CITY OF FARMINGTON

L:\SPECS\Distribution Equipment Devices & Materials \Specification_Single Phase Padmount Transformer_167kVA & Below_Rev 36_2025-11-25

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NAME OF MATERIAL OR DEVICE: **SINGLE-PHASE, DEAD-FRONT, LOOP-FED PADMOUNTED TRANSFORMER**

REVISION DATE: November 20, 2025 APPROVED: */s/ Roberto Ga* Engineer

DATE: July 24, 1990 APPROVED BY STANDARDS COMMITTEE

1. SCOPE:

1.1 This specification describes the electrical and mechanical characteristics of single-phase, dead-front, loop-feed, padmounted transformers for the City of Farmington.

2. ORDERING INSTRUCTIONS:

2.1 All orders shall include the following:

2.1.1 KVA rating

2.1.2 Type: Radial- or Loop-Feed

2.1.3 High- and Low-voltage ratings

3. GENERAL:

3.1 This specification is written for single-phase, 60 hertz, 65° C temperature rise, mineral-oil filled, self-cooled, padmounted, single-compartment, distribution transformers, rated 167 KVA and below, for use with separable insulated, high-voltage connectors.

3.2 All characteristics, definitions, terminology, and voltage designations, except as otherwise specified herein, shall be in accordance with applicable provisions of the latest editions of ANSI C57.l2.25-1990 or its successors and applicable ANSI C57.12.00 series specifications, C57.12.90-1980, C57.12.80-2010, C57.12.28-2005 (or the latest editions).

3.3 All distribution transformers shall comply with U.S. Department of Energy transformer efficiency standards.

Table 1 – Efficiency Standards

Single-Phase Transformer Efficiency	
KVA	Amended (%)
10	98.70
15	98.82
25	98.95
37.5	99.05
50	99.11
75	99.19
100	99.25
167	99.33

4. RATING:

4.1 Number of phase — One
Coolant — Oil
Frequency — 60 Hertz
Self-Cooled Rating — 65° C
High Voltage — 13800 GrdY/7970V
Low Voltage — 240/120V

4.2 BIL levels shall be:

4.2.1 High Voltage — 95kV
4.2.2 Low Voltage — 30kV

4.3 Short-Circuit Capability:

4.3.1 Mechanical short-circuit capability shall be demonstrated by design compliance with ANSI C57.12.90-2010 (or the latest edition).

4.3.2 Thermal capability shall be demonstrated by design compliance with ANSI C57.12.00 series (or the latest edition).

5. CONSTRUCTION:

5.1 Transformers shall be designed to protect against accidental contact or energized parts, discourage unauthorized access and protect against weather.

5.2 All 25 KVA & below transformers shall have interlaced windings.

5.3 The padmount transformer shall consist of the transformer tank, and high & low voltage cable terminating compartment. The transformer tank and compartments shall be assembled as a rain-tight, waterproof, and tamper resistant integral unit suitable for mounting on a flat surface.

5.4 There shall be no exposed screws, bolts, or other fastening or hinging devices (other than the pentahead specified in section 8) which are externally removable. There shall be no opening through which foreign objects such as sticks or wires might be inserted to contact energized parts. Suitable means for padlocking the compartment door shall be provided.

5.5 Construction of the unit shall be such that it can be lifted, skidded, and slid into place on the mounting pad without disturbing the entrance cables.

6. BOTTOM PROTECTION:

6.1 The transformer tank base shall be raised above the pad to protect the bottom finish during installation and to minimize corrosion due to moisture accumulation. The base shall be cross-braced to permit rolling in two directions.

6.2 All external surfaces of ferrous material used in the construction of the assembly shall have a paint system that meet all criteria in accordance set forth with IEEE C57.12.28 for Enclosure Integrity, applied to the bottoms of the components and extending up the side to a point one-inch (l") above the bottom of their bases.

