

CITY OF AUSTIN ELECTRIC UTILITY DEPARTMENT

PURCHASE SPECIFICATION

FOR

TRANSFORMER, NETWORK, URD, 3PH, 2000KVA, 34.5K-2400Y-1386VOLT

DATE	PREPARED BY	ISSUANCE/REVISION	APPROVAL PROCESS SUPV. / MATERIALS SUPV.
08/29/ 95	George Martinez	Issuance	Jerrel Wallace / Peter G. Soosay
10/26/15	Brantley Gosey	Revision	
11/6/15	Dennis Patrick	Revision	Michael Pittman

REASON FOR REVISION	AFFECTED PARAGRAPHS
10/26/15: Add DOE Requirements	Section 6.3
11/6/15: Added Secondary Voltage Signage	Section 10.0

This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein.
Retain for future reference.

**CITY OF AUSTIN ELECTRIC UTILITY DEPARTMENT
PURCHASE SPECIFICATION
FOR
TRANSFORMER, NETWORK, 2000 KVA, THREE-PHASE
34.5K/2400Y/1386 VOLT**

1.0 SCOPE AND CLASSIFICATION

1.1 Scope

- 1.1.1 This specification covers three-phase oil filled network type transformers.
- 1.1.2 No deviations from this specification will be permitted.
- 1.1.3 Only manufacturer's products approved by the City of Austin, Texas, Electric Utility Department Materials and Standards Committee will be considered for use in the City of Austin Electric System.

1.2 Classification

- 1.2.1 Voltage shall be 34,500 Volts delta, 2400Y/1386 Volts.
- 1.2.2 Transformer rating will be 2000 kVA.
- 1.2.3 Taps shall be 5% below, 2 1/2% below, rated 2 1/2% above, and 5% above.
- 1.2.4 Basic Insulation Level (BIL) shall be 200 kV for windings, 150 kV for bushings, and 45 kV for low voltage.

2.0 APPLICABLE STANDARDS

- 2.1 Unless otherwise stated in these specifications, network transformers furnished under these specifications shall meet all applicable EEI-NEMA, ANSI, and IEEE Standards, latest revision. All insulating oil shall be in accordance with all applicable ASTM standards.

3.0 FUNCTIONAL REQUIREMENTS

- 3.1 Transformers shall be self-cooled, 65 degrees (°) Centigrade (C) temperature rise above ambient, vault type construction.
- 3.2 Marking of terminals, winding connections, and vector relationships of windings shall be as shown on the attached drawing (Attachment I).
- 3.3 The transformer shall be equipped with a glass or magnetic type liquid level indicator on all transformer compartments. The indicator shall be marked to show high, low, and 25° C. Electric alarm contacts shall be provided.
- 3.4 The transformer shall be equipped with a dial type thermometer for indicating liquid temperature. The thermometer shall have a black indicating hand and a red maximum indicating hand. Electric alarm contacts shall be provided.
- 3.5 A sudden pressure relay shall be mounted on the main tank to respond to sudden increases in internal gas pressure. A seal-in relay with contacts for alarm and tripping and a reset switch shall be externally mounted. Normal operating voltage of the seal-in relay shall be 125 VAC. Adequate surge suppression to prevent false operations due to transient voltages on control leads shall be provided. The sudden pressure relay shall be designed such that external vibration or mechanical shocks shall not cause false operations. All mechanical provisions and equipment for testing shall be provided. In addition, the seal-in relay and wiring shall be rated for in-circuit testing with remote lockout relay. Printed circuit board design is not acceptable.

- 3.6 The transformer shall have three (3) current transformers (CT's) located internally on the high voltage side between the transformer windings and the three-pole disconnect switch. The CT's shall have a 100:5 ratio and a relay accuracy of C50. The CT's shall be wired to an external terminal block, in a waterproof enclosure. The enclosure shall be fitted with a one inch (1") plug for external connections. The CT's shall be mechanically rated to the momentary rating of the transformer and shall be fully insulated to the rating of the transformer. The CT's shall be accessible from a hand hole for ease in replacement.
- 3.7 A three-pole, three position switch for disconnecting and grounding the high voltage feeder shall be provided on the transformer. The switch shall remain in alignment under normal installation and operating conditions. The switch shall have a continuous rating of 200 amperes at 60 cycles. The switch shall be provided with three operating positions: "OPEN," "CLOSED" and "GROUND," and shall be marked as such. In the closed position, the switch shall be capable of withstanding the full short circuit duty of the transformer. In the ground position, the switch shall be capable of withstanding 15,000 amperes short circuit current. An electrical interlock shall prevent movement of the switch from any position when the transformer is energized. The sequence of operation shall be open, closed and ground, and the switch shall be designed so that when it is moved from open to ground, or ground to open, the operator must pause in the closed position to give the electrical interlock time to engage if the transformer is energized. The operating handle shall be equipped for padlocking the switch in each direction.
- 3.8 Alarm contacts shall be suitable for interrupting:
- 0.02 ampere direct-current inductive load
 - 0.02 ampere direct-current noninductive load
 - 2.5 ampere alternating-current noninductive or inductive load
 - 250 volts maximum in all cases

