

CLARK PUBLIC UTILITIES
TECHNICAL SPECIFICATIONS
SINGLE-PHASE PADMOUNTED TRANSFORMERS

Original Issue 1/84
Revised 1/91
Revised 6/02
Revised 11/05
Revised 11/09
Revised 1/12
Revised 11/12
Revised 5/14
Revised 9/15
Revised 1/19
Revised 1/19 R1
Revised 11/21
Revised 3/24

**SPECIFICATIONS
PADMOUNTED SINGLE-PHASE
DISTRIBUTION TRANSFORMERS
12470 GRD Y/7200 VOLTS**

1.0 Scope

- 1.1 This specification covers new, single-phase, low-profile, deadfront, loop-feed, padmounted transformers for use on a 12.47/7.2 kV multi-grounded wye, 60 Hz distribution system.
- 1.2 Transformers supplied under this specification shall conform to the requirements of the editions listed below, amendments, and supplements of the applicable parts of the following standards, characteristics, definitions, terminology and voltage designations except as otherwise specified herein:

IEEE C57.12.00-2021	IEEE C57.12.28-2014
IEEE C57.12.35-2013	IEEE C57.12.38-2014
IEEE C57.12.70-2020	IEEE C57.12.80-2010
IEEE C57.12.90-2021	IEEE C57.147-2018
IEEE 386-2016	ANSI Z535 (latest edition)
NEMA 260-1996	NEMA TR-1-2013

2.0 Ratings

- 2.1 All transformers shall have 12470 Grd Y/7200 volt primaries and 240/120 or 480/240 volt secondaries as specified on the description sheets.
- 2.2 kVA ratings shall be 25, 50, 75 or 100kVA as specified on the description sheets.
- 2.3 All primary windings shall be furnished with 4-2½% taps below 100%.

3.0 Connectors and Terminals

- 3.1 All units shall have high-voltage, externally-bolted, universal bushing wells with removable studs.
- 3.2 The number, location, and arrangement of the high-voltage connectors and low-voltage terminals shall be as shown in Figure 3 of IEEE C57.12.38.
- 3.3 Loadbreak bushing inserts shall be provided.

- 3.4 There shall be a clear area around all primary bushings so that Cooper/Eaton feed-through inserts can be installed when needed.
- 3.5 The low-voltage bushings shall be externally bolted and have copper-stud terminals on the phase and neutral. Stud size shall be in accordance with IEEE C57.12.38 Figure 7.

4.0 Construction Features

- 4.1 The core shall be grain-oriented silicon steel. Amorphous cores will not be accepted.
- 4.2 Transformer rating to be 3" yellow letters on black background mounted 4" above lid handle. Transformers with taps to have the rating suffixed by the letter "T".
- 4.3 All units shall have an externally operated tap changer.
- 4.4 Transformer oil shall be non-PCB containing less than 1 ppm of PCB. Transformer nameplate to be stamped as follows:

NON-PCB/LESS THAN 1 PPM PCB WHEN MANUFACTURED

Mineral oil or natural ester fluids which meet the requirements of IEEE C57.147, "IEEE Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers" are acceptable. All transformers may be retro-filled with mineral oil so they shall be designed for mineral oil even if they are supplied with a natural ester fluid.

- 4.5 The bottom and two inches up the sides shall have a coat of coal tar epoxy paint, electrostatic polyester powder coat, or equivalent approved by CPU Standards Engineer, applied to the bare metal to a dry film thickness of 5 mils minimum.
- 4.6 A removable front sill such that the transformer can be lifted, skidded, or slid into place on the mounting pad without disturbing the high- or low-voltage cables.
- 4.7 A fully insulated low-voltage neutral terminal and a ground pad on the outer surface of the tank.
- 4.8 A removable ground strap, sized for the rating of the transformer, connected between the low-voltage neutral bushing and the tank.
- 4.9 Stainless steel hinges.

- 4.10 Stainless steel pins.
- 4.11 Pentahead bolt in a recessed cup as per IEEE C57.12.28 Section 4.1.8 and Figure 1.
- 4.12 A pressure-relief valve with the characteristics as described in IEEE C57.12.38 Section 11.
- 4.13 All 25kVA, 50kVA and 75kVA padmount transformers shall meet the following dimensions:

	Minimum	Maximum
Height	24"	n/a
Width	34"	38"
Depth	n/a	38.5"

All 100kVA padmount transformers shall meet the following dimensions:

	Minimum	Maximum
Height	24"	n/a
Width	34"	38"
Depth	n/a	44"

5.0 Short Circuit Current

- 5.1 All transformers rated 25, 50 and 75 kVA shall have maximum line-to-ground and line-to-line short circuit current of 10,000 amps symmetrical at the external low-voltage bushing terminals. All 100 kVA transformers shall have a maximum 14,000-amp symmetrical short circuit current line-to-ground and line-to-line at the external low-voltage bushing terminals. These limits shall be based upon the assumption that the high-voltage bushing terminals are an infinite short circuit current source.
- 5.2 The maximum and minimum %Z for each kVA size with 240/120v low-voltage bushings shall be as follows:

kVA	Max %Z	Min %Z
25	2.0	1.04
50	3.0	2.08
75	4.0	3.13
100	4.0	2.98

For kVA sizes with 480/240v low-voltage bushings, industry standards are acceptable.