7. PROTECTIVE COATING:

7.1 All coated surfaces, both exterior and interior, shall be painted using a system which conforms to the requirements of ANSI C57.12.28-2005 (or the latest edition).

7.2 The finish shall be weather-resistant, green color Munsell No. 7.0 GY 3.29/1.5.

7.3 All external surfaces shall be constructed of steel, 13 USS gauge or thicker.

7.4 The transformer and compartment hoods shall be crowned to insure water run-off.

8. HIGH- AND LOW-VOLTAGE COMPARTMENT:

8.1 General design shall conform to Figure 1 of ANSI C57.l2.25-l990 (or the latest edition). Opening the access hood shall permit access to both the high- and low-voltage terminations.

8.2 The edges of the access hood shall be formed to provide a close fitting mating surface, with internal insertion-prevention lip that will be shaped to resist entry or prying by screwdrivers, wrecking bars, tire irons, single-socket lug wrenches, or other readily accessible tools.

8.3 Hinges and hinge-pins shall be passivated ANSI Type 304 stainless steel or equivalent corrosion-resistant metal. Hinges shall be so designed as to prevent removal of pin.

8.4 The padlocking provision shall be so designed and located as to resist prying or breaking off by screwdrivers, wrecking bars, tire irons, single-socket lug wrenches, or other readily accessible tools and to inhibit removal of the pad-lock with a bolt cutting device or hacksaw.

8.5 In addition to the regular locking provisions above, the access hood shall be secured by a captive, recessed pentahead bolt as depicted in ANSI C57.12.25-1981 (or the latest edition). Bolts and associated hardware must be rust and corrosion resistant and the design shall minimize the possibility of misalignment and cross-threading. The design must be such that wire entry through the bolt hole into the compartment is prohibited when the bolt is removed. The non-rotating cap shall be permanently attached.

8.5.1 The captive pentahead bolt shall be coordinated with the padlock to prevent insertion of the padlock into the hasp until the bolt is completely threaded.

8.5.2 The pentahead assembly shall be designed to withstand, without damage, the access hood dropping from a 90^{o} open position.

8.6 The hood shall open in such a way that exposed working space is obtained on the sides and front of the compartment.

8.7 The bottom edge of the transformer shall provide for flush mounting on a flat, rigid surface to prevent wire entry into the compartment.

9. CERTIFICATION:

9.1 The design must meet the requirements of ANSI C57.12.28-2005 (or the latest edition).

10. BUSHINGS AND TERMINALS:

10.1 Number, location, and arrangement of bushings and terminals shall comply with Figure 1 of ANSI C57.12.25-1990 (or the latest edition).

10.2 Two (2) high-voltage, bolted-type bushing inserts and wells shall be supplied. Bushings and wells shall conform to ANSI/IEE Std. 386-1977 (or latest edition), Figure l.

10.3 The low-voltage portion of the compartment shall contain three (3) stud-mounted transformer connectors, Aluminum Alloy, supplied with radial-tipped set screws. Six (6) ports, slip on, insulated stud-mounted transformer connectors shall be required for all phases and six (6) ports, slip on, non-insulated stud-mounted connector for neutral. Dual-rated connectors for Aluminum or Copper conductors, and fully tested to ANSI C119.4 for class "A" connectors. Connectors to accommodate #6 up to 350MCM wire range.

10.3.1.1 Approved stud-mounted transformer connectors:

10.3.1.2 5/8" Transformer Secondary Bushing, CMC Connectors
Catalog No. RLSS350 – 6I (Insulated)
Catalog No. NSSM350 – 6I (Non-insulated)

10.3.1.3 1" Transformer Secondary Bushing, CMC Connectors
Catalog No. RLSS500-6I (Insulated)
Catalog No. NSSM500-6I (Non-insulated)

10.4 The terminal marked "X2" shall be neutral and shall have a removable copper ground strap bussed to the transformer tank. The connection between the strap and the X2 stud-mounted connector shall be done in a manner that there will still remain five (5) unused ports as described in 10.3.

