minimum efficiency levels contained in tables 4-1 and 4-2 of National Electrical Manufacturers Association (NEMA) standard TP-1-1996.

3.15. **Required Tests**

Each transformer shall receive all standard routine tests required by ANSI/IEEE C57.12.00 and performed as specified by ANSI/IEEE C57.12.90. As a minimum, the following tests shall be performed. Test results will be provided to DOP upon request.

- a) Insulation resistance test on both primary and secondary windings.
- b) Turns ratio tests on each tap.
- c) Losses: load (corrected to 85° C) and no load (at rated voltage and corrected to 20° C).

3.16. **Approval Drawings and Documentation**

3.16.1. The awarded supplier will be required to submit preliminary drawings in one Adobe Acrobat PDF file for approval prior to the manufacturer of the transformers. The drawings will promptly be reviewed by the city and returned approved or with corrections as required.

3.16.2. All documentation shall be in English and use customary inch-pound units. The successful bidder shall submit in a single Adobe Acrobat PDF file the following:

- a) An outline drawing showing the principle view and dimensions and including a descriptive table of the accessories
- b) A nameplate drawing including wiring diagram
- c) No-load (core) losses, load (winding) losses at rated current
- d) Information on compliance with IEEE corrosion resistance standards
- e) Instructional materials demonstrating the proper installation, operation, and maintenance of the equipment
- f) Certified test data for each transformer type bid and for every category listed in ANSI/IEEE C57.12.00 Section 8.7. Format test data using numbering system shown in ANSI/IEEE C57.12.00 Section 8.7.
- g) Estimated delivery days after order

3.16.3. Final drawings, operating manuals, maintenance manuals, and certified test results shall be provided at time of delivery.

3.17. **Standard Transformers**

Division ID	Primary Voltage Configuration	Primary Voltage (V)	Secondary Voltage (V)	Size (kVA)
77445	E1 Grd Y / E	14400 Grd Y/8320	120/240	25
77446	E1 Grd Y / E	14400 Grd Y/8320	120/240	50
77447	E1 Grd Y / E	14400 Grd Y/8320	120/240	75

TRANSFORMERS – PAD-MOUNTED

Single-Phase – Conventional

Specification

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Division ID	Primary Voltage Configuration	Primary Voltage (V)	Secondary Voltage (V)	Size (kVA)
20773	E1 Grd Y / E	14400 Grd Y/8320	240/120	25
20778	E1 Grd Y / E	14400 Grd Y/8320	240/120	50
20780	E1 Grd Y / E	14400 Grd Y/8320	240/120	75
20784	E1 Grd Y / E	14400 Grd Y/8320	240/120	100
20788	E1 Grd Y / E	14400 Grd Y/8320	240/120	167
20774	E1 Grd Y / E	14400 Grd Y/8320	480/240	25
20770	E / E1 Y	7200/12470Y	240/120	25
20775	E / E1 Y	7200/12470Y	240/120	50
20782	E / E1 Y	7200/12470Y	240/120	100