CITY OF AUSTIN ELECTRIC UTILITY DEPARTMENT

PURCHASE SPECIFICATION

FOR

THREE-PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMERS

75-2500 KVA

DATE	PREPARED BY	ISSUANCE/REVISION	APPROVAL PROCESS SUPV. / MATERIALS SUPV.
6/25/81	Richard Dreiss	Revision	Richard