10.5 The "HO" transformer lead shall be internally connected to the transformer tank ground pad, and there shall be no internal connection between "HO" and "X2".

10.6 Transformer design shall allow external replacement of the high-voltage bushing wells and low-voltage bushings with common hand tools and oil handling equipment. Wire leads shall have sufficient length and flexibility as to accomplish the replacement. Bushing well or low-voltage insulators that are permanently fastened to the tank with cement, welds, or epoxy preventing their replacement are totally unacceptable.

11. OVERCURRENT PROTECTION:

11.1 Transformers shall be furnished with an expulsion fuse assembly.

11.2 Expulsion fuse element shall be a Kearney dual-element-weak-link (DEWL) or manufacturer's equivalent standard use dual element in accordance with Table 2 below:

TABLE 2

KVA	KEARNEY OR EQUIVALENT BAY-O-NET DEWL CATALOG NO.
10	124080-5
15	124080-5
25	124080-5
37.5	124080-8
50	124080-12
75	124080-15
100	124080-25
167	124080-30

11.3 A drip plate shall be positioned to prevent oil from contacting any high-voltage connector or cable. The fuse and canister assembly shall be located in the upper left quadrant of the high-voltage portion of the compartment.

11.4 A backup current-limiting fuse, liquid immersed, properly sized, and connected in series with each Bay-O-Net, shall be provided to isolate a faulted transformer winding.

11.5 The fuse shall be located as to minimize the amount of unprotected equipment consistent with good design practice.

11.6 The fuse catalog number from Table 2 shall be stenciled in yellow on the hood to be readable when the hood is fully open. Example: "Fuse (Cat. No.)".

12. ACCESSORIES:

12.1 A cable accessory parking stand shall be provided between "HIA" and "HIB" and shall comply with Figure 1 of ANSI C57.12.25-1990 (or the latest edition).

12.2 Pressure relief device. The following are approved:

Qualitrol	202-03l-0l
Qualitrol	202-030-0l
Tomco/Beta	1712K-3

12.3 Upper filter plug and lower drain plug.

12.4 A ground pad shall be located in both the high- and low-voltage portion, near the tank base plane.

12.5 Two-hold down straps for attaching the transformer to a fiberglass or any non-concrete pad.

13. LIQUID LEVEL:

13.1 A suitable marking that indicates the correct level at 25°C temperature.

14. TERMINAL MARKINGS:

14.1 Terminal markings shall comply with ANSI C57.12.25-1990 (or the latest edition) and shall be stenciled on the tank in yellow.

15. NAMEPLATE:

15.1 An easily readable nameplate that conforms to ANSI C57.12.00 series (or the latest edition) shall be furnished with each transformer. It shall be so located that it will be readable with all cables installed and in place. The nameplate shall be mounted on a stationary surface.

15.2 Nameplate shall indicate that the transformer oil contained less than l ppm PCB at time of manufacture.

16. TANKS AND PRESERVATION:

16.1 Transformers shall be of a sealed tank construction, so designed that the interior is sealed from the atmosphere, and the gas plus oil volume remains constant. The transformer shall remain effectively sealed for all temperatures to plus 105° top oil.

16.2 The tank shall be of sufficient strength as to withstand a pressure of 7 psi gauge, without permanent distortion.

17. UNDER OIL LIGHTNING ARRESTERS:

17.1 10kV under oil zinc oxide lightning arresters shall be furnished for application on a 13.8/7.97kV, 4-wire, multi-ground distribution system. The arrester shall be GE Tranquell IA1, or approved equal, with protective characteristics equal to or better than GE Cat. #9L25A-10kV. Rated minimum MCOV 8.4kV; at 7000 foot elevation.

17.2 Protective characteristics shall be provided with each order.

17.3 Transformer nameplate shall indicate "10kV under oil arrester" and LA shall be stenciled on the upper left outside of the cabinet door.

