

CITY OF FARMINGTON ELECTRIC UTILITY

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Specification_Pole Mounted Conv Transformer_100kVA
& Below_Rev 48_2025-11-20

SPECIFICATION

REVISION NO: 48

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NAME OF MATERIAL OR DEVICE:

Single-Phase Conventional Pole Mounted Transformers
100kVA and Below

REVISION DATE: November 20, 2025

APPROVED: /s/ Roberto Ga
Engineer

DATE: June 17, 1993

APPROVED BY STANDARDS COMMITTEE

1. SCOPE:

- 1.1 This specification describes the electrical and mechanical characteristics of single-phase, conventional pole-mounted transformers for the City of Farmington.

2. ORDERING INSTRUCTIONS:

All orders shall include the following information:

- 2.1.1 KVA rating
- 2.1.2 Type: Conventional
- 2.1.3 High- and Low-voltage ratings
- 2.1.4 Impedance

3. GENERAL:

- 3.1 This specification is written for single-phase, 60 hertz, 65° C temperature rise, mineral-oil filled, conventional overhead, pole-mounted, distribution transformers, rated 100 KVA and below.
- 3.2 All characteristics, tests, definitions, terminology, and voltage designations, except as otherwise specified herein, shall be in accordance with applicable provisions of the latest edition of ANSI C57.12.20.2023 and applicable ANSI C57 Series specifications or latest editions.
- 3.3 All distribution transformers shall comply with 2016 U.S. Department of Energy transformer efficiency standards.
- 3.4 All conventional overhead, pole-mounted, distribution transformers, rated 100 KVA and below shall be manufactured and/or at least major components are assembled in the United States.

TABLE I – 2016 DOE Efficiency Standards for Liquid-Immersed Distribution Transformers.

Single-Phase Transformer Efficiency		Three-Phase Transformer Efficiency	
KVA	Amended (%)	KVA	Amended (%)
		15	98.65
10	98.70	30	98.83
15	98.82	45	98.92
25	98.95	75	99.03
37.5	99.05	112.5	99.11
50	99.11	150	99.16
75	99.19	225	99.23
100	99.25	300	99.27
167	99.33	500	99.35

4. ELECTRICAL CHARACTERISTICS:

4.1 KVA High- and Low-Voltage Ratings

Self-cooled 65° C KVA ratings, and voltage ratings and taps shall be in accordance with TABLE II below:

TABLE II - RATINGS AND TAPS

<u>PRIMARY-VOLTAGE</u>	<u>HIGH-VOLTAGE TAPS</u>		<u>KV</u>	<u>SECONDARY-VOLTAGE</u>	
<u>RATING</u>	<u>ABOVE</u>	<u>BELOW</u>	<u>BIL</u>	<u>RATING</u>	<u>KVA SIZES</u>
<u>CONVENTIONAL</u>					
7970/13800Y	Two 2-1/2%	Two 2-1/2%	95	120/240	10,15,25,37.5,50,75,100
7970/13800Y	Two 2-1/2%	Two 2-1/2%	95	240/480	10,15,25,37.5,50,75,100
7970/13800Y	Two 2-1/2%	Two 2-1/2%	95	277	10,15,25,37.5,50,75,100

4.2 Short-Circuit Capability:

4.2.1 Mechanical short-circuit capability shall be demonstrated by design compliance with ANSI C57.12.90-2021 (or the latest edition).

4.2.2 Thermal capability shall be demonstrated by design compliance with ANSI C57.12.00-2021 (or latest edition).

4.3 Windings:

All 75 kVA & below transformers shall have interlaced windings.

5. BUSHINGS AND TERMINALS:

5.1 Electrical Characteristics:

Electrical characteristics of high- and low-voltage bushings shall be in accordance with Section 6 of ANSI C57.12.20-2023 (or the latest edition).

5.2 High-Voltage Bushings:

Location and arrangement of the two high-voltage bushings for conventional units shall be in accordance with the designated Figure and Table from ANSI C57.12.20-2023 (or the latest edition). A wildlife guard shall be provided for all bushings. A Salisbury #21183 bushing cover kit or equivalent with Stinger cover bird guard shall be furnished with each transformer.