6.0 Fusing

- 6.1 All transformers shall be equipped with **only** RTE/Cooper/Eaton flapper-valve Bay-O-Nets with 4000-series fuses and shall be equipped with either RTE/Cooper/Eaton series 300 isolation links or Howard Industries isolation links. Each Bay-O-Net shall have a drip shield below it and arranged to prevent oil from dripping onto elbow terminators or cables. Fuse links shall be furnished and installed as follows:

kVA	Primary Fuse	Isolation Link
25	Cooper 4000358C05	Cooper 3001861A02 Howard 0066-002812-812
50	Cooper 4000358C08	Cooper 3001861A03 Howard 0066-002812-813
75	Cooper 4000358C10	Cooper 3001861A05 Howard 0066-002812-815
100	Cooper 4000358C10	Cooper 3001861A05 Howard 0066-002812-815

- 6.2 All units shall have provisions for storing one spare replacement fuse link in a moisture-proof container and one link of the proper size shall be included.

7.0 Maximum Losses

- 7.1 Losses shall not exceed the values shown on the following table. No-load (core) and load (copper) losses shall be independent of each other. No combining or averaging is acceptable.

1Ø Padmount Transformer
Maximum Losses

kVA	No-load (watts)*	Load (watts)*
25	80	245
50	115	495
75	174	600
100	149	1045

* No-load losses calculated at 20° C and load losses at 85° C. All loss values are based upon the maximum values from bid data for 1990 through 2005.

7.2 CPU does not specify efficiencies. It is expected that the transformer manufacturer will meet whatever the current DOE efficiencies are without exceeding the maximum losses as outlined in this section.

7.3 Transformers Purchased by Contractors

7.3.1 Certified loss data on all transformers will be required from contractors during the installation inspection for review and approval before the facility will be accepted and energized.

7.3.2 Transformers which exceed maximum losses for each kVA as outlined in the table above will be subject to loss dollar penalties on losses over the maximum. Cost of losses will be \$4,277/kW no-load (core) and \$2,007/kW load (copper) for 1Ø units.

7.4 Transformers Purchased by Clark Public Utilities

7.4.1 Clark Public Utilities will evaluate losses on all bids and quotes. However, all designs must ***not*** exceed the maximum losses in the table above. Certified loss data on all transformers will be required for each shipment of transformers. Transformers which exceed the design losses quoted will be subject to loss dollar penalties. Cost of losses will be \$4,277/kW no-load (core) and \$2,007/kW load (copper) for 1Ø units.

8.0 Nameplate and Barcoding

8.1 In addition to the IEEE standard nameplate information, the nameplate shall show

1. The maximum low voltage, line-to-ground, short circuit current. It shall be stamped "Max. LV L-G I_{sc} = xxxx" where "xxxx" is the actual maximum I_{sc},
2. total weight, and
3. gallons of oil.

8.2 Each nameplate shall have a permanent barcode as outlined in IEEE C57.12.35 Section 4.2.

9.0 Shipping Pallets

9.1 All shipping pallets shall have the following general requirements:

9.1.1 Pallets shall be designed for movement by pallet jack or forklift with a minimum of 3 rails at 5 inches of vertical clearance for forks.

9.1.2 Two-way access is acceptable. Four-way access is preferred.

9.1.3 Pallet strength and design shall be adequate to contain the load for which it is intended. Stackable pallets are acceptable as long as they protect the paint and transformers from shipping damage. Double stacking is the maximum allowed

9.1.4 Materials or equipment shall be secured to pallets with suitable bands, bolts, screws, or nails.

9.2 Returnable Shipping Pallets

9.2.1 Returnable shipping pallets shall be adequately marked to identify the owner and return location.

9.2.2 No environmentally harmful substance shall leach from or be abradable from the pallets.

9.3 Non-Returnable Shipping Pallets

9.3.1 Non-returnable shipping pallets shall be biodegradable.

9.3.2 Non-returnable shipping pallets shall be made with natural wood, dimensional lumber, and metal nails, screws, or bolts.

9.3.3 No adhesive or non-metal fastening will be permitted.

9.3.4 No paint is allowed.

9.3.5 No composite materials such as, but not limited to, plywood, particle board, flake board, or paper products are acceptable.

9.3.6 No plastics are acceptable.

9.4 It shall be the responsibility of the vendor to deliver all transformers free from mechanical or electrical damage and/or damage to the paint system.

10.0 ANSI Z535 Safety Labels

Clark Public Utilities will provide its own custom “danger” and “warning” labels which will be placed on the transformers in the Clark Public Utilities’ warehouse once they are received. The transformer manufacturer does not need to provide these labels.

BID DATA SHEET
PADMOUNT TRANSFORMER
SINGLE-PHASE

Distributor _____ Date _____
Manufacturer _____
Manufacturing Plant Location _____
Clark Stock Code Number _____ Bid Number _____

KVA _____
High Voltage (IEEE Desig.) _____ kV
Low Voltage (IEEE Desig.) _____ volts
High Voltage Taps _____ AN _____ BN
Impedance Voltage _____ %
Maximum LV Short Circuit Current _____ kA
Maximum LV Short Circuit Current is at L-L _____ or _____ L-N
Short Circuit Impedance _____ %
Approved Bay-O-Nets, Isolation Links
& Fuses _____ Yes _____ No
Total Weight _____ pounds
Dimensions
Height _____ inches
Width _____ inches
Depth _____ inches
Insulating Fluid _____ type
Insulating Fluid _____ gallons
HV Winding Metal _____
LV Winding Metal _____
Core Metal, Type _____
(Grain oriented, only)
Minimum Paint Thickness (Tank) _____ mils
No-load losses _____ watts
Load losses _____ watts
Total losses _____ watts
Efficiency Rating (Informational only) _____ %

Minimum bottom and lower side coating (corrosion resistance) describe below:

A separate Bid Data Sheet must be completed for each kVA size and voltage rating.

This form must be completely filled in and included with all bid submittals at the time bids are due. Bid submittals without the Bid Data Sheet will be deemed non-responsive and will not be evaluated for award. Only Clark's Bid Data Sheets will be acceptable.