17.4 Manufacture and testing of lightning arrester shall comply with the latest revisions of ANSI/IEEE Standards C62.11-2012.

18. DATA TO BE SUBMITTED WITH PROPOSAL:

18.1 Two (2) copies of outline drawings including overall height, overall width, overall depth, base dimensions, clearances required for opening doors, arrangement of bushings and other appurtenances, and compartment dimensions.

18.2 Weights of tank, oil, transformer total, and shipping weight.

18.3 Performance data.

18.4 All information and drawings shall be legible and assembled in a coherent format.

18.5 Exciting current at 100% of rated voltage.

18.6 Average excitation loss in accordance with ANSI C57.12.00 series (or the latest edition).

18.7 Average load-loss derived from ANSI C57.l2.00 series (or the latest edition.

18.8 Percent impedance volts, of the low-voltage winding with respect to the high-voltage winding at rated self cooled KVA.

18.9 Nameplate shall be stamped that transformer oil contained less than l ppm PCB at time of manufacture.

19. PRODUCTION TESTS:

19.1 The manufacturer shall perform all routine tests as defined in ANSI C57.12.00 series (or the latest edition).

19.2 The manufacturer shall provide the following certified data by transformer serial number for each transformer shipped. Data shall be supplied for each production run.

19.2.1 Excitation loss, watts

19.2.2 Impedance, % IZ

19.2.3 Total loss, watts

20. SHIPPING:

20.1 The manufacturer shall provide adequate and necessary skids, crating, and packing for transformer to eliminate damage from reasonable handling while in transit to the City of Farmington's point of delivery. Units shall at no time be double stacked.

21. EXCEPTIONS AND CHARGES:

21.1 The manufacturer must state specifically, in writing with the bid, any exceptions made to the specification.

21.2 The supplier may not alter or change the design of the transformer submitted to the Farmington Electric Utility System under this specification.

22. APPROVED TRANSFORMER MANUFACTURERS:

22.1 All transformers bid must be supplied by manufacturers as approved by the Farmington Electric Utility Standards Committee (FEUSC).

22.1.1 Manufacturers must be approved by three (3) of five (5) major Southwest Utilities contacted by the FEUSC. Utilities are contacted upon request for input to update our approved Manufacturers' list. Sample transformers (one or two) must be provided, if requested, for a tear down as part of the approval process by the Standards Committee. Manufacturers may contact FEUSC Electrical Engineer at (505)599-8314 for details.

22.2 Following is a list of manufacturers approved by the FEUS Committee for supplying single-phase, padmounted transformers:

ABB Power T & D Co., Inc.
Kuhlman Electric Company
Eaton Cooper Power
Central Moloney Transformer Division
Howard Industries
ERMCO

22.3 All other manufacturers should contact the City of Farmington's Electrical Engineering Department at (505) 599-8314 for requirements that must be met before being included on approval list.

23. INVENTORY ITEM:

23.1 This specification is applicable to the following City of Farmington stock numbers:

285 084 7210 TRANSFORMER, PADMOUNT, 10KVA 1PH, LOOP, 13800/7970-240/120
285 084 7225 TRANSFORMER, PADMOUNT, 25KVA 1PH, LOOP, 13800/7970-240/120
285 084 7237 TRANSFORMER, PADMOUNT, 37.5KVA 1PH, LOOP, 13800/7970-240/120
285 084 7250 TRANSFORMER, PADMOUNT, 50KVA 1PH, LOOP, 13800/7970-240/120
285 084 7275 TRANSFORMER, PADMOUNT, 75KVA 1PH, LOOP, 13800/7970-240/120
285 084 7300 TRANSFORMER, PADMOUNT, 100KVA 1PH, LOOP, 13800/7970-240/120
285 084 7367 TRANSFORMER, PADMOUNT, 167KVA 1PH, LOOP, 13800/7970-240/120

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