5.3 Low-Voltage Bushings:

5.3.1 Low-voltage bushings shall be sidewall type, singly mounted.

5.3.2 Number and location shall conform to the designated Figure and Table from ANSI C57.12.20-2023 (or the latest edition).

5.4 High-Voltage Terminals:

High-voltage terminals shall be universal solderless type connections accommodating No. 8 AWG solid to No. 2 AWG stranded in accordance with ANSI C57.12.20-2023 (or the latest edition).

5.5 Low-Voltage Terminals:

5.5.1 Low-voltage terminal sizes shall comply with ANSI C57.12.20-2023 (or the latest edition). Terminals shall be arranged for vertical takeoff.

5.5.2 Polarity and connection of terminals shall comply with ANSI C57.12.20-2023 (or the latest edition).

5.5.3 On all transformers with a low-voltage rating of 120/240 and 240/480, the X2 terminal shall be bussed to the tank by a removable copper strap. There shall be no internal neutral to tank connection on the low-voltage winding. The copper strap shall be capable of withstanding a fault of the magnitude and duration defined in ANSI C57.12.00-2021 (or the latest edition).

TABLE III - Terminals and Bushings

CONVENTIONAL

PRIMARY VOLTAGE RATING	PRIMARY AND SECONDARY BUSHING FIGURE	SECONDARY VOLTAGE RATING	TERMINAL CONNECTIONS FIGURE S19(a)
7970/13800Y	9	120/240	Upper
7970/13800Y	9	240/480	Upper
7970/13800Y	9	277	Lower

6. PROTECTIVE DEVICES:

- 6.1 Lightning arresters shall be direct connectible with a "ground-lead isolator" that will visibly disconnect a short-circuited arrester from ground potential. Tangent connectors shall be provided for 600 volt insulated jumper between the high-voltage bushing and the lightning arrester. Incoming line is to be terminated at the arrester. A wildlife guard must be provided for all arresters. The lightning arrester bracket to transformer bracket, single mounting bolt must be of insulating material or coated with insulating material.
- 6.2 Lightning arresters shall be distribution class, heavy duty, 10kV, 8.4 MOV (metal oxide varistor or silicon carbide). Approved manufacturers are shown below.
 - 6.2.1 Joslyn (MacLean)
 - 6.2.2 Ohio Brass
 - 6.2.3 Eaton Cooper Power

7. ACCESSORY EQUIPMENT:

7.1 Tank Grounding:

Each unit shall have a tank grounding provision that will accommodate No. 8 AWG to No. 2 AWG conductor.

7.2 Pressure Relief Device:

Each unit shall have an automatic pressure relief valve in accordance with ANSI C57.12.20-2023 (or the latest edition) properly torqued into the tank. The following are approved:

Qualitrol	202 Series
Tomco/Beta	1712K-3

The Qualitrol 202-031-01 is preferred. ABB Power self-venting cover is an acceptable alternative.

7.3 Nameplate:

- 7.3.1 Each unit shall include a fully legible nameplate that is permanently attached to the tank or mounting bracket. The nameplate shall be readable and visible when the transformer is pole mounted and all cables and wires are fully installed. The nameplate shall conform to ANSI C57.12.00-2021 (or the latest edition), Section 5.12, nameplate A.
- 7.3.2 Nameplate shall indicate that the transformer oil contains less than one (1) ppm PCB at time of manufacture.
- 7.3.3 Nameplate shall have total weight, gallon, size, all voltage information, polarity and other relevant information normally expected per ANSI Standard C57.12.00.

7.4 Brackets:

Pole mounted brackets shall be:

5, 10, 15, 25, 37.5, 50 kVA sizes - ANSI Type A
75, 100 kVA sizes - ANSI Type B

7.5 Arrester mounting nuts welded to tank (single and double bushing designs).

8. OIL PRESERVATION:

All transformers furnished under this specification shall be of a sealed-tank construction in which the gas plus oil volume remains constant. The transformer will remain effectively sealed for all temperatures to plus 105°C top oil.