4.0 PHYSICAL

- 4.1 The transformer shall have 600 ampere side-mounted apparatus bushings on the high and low voltage side. The bushings shall be bolted to the tank for ease in replacement. Welded bushings will not be accepted. Bushings provided shall be Elastimold 775SI (copper) or equivalent.
- 4.2 The high voltage compartment shall be completely sealed and filled with insulating oil prior to shipping.
- 4.3 The tap changer shall be designed for de-energized operation. An indicator shall clearly show the position of the tap changer.
- 4.4 The transformer tank shall be of a sealed construction, consisting of a welded main cover equipped with lifting lugs and gasketed hand hole cover(s).
- 4.5 Jack pads or bars shall be provided so that there is three inches (3") of clearance under the transformer for lifting jacks.
- 4.6 The transformer shall not exceed five and one-half (5- 1/2") feet in overall width, twelve (12) feet in overall length, and eight (8) feet in height.

5.0 INSULATING OIL REQUIREMENTS

- 5.1 The insulating oil shall be non-PCB (polychlorinated biphenyl), defined as containing less than one part per million (ppm) PCB. Certification of the non-PCB oil shall be furnished and shall include the method of testing used.
- 5.2 The transformer nameplate shall be marked "NON-PCB (Manufacturer certified less than 1 PPM)". In addition, a blue "NON-PCB (Manufacturer certified less than 1 PPM)" label of a minimum 1" X 2" size shall be installed directly below the nameplate. (See Attachment II)

5.3 Insulating oil furnished under these specifications shall meet or exceed the following:

Dielectric Strength	Minimum 40 kV
Flash Point	Minimum 145°C
Pour Point	Below -40°C
Saybolt Viscosity at 37.8°C	Maximum 62 Sec.
Viscosity at 0°C	Maximum 320 Sec.
Specific Gravity 15.5/15.5°C	0.865 to 0.905
ASTM D974 - D664 Total Acid	Maximum 0.02
ASTM D1500 Color	Maximum 0.5
Power Factor 60 cyc 100°C	Maximum 0.30%
Moisture Content	Maximum 25 PPM
Free Sulfate Ion	Maximum None
Free Chloride Ion	Maximum 0.10 PPM
Interfacial Tension 25°C	Minimum 40
Total Combined Sulfur	Maximum 0.15
Corrosive Sulfur Compounds	Maximum None
Visual Condition	Clear
DBPC Inhibitor Content	Minimum 0.15% by weight

5.4 All suppliers shall be subject, on request, to furnish laboratory test data as desired on any insulating oil purchased. All oil furnished under these specifications shall be subject to tests and any insulating oil failing these tests will be returned to the supplier at the supplier's expense.

6.0 GENERAL REQUIREMENTS

- 6.1 The Supplier shall provide the City of Austin with two (2) sets of drawings for "approval" prior to beginning manufacture of transformers.
- 6.2 With each transformer delivered, the supplier shall furnish, bound in a light weight folder suitable for filing and reference, three (3) copies of the following:
 1. Complete nameplate data
 2. Outline drawings of complete transformer
 3. High and low voltage drawings
 4. Certified transformer test report
 - a. City of Austin purchase order number
 - b. Excitation losses, corrected to 20 0c
 - c. Winding losses, corrected to 650 c
 - d. Total losses
 - e. Percent Impedance, corrected to 650 c
 - f. Excitation current
 5. Complete set of instructions for installation, maintenance, and operation of transformer.

6.2 The information in sections 6.1 and 6.2, and any other correspondence shall be sent to the following address:

City of Austin Electric Utility Department
 4411-B Meinardus Drive
 Austin, Texas 78744

ATTN: George M. Martinez

6.3 All transformers supplied to AE shall meet or exceed the efficiency values in accordance with the latest revision of Department of Energy CFR Title 10, Volume 3, Chapter II, Subchapter D, Part 431, Subpart K – “Energy Efficiency Program for Certain Commercial and Industrial Equipment” as applicable. Certified test data by serial number shall be provided with each transformer.

