

**CITY OF AUSTIN ELECTRIC UTILITY DEPARTMENT**  
**PURCHASE SPECIFICATION**  
**FOR**  
**TRANSFORMER, DISTRIBUTION, OH, 1PH, 3-167KVA, 15KV**

DATE	PREPARED BY	ISSUANCE/REVISION	APPROVAL PROCESS SUPV. / MATERIALS SUPV.
07/06/99	Gary Noble	Issuance	
01/01/03	Steve Booher	Revision	
05/30/03	Steve Booher	Revision	
06/06/03	Steve Booher	Revision	
09/05/03	Steve Booher	Revision	
02/18/04	Leonard Hough	Revision	
04/26/05	Dennis Patrick	Revision	
03/19/09	Arthur Gonzalez	Revision	
07/07/09	Arthur Gonzalez	Revision	
10/22/09	Steve Booher	Revision	
11/07/11	Arthur Gonzalez	Revision	
05/15/15	Daniel McReynolds	Revision	
09/04/15	Dennis Patrick	Revision	Michael Pittman
12/02/15	Dennis Patrick	Revision	Michael Pittman
04/05/18	Obaid Rehman	Revision	Michael Pittman
05/11/18	Obaid Rehman	Revision	Michael Pittman
07/22/18	Obaid Rehman	Revision	Michael Pittman
REASON FOR REVISION			AFFECTED PARAGRAPHS
12/28/05: Added arrester wire details			3.8.1
04/26/05: Changed Mfg Part No. Added new Mfg with part number.			3.8.2
04/26/05: Changed approved Mfg and Mfg Part No's.			4.0
04/26/05: Restructured Data Requirements			7.0
04/26/05: Added Warranty Requirements			11.4
04/26/05: Changed Sticker Requirements.			Attachment VI
03/19/09: Change Losses and Added New Oil Requirements			5.0, Attachment II
07/07/09: Revised Wording for Low Voltage Bushing Terminals Specified for 100 and 167 KVA			3.5.1
10/22/09: Added connector arrester wire. Added Wildlife guard.			3.8.1; 4.0
11/07/11: Updated grounding for two tank transformers			3.7.7
05/15/15: DOE 2016 Updates			2.0, 11.1
9/04/15: Updated Signage on two attachments			Attachments V and VI
12/02/15: Added IFD Requirement			Section 3.7.4
04/05/18: Changed Dielectric Fluid			Section 5.0
05/11/18 Added Mineral Oil Requirements			Section 5.0
07/22/2020 Added new manufacturer for wildlife protection			Section 4.0

This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein.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, SINGLE-PHASE OVERHEAD-TYPE DISTRIBUTION  
(3 kVA through 167 kVA)**

**1.0 SCOPE AND CLASSIFICATION**

**1.1 Scope**

The City of Austin Electric Utility Department, hereinafter referred to as Austin Energy (AE), requires a qualified Vendor, to provide, single phase, 60 hertz, dual HV bushings with tank-mounted surge arrester, mineral oil -filled, conventional distribution transformers rated 3 kVA through 167 kVA.

**1.2 Classification**

**1.2.1** No deviation from these specifications on the part of the Vendor shall be allowed. Any item supplied under these specifications which is not in complete compliance with these specifications will not be accepted and will be returned to the Manufacturer.

**1.2.2** All Manufacturers furnishing transformers under these specifications shall have at least ten (10) years experience in the manufacture and sale of distribution transformers.

**2.0 APPLICABLE SPECIFICATIONS**

All Characteristics, definitions and terminology, except specifically covered in this specification shall be in accordance with the latest revision of IEEE C57.12.20, C57.12.31 and DOE CFR Title 10, Volume 3, Chapter II, Subchapter D, Part 431, Subpart K.

**3.0 FUNCTIONAL REQUIREMENTS**

**3.1 Voltage and kVA Ratings**

The voltage ratings shall be in accordance with the table in Attachment I.

**3.2 Maximum Guaranteed Transformer Losses**

The single phase distribution transformer maximum guaranteed losses (both No Load and Load Loss) shall be in accordance with Attachment II. All units, exceeding the maximum guaranteed losses will be rejected. There is no additional tolerance allowed on these values.

**3.3 High Voltage (HV) Taps**

Manufacturer shall **not** provide taps for the transformers described herein.

**3.4 High Voltage Bushings and Terminals**

**3.4.1** The High Voltage Terminals shall be in accordance with IEEE C57.12.20.

**3.4.2** High voltage bushing shall be in accordance with IEEE C57.12.20, IEEE C57.19.00 and IEEE C57.19.01.

**3.5 Low Voltage (LV) Bushings and Terminals**

**3.5.1** The low-voltage bushings and terminals shall be 2-hole spades for 3 kVA - 15 kVA transformers. 25 kVA – 167 kVA transformers shall have 4-hole spades. All secondary bushings shall have captive, compression limited, fully shielded conductor and flange seals. Bushings shall be certified to withstand the following cantilever loading without leaking. The

bushings for the pole mounted transformers shall be Central Moloney Speedmount Series Bushings as required by the cantilever withstand rating table shown below. Terminal designation and markings shall be in accordance with IEEE C57.12.70.

kVA	SECONDARY VOLTAGE		
	120/240	240/480	277
10 - 50	100 FT LBS	100 FT LBS	100 FT LBS
75	300 FT LBS	100 FT LBS	100 FT LBS
100	300 FT LBS	100 FT LBS	100 FT LBS
167	300 FT LBS	300 FT LBS	300 FT LBS
250	400 FT LBS	300 FT LBS	400 FT LBS
333	400 FT LBS	300 FT LBS	400 FT LBS
500	400 FT LBS	400 FT LBS	400 FT LBS

**3.5.2** The terminals shall be finished on both sides to enable a complete connection to either side.

### **3.6 CORE AND COIL**

**3.6.1** The transformer coils shall be designed to maintain their nameplate kVA rating throughout the temperature range. The continuous kVA ratings shall be based on an average winding temperature rise by resistance of 65°C as per IEEE C57.12.00.

**3.6.2** All materials used shall be of the 65°C (85° C Hot Spot) Class and be thoroughly tested for compatibility with all transformer components.

**3.6.3** Oil ducts shall be strong enough to withstand full short circuit forces.

**3.6.4** The windings shall be a mechanically rigid assembly to resist axial and radial short circuit forces.

**3.6.5** The primary coil shall be wound in such a manner, that when properly cured, will have an effective bond both turn to turn and layer to layer.

**3.6.6** The primary coil shall be wound with continuous conductor without splices, joints or welds inside the windings.

**3.6.7** High Voltage (HV) leads shall be trained and appropriately insulated to avoid dielectric breakdown between adjacent cables. Spacers, permanently held in place, shall be used to prevent a phase-to-ground short.

**3.6.8** The secondary coils shall be wound with a rectangular or strip conductor. Each secondary coil shall be wound with a continuous conductor without splices, joints or welds inside the windings.

**3.6.9** LV bushing leads shall be cold or thermally welded, where joined to the winding material

**3.6.10** Aluminum low voltage leads shall be connected to their bushings, with hardened aluminum connectors which have been cold or thermally welded to the leads.

**3.6.11** The core and coil assembly shall be rigidly held together as a unit with a core clamp whose design shall maintain reasonable pressure on the assembly throughout the life of the unit.

### **3.7 Tank**

#### **3.7.1 Leak Resistant**

The transformer tank shall be leak resistant throughout the operational life of the transformer.

#### **3.7.2 Covers**

The transformer cover shall be insulated. The transformer shall have removable cover with nitrile rubber gaskets. The cover, when secured in place, shall prevent any moisture from entering the tank.

#### **3.7.3 Pressure**

The transformer tank and cover shall be designed to withstand pressure in accordance with IEEE C57.12.20.

#### **3.7.4 Pressure Relief Valve**

All transformers shall be equipped with a resettable device (which can be reset by trained personnel only) which detects and provides external indication of internal transformer faults, and also incorporates pressure relief functionality. The approved device is manufactured by IFD Corporation part number IFD-ORCA-10PSI-aA, or approved equal.

#### **3.7.5 Hand Holes**

The transformers shall not have hand holes.

#### **3.7.6 Support Lugs (Hangers)**

All transformers shall have support lugs for one (1) position mounting. The support lugs shall be in accordance with IEEE C57.12.20, Section 7.5.2 (Figure 1 and Figure 11).

#### **3.7.7 Grounding**

All transformers shall have two tank ground provisions as per IEEE C57.12.20, section 7.5.4.1 figure 7. As shown in figure 7, the two tank ground provisions shall be located under the low voltage bushings.

In addition to the two tank ground provisions, all transformer sizes shall have a low voltage ground provision as shown in IEEE C57.12.20, section 7.5.4.4 figure 7.

Transformers with three LV bushings shall be externally grounded to the tank with a ground strap of sufficient length to attach to the adjacent bushings.

Transformers with two LV bushings shall have a grounding strap attached from the X2 bushing to a grounding lug on the tank centered between X1 and X2.

Transformers with four LV bushings shall have a grounding strap attached from the X2 bushing to a grounding lug on the tank centered between the X2 and X3.

#### **3.7.8 Labels**

The Vendor shall place all labels required by AE Distribution Construction Standard #1000-17, and shown in Attachments V and VI, on the tank of each transformer. This includes the "SIZE kVA" and the "NO PCBS" labels.

### **3.8 Arresters**

- 3.8.1** An arrester shall be mounted on the transformer adjacent to the H1 bushing. The arrester shall be connected from the top of the arrester the H1 transformer bushing. The arrester wire shall be 24 inches long; #6 compressed soft stranded copper transformer riser wire, polyethylene covered. A single hole tin plated compression connector shall be utilized to connect the wire on both ends that connects the H1 bushing to the arrester. The connection from the bottom of the arrester shall be solid copper strap rated for 10KA and bolted to the bottom of the transformer tank. All connections to the lugs, bushing and arrester shall be properly installed as per manufacturer instructions .
- 3.8.2** The arrester supplied shall have a rating of 10 kV, 8.4 kV MCOV, polymer, metal- oxide type, with wire nut and wire clamp on top terminal. The transformers shall be delivered with one of the arresters listed as shown in Attachment III.

#### **4.0 WILDLIFE GUARDS**

All transformers shall be delivered with the below listed animal guard properly installed on the HV bushing and arrester: No other Wildlife Guards will be permitted.

- a. Howard Industries 0060-002163-405
- b. Cantex EZguard
- c. Central Molony 70380486

#### **5.0 TRANSFORMER DIELECTRIC OIL**

The dielectric fluid shall be a mineral oil(UL approved)

The dielectric fluid supplied with all transformers shall be in accordance with IEEE C57.147. The manufacturer shall provide batch test reports of the oil characteristics to the AE Standards Engineer.

The PCB content in the dielectric fluid shall be less than 1 ppm. The vendor shall provide written certification to the City that all dielectric fluid contains less than 1 ppm. The PCB content shall be shown on the nameplate of the transformer.

#### **6.0 PAINT REQUIREMENTS**

The unit shall be painted Light Gray Number 70, Munsell Notation 5BG 7.0/0.4 as described in IEEE C57.12.31.

#### **7.0 DATA REQUIREMENTS**

The Vendor shall provide for the AE Specifications Engineer, upon receiving a new shipment of transformers to Vendor's receiving site, including but not limited to the following information on each transformer:

**7.1** The following items shall be provided for each transformer on every shipment. Data that is gathered from testing, shall be done so in accordance with IEEE C57.12.00, C57.12.80:

- 7.1.1** Serial Number
- 7.1.2** kVA Rating

- 7.1.3 Voltage Rating
  - 7.1.4 Core (Iron) losses at rated load, corrected to 85°C
  - 7.1.5 Copper losses at rated load, corrected to 85°C
  - 7.1.6 Percentage (%) impedance
  - 7.1.7 Exciting current at 100% rated voltage
  - 7.1.8 Percentage (%) regulation at 80% power factor and rated load
  - 7.1.9 Percentage (%) regulation at 100% power factor and rated load
  - 7.1.10 Gallons of biodegradable dielectric fluid used in the transformer
  - 7.1.11 Percentage (%) efficiency @ DOE efficiency criteria
- 7.2 The following items shall be provided in a yearly report with every first shipment of every year:
- 7.2.1 Drawings
  - 7.2.2 Total transformer weight, filled with oil and with arrester mounted
  - 7.2.3 Winding Material
  - 7.2.4 Core Material
  - 7.2.5 Conductor temperature at rated load (Design Test)
  - 7.2.6 Hot Spot temperature at rated load (Design Test)
  - 7.2.7 Top Oil temperature at rated load (Design Test)
  - 7.2.8 Thermal time constant (Design Test)
  - 7.2.9 Short-Circuit Withstand Capability (Design Test)
  - 7.2.10 Exciting current at 110% rated voltage (Design Test)
  - 7.2.11 Radio Influence Voltage (RIV) at 110% rated voltage (Design Test)

## 8.0 NAMEPLATE

The nameplate of the transformer shall be in accordance with IEEE C57.12.00, Table 10 (Nameplate A). The following additional information shall be provided on the nameplate:

- 8.1 Bar Code (Section 9.0)
- 8.2 PCB content (No-PCB or Less than 1PPM)

## 9.0 PERMANENT BAR CODE

The bar code shall be in accordance Attachment IV and with the latest revision of the following standards: ANSI X3.17, ANSI X3.182, ANSI X3.4, ANSI X3.49, and ANSI MH10.8M

## **10.0 AUSTIN ENERGY REQUIREMENTS**

Austin Energy or its designated representative reserves the right to inspect and test transformers and materials in all stages of manufacturing and testing, at whatever location the manufacturing is performed, at no charge to Austin Energy.

## **11.0 OTHER REQUIREMENTS**

**11.1** All transformers supplied to AE shall meet or exceed the efficiency values in accordance with Department of Energy (2016 requirements) CFR Title 10, Volume 3, Chapter II, Subchapter D, Part 431, Subpart K 10 CFR 431 part III - Energy Conservation Efficiency Pprogram for Certain Commercial and Industrial Equipment: Distribution Transformers Energy Conservation Standards table I.1431.196 (b) (1) & (2) . Certified test data by serial number shall be provided with each transformer. Any transformer not complying with Department of Energy efficiency ratings shall be rejected. Certified test data by serial number shall be provided with each transformer.

**11.2** A decal shall be placed on the transformer in accordance with Attachments V and VI. The decal shall be colored blue with white lettering. The decal shall be 6” tall by 6” wide and shall have the precise wording, in capital letters, “NO PCBS”.

**11.3** The Vendor shall provide the information in Section 7 (numerical values and/or pass/fail, as applicable) to the AE Distribution Standards Engineer:

AE Distribution Standards Engineer  
4411-B Meinardus Drive  
Austin, TX 78704

The test reports shall clearly state Austin Energy’s specification number E-1579 and the type of transformer (Polemount).

**11.4** If any defect in the equipment supplied, or failure to comply with this specification, shall appear within the period of 18 months from date of final acceptance of the equipment, the Contractor shall be notified, and the Contractor shall thereupon correct without delay and at Contractor's own expense the defect or failure of compliance by repairing the defective part or parts, by supplying a non-defective replacement or replacements, and/ or by correcting a deficient design as required. The Contractor shall further replace or repair all other similar equipment if such defect may reasonable be expected to develop or occur in said similar equipment. Removal and installation cost of the defective parts or equipment shall be at Contractors expense. In the event the Contractor shall correct any defect(s) or failure of compliance by repair, replacement, or correction as required above, then with respect to the equipment corrected, the aforesaid warranty period shall begin from the date of completion of installation of such correction and acceptable therefore, provided same is not unreasonably delayed by Austin Energy.

**ATTACHMENT I**

**TRANSFORMER VOLTAGE RATINGS  
FOR  
SINGLE-PHASE DISTRIBUTION TRANSFORMER**

<b>HIGH VOLTAGE</b>	<b>HV BIL kV</b>	<b>LOW VOLTAGE</b>	<b>LV BIL kV</b>
7200/12470Y	95	120/240	30
7200/12470Y	95	240/480	30
7200/12470Y	95	277	30



## ATTACHMENT II

### MAXIMUM GUARANTEED TRANSFORMER LOSSES

Transformer (kVA)	No-Load Losses (Watts)	Load Losses (Watts)	Impedance (%) @ 85° C
3	14	43	2.0
10	31	141	2.0
15	47	164	2.0
25	70	178	2.0
50	111	409	2.0
75	135	652	2.0
100	192	730	2.0
167	250	1295	3.0

### ATTACHMENT III

#### TANK-MOUNTED SURGE ARRESTERS FOR SINGLE-PHASE DISTRIBUTION TRANSFORMER

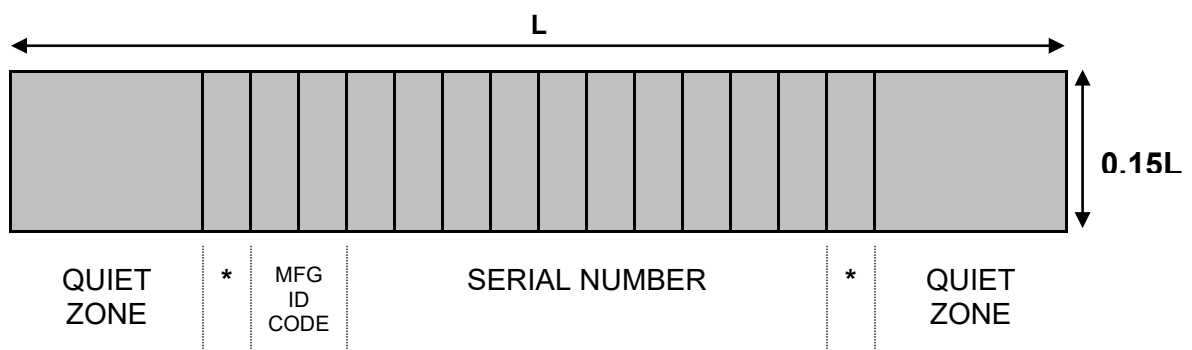
<b>Nominal System Voltage (L-L) kV RMS</b>	<b>BIL* (kV)</b>	<b>Manufacturer</b>	<b>MCOV Rating** (kV)</b>	<b>Manufacturer Part Number</b>
12.47	95	Cooper	8.4	UHS10050A1A1A1A
12.47	95	Ohio Brass	8.4	213709-7214
12.47	95	Maclean	8.4	ZHP010-0000000

\* Minimum BIL of Surge Arrester Housing with Metal Oxide Blocks

\*\* MCOV - Maximum Continuous Operating Voltage

## ATTACHMENT IV BAR CODING AND MANUFACTURING CODES FOR SINGLE-PHASE DISTRIBUTION TRANSFORMER

### 1.0 ORIENTATION OF BAR CODE CHARACTERS



\*Start/Stop Character

### 2.0 MANUFACTURER IDENTIFICATION CODES

The Manufacturer Identification Codes suggested below represent, in part, codes which are utilized for bar coding distribution transformers. The above listing does not represent an inclusive list of distribution transformer manufacturers.

AB	–	Asea Brown Boveri / Power Partners
CM	–	Central Moloney
CP	–	Cooper
GE	–	General Electric
HI	–	Howard Industries
KU	–	Kuhlman



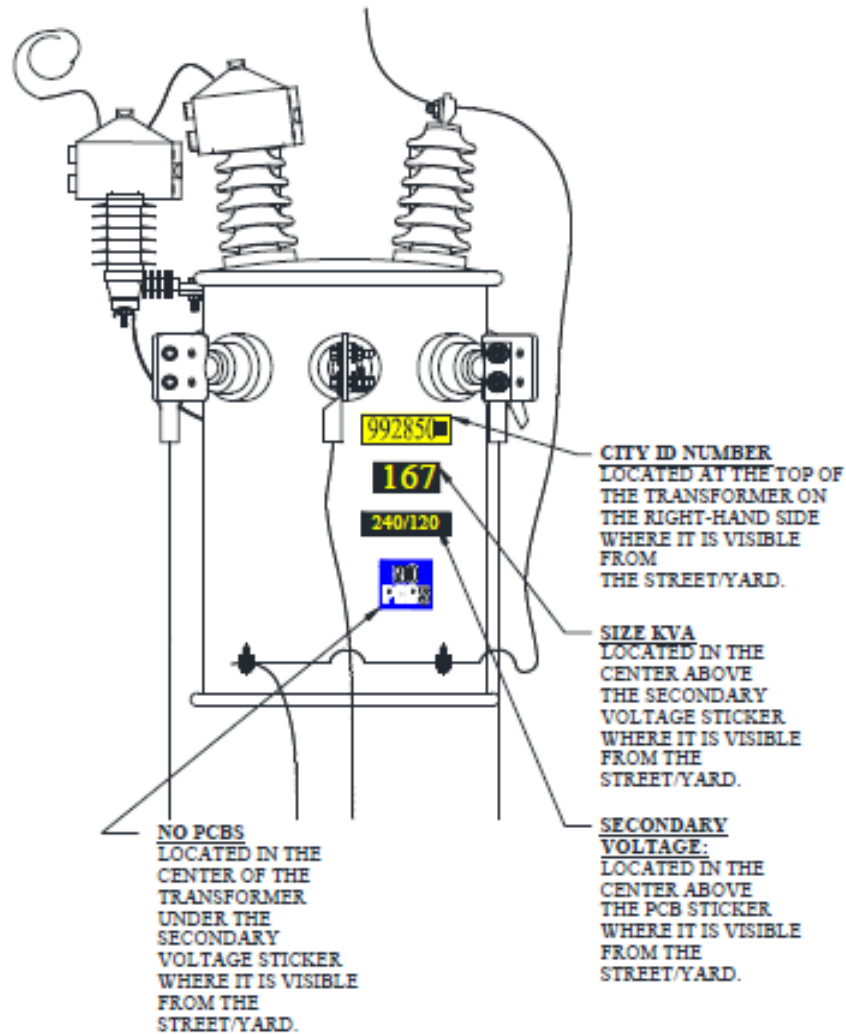
## ATTACHMENT V

# SIGNAGE FOR SINGLE-PHASE POLE-MOUNTED TRANSFORMERS (AE DISTRIBUTION CONSTRUCTION STANDARD #1000-17)

 Rev: 06/05/15	<b>POLE APPARATUS</b> <b>SIGNAGE</b> <b>SIGNAGE-POLE MOUNT 1PH</b>	1000-17A Sheet 1 of 1
		06/15/06

1000-17A SIGNAGE-POLE MOUNT 1PH

TYPICAL SIGNAGE PLACEMENT FOR 3 PHASE TRANSFORMER



## ATTACHMENT VI

### TYPICAL EXTERNAL SIGNAGE MATERIAL REQUIREMENTS POLE-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  $\pm 0.0001$ , inch high pigment volume concentration total PVC 40-50 (copper phthalocyanines). Liner: 0.0007-inch  $\pm 0.001$ -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. Minimum lifetime exterior durability of 15 years from installation date with proper surface preparation.

**Approved Manufacture or equal: Mitrographers, catalog number COA-001**

**“SIZE kVA” decal:** width as required, 2 7/8 inches tall, Engineer Grade, adhesive reflective vinyl. Yellow numbers, black back ground.

**“City ID Number” decal:** width as required, 2 7/8 inches tall, Engineer Grade, adhesive reflective vinyl. black numbers, Yellow back ground.

**“SECONDARY VOLTAGE” decal:** width as required, 2 7/8 inches tall, Engineer Grade, adhesive reflective vinyl. Yellow numbers, black back ground. Sticker shall read “L-L Voltage / L-G Voltage”.