9. TANK AND COVER:

- 9.1 The tank shall be of sufficient strength to withstand a pressure of 7 psi gauge, without permanent distortion.
- 9.2 Conventional transformers, tank and cover assemblies shall be capable of safely passing a test where an 8000 amp, one (1) inch arc is cleared by a cutout at rated primary voltage.
- 9.3 All exterior surfaces shall be painted using a system of coordinated and thoroughly tested materials and application techniques that will insure long life in outdoor exposure.
- 9.4 The finish shall be weather-resistant, "sky gray" ANSI No.70, having an arbitrarily measured minimum thickness of 3 mils.

10. PRODUCTION TESTS:

- 10.1 The manufacturer shall perform all routine tests as defined in ANSI C57.12.00-2021 (or the latest edition).
- 10.2 The manufacturer shall provide the following certified data by transformer serial number for each transformer shipped. Data shall be supplied for each production run.
 - 10.2.1 Excitation loss, watts
 - 10.2.2 Impedance, % IZ
 - 10.2.3 Total loss, watts
- 10.3 No individual transformer shall be shipped with losses that exceed quoted losses by more than the tolerances in ANSI C57.12.00-2021 (or the latest edition), Table 16, Line 2, without written approval of the City of Farmington's Electrical Engineering Department.

11. DATA TO BE SUBMITTED WITH PROPOSAL:

- 11.1 Two (2) copies of outline drawings, including overall height, overall circumference, and diameter (including support brackets and radiator fins), clearances, and separation dimensions for high- and low-voltage bushings, and all appurtenances.
- 11.2 Weights of tank, oil, transformer total and shipping weight.
- 11.3 Test and Performance Data:
 - 11.3.1 Exciting current at 100% rated voltage.
 - 11.3.2 Average excitation loss in accordance with ANSI C57.12.90-2021 (or the latest edition), Section 9, Paragraph 9.3 and Table 16, Line 3.
 - 11.3.3 Average load-loss in secondary breaker for CSP units only.
 - 11.3.4 Average load-loss in accordance with ANSI C57.12.00-2021 (or the latest edition), Paragraph 9.3 and Table 16, Line 3.
 - 11.3.5 Percent impedance volts, of the low-voltage winding with respect to the high-voltage winding at rated self-cooled kVA.
 - 11.3.6 Accuracy of production test loss measurements (+%) in accordance with National Bureau of Standards TN 1204.
- 11.4 Manufacturer shall supply transformers with oil that contains less than 1 ppm PCB.
- 11.5 Amorphous core shall not be used in transformers over 25kVA.

12. SHIPPING:

The manufacturer shall provide adequate and necessary skids, crating, and packing for transformer to eliminate damage from reasonable handling while in transit to point of delivery. Shipment shall be by open, side-loaded, flatbed truck.

13. EXCEPTIONS AND CHANGES:

- 13.1 The manufacturer must state specifically, in writing with the bid, any exceptions made to the specification.
- 13.2 The supplier may not alter or change the design of the transformer submitted to the Farmington Electric Utility System under this specification.

14. APPROVED TRANSFORMER MANUFACTURERS:

14.1 All transformers bid must be supplied by manufacturers as approved by the Farmington Electric Utility Standards Committee (FEUSC). Manufacturers must be approved by three (3) of five (5) major Southwest Utilities and by the FEUSC. Utilities are contacted upon request for input to update our approved Manufacturers' list. Sample transformers (one or two), if requested, must be provided for a tear down as part of the approval process by the Standards Committee. Manufacturers may contact FEUSC Electrical Engineer at (505) 599-8321 for details.