7.0 COST EVALUATION

7.1 All network transformers bids will be evaluated based on purchase price, guaranteed no load losses, and guaranteed winding losses. The formula and cost of losses are as follows:

$$\text{Total Evaluated Bid} = \text{Bid price} + (\text{cost of no load losses})(\text{quoted guaranteed no load losses}) + (\text{Cost of winding losses})(\text{quoted guaranteed winding losses})$$

$$\text{Cost of no load losses} = \$4380./\text{kW}$$

$$\text{Cost of winding losses} = \$1925./\text{kW}$$

7.2 Each Manufacturer shall quote the guaranteed no load losses and guaranteed winding losses at the time of bid opening.

7.3 Before or upon delivery, manufacturer's certified factory test reports shall be provided to the City of Austin Electric Utility Department for final review.

7.4 Losses shall be the actual tested losses corrected to 85uC, reported by serial number and purchase order number for each transformer delivered (see section 6.2).

7.5 The actual losses of any one transformer on an order shall not exceed the quoted guaranteed losses by more than the following percentages:

	<u>No load losses</u>	<u>Winding losses</u>
Each Unit	10%	5%

7.6 Penalty

For each transformer where the actual losses exceed the quoted guaranteed losses a penalty will be assessed through a price reduction for each transformer.

$$\text{Penalty} = 2[(\$4380./\text{kW})(\text{actual no load losses} - \text{quoted guaranteed no load losses}) + (\$1925./\text{kW})(\text{actual winding losses} - \text{quoted guaranteed winding losses})]$$

8.0 DELIVERY

The City of Austin Electric Utility shall be given 48 hours advanced notice of intent to deliver. If proper notice of intent to deliver is not received, then the shipment will be rejected. Any additional charges due to the refusal of the shipment will be the responsibility of the Supplier.

9.0 WARRANTY

If any defect in the equipment supplied, or failure to comply with said specification, shall appear within the period of one (1) year from the energization of the equipment or a maximum of eighteen (18) months from the date of final acceptance of the equipment, the Supplier will be immediately notified, and Supplier shall thereupon correct without delay and at Supplier's own expense the defect or failure of compliance, by repairing the defective part or parts, by supplying a non-defective replacement or replacements, or by correcting a defective or deficient design. Supplier shall further replace or repair all other similar equipment

if such defect may reasonably be expected to develop or occur in said similar equipment. Removal and installation cost of the defective parts or equipment shall be at Supplier's expense. In the event the Supplier must correct any defect or defects or failure of compliance by repair, replacement or correction as hereabove provided, then with respect to the equipment corrected, the aforesaid warranty period shall begin from the date of completion of installation of such correction and acceptance thereof, provided same is not unreasonably delayed by the City of Austin.

10.0 SIGNAGE

TYPICAL EXTERNAL SIGNAGE MATERIAL REQUIREMENTS OF 3-PHASE PAD-MOUNTED TRANSFORMERS

“NO PCBS” decal: 6 inch X 6 inch, blue. Base Film: 0.0035-inch cast polyvinyl chloride, with UV inhibitors as per MIL-M-22106A. Cyasorb UV-9 light absorber C14H1203, Gloss 80 UL 94 rated. Over lamination: 002PVF (polyvinylfluoride) Tedlar UV screening film from E.I. DuPont. Cold-seal bonded. Adhesive: 0.002-inch permanent acrylic hi-tack, with high-temperature-resistant Elasticisors for adhesion at 40 deg. F. PSTC test method: #1 modified for a 15 minute dwell time, with 2 mils of adhesive, 56 oz/inch width rating. Ink: Silkscreen type 4, with automotive grade pigments and binders, 0.0004-inch thick + 0.0001, inch high pigment volume concentration total PVC 40-50 (copper phthalocyanines). Liner: 0.0007-inch + 0.001-inch Kraft coated one side chemical resistant. Salt spray: 240 hours 5%, at 100 degrees, with no blistering, color change, or other material degradation. No effect when immersed in diesel fuel, motor oil, anti-freeze, detergent 2 %, ammonium hydroxide (12% and 39%), kerosene, acetic acid, acetone and water. Service temperature range: -40 to +170 deg. F. Decal shall last a minimum lifetime exterior durability of 15 years from installation date with proper surface preparation.

“SIZE KVA” decal: width as required, 2 7/8 inches tall, Engineer Grade, adhesive reflective vinyl, with yellow numbers, black background.

“SIZE SECONDARY” decal: width as required, 2-7/8 inches tall, Engineer Grade, adhesive reflective vinyl, with yellow numbers on Black Background. Sticker shall read “L-L Voltage Y / L-G Voltage”.

ATTACHMENT I

TERMINAL DESIGNATIONS AND VECTOR RELATIONSHIPS
FOR NETWORK TRANSFORMERS