14.2 The list of approved manufacturers for pole mounted transformers is as follows:

- 14.2.1 Power Partners
- 14.2.2 Kuhlman Electric Company
- 14.2.3 Eaton Cooper Power
- 14.2.4 Central Moloney Transformer Division
- 14.2.5 Howard Industries
- 14.2.6 ERMCO
- 14.2.7 General Electric Co.
- 14.2.8 ABB

15. INVENTORY ITEM:

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

285 084 2005	TRANSFORMER, CONV, 5KVA 7970/13800V-120/240V
285 084 2010	TRANSFORMER, CONV, 10KVA 7970/13800V-120/240V
285 084 2015	TRANSFORMER, CONV, 15KVA 7970/13800V-120/240V
285 084 2025	TRANSFORMER, CONV, 25KVA 7970/13800V-120/240V
285 084 2037	TRANSFORMER, CONV, 37.5 KVA 7970/13800V-120/240V
285 084 2050	TRANSFORMER, CONV, 50KVA 7970/13800V-120/240V
285 084 2075	TRANSFORMER, CONV, 75KVA 7970/13800V-120/240V
285 084 2100	TRANSFORMER, CONV, 100KVA 7970/13800V-120/240V
285 084 2210	TRANSFORMER, CONV, 10KVA 7970/13800V-240/480V
285 084 2215	TRANSFORMER, CONV, 15KVA 7970/13800V-240/480V
285 084 2225	TRANSFORMER, CONV, 25KVA 7970/13800V-240/480V
285 084 2237	TRANSFORMER, CONV, 37.5 KVA 7970/13800V-240/480V
285 084 2250	TRANSFORMER, CONV, 50KVA 7970/13800V-240/480V
285 084 2275	TRANSFORMER, CONV, 75KVA 7970/13800V-240/480V
285 084 2310	TRANSFORMER, CONV, 10KVA 7970/13800V-277V
285 084 2315	TRANSFORMER, CONV, 15KVA 7970/13800V-277V
285 084 2325	TRANSFORMER, CONV, 25KVA 7970/13800V-277V
285 084 2337	TRANSFORMER, CONV, 37.5 KVA 7970/13800V-277V
285 084 2350	TRANSFORMER, CONV, 50KVA 7970/13800V-277V
285 084 2375	TRANSFORMER, CONV, 75KVA 7970/13800V-277V

Requirements:

1. All manufacturers shall submit quoted transformer weight and dimensions of all transformers listed on the bid.
2. FEUS will only accept quotes that are $\pm 20\%$ or less of FEUS approximate weight and $\pm 25\%$ of FEUS approximate dimensions. See table below.
3. All quotes have to be in percentage based upon FEUS approximate values.
4. For dimensions, refer to Drawing T-CONV.

Weight & Dimensions for Conventional Transformers (7,970/13800V - 120/240V) (FEUS Approximate & Vendors/Manufacturers Quoted Values)					
TABLE IV					
Size		Weight		Dimensions (inches)	
(KVA)	(lbs)	A	B	C	D
5	221	22	28	14	18
Quoted (%)					
10	280	23	30	15	20
Quoted (%)					
15	345	26	30	18	22
Quoted (%)					
25	412	25	32	17	22
Quoted (%)					
37.5	532	27	34	18	23
Quoted (%)					
50	707	30	35	22	26
Quoted (%)					
75	932	31	45	22	26

Weight & Dimensions for Conventional Transformers (7,970/13800V - 240/480V)
(FEUS Approximate & Vendors/Manufacturers Quoted Values)

TABLE V

Transformer		Weight		Dimensions (inches)	
(KVA)	(lbs)	A	B	C	D
10	304	25	29	17	21
Quoted (%)					
15	374	26	30	18	22
Quoted (%)					
25	452	27	32	18	23
Quoted (%)					
37.5	524	27	35	18	23
Quoted (%)					
50	717	30	35	22	26

Weight & Dimensions for Conventional Transformers (7,970/13800V - 277/480V)
(FEUS Approximate & Vendors/Manufacturers Quoted Values)

TABLE VI

Size		Weight		Dimensions (inches)	
(KVA)	(lbs)	A	B	C	D
10	281	23	29	16	20
Quoted (%)					
15	367	26	30	18	22
Quoted (%)					
25	441	26	32	18	22
Quoted (%)					
37.5	525	27	34	18	23
Quoted (%)					
50	656	28	35	20	25
Quoted (%)					
75	982	33	45	23	27

----- End of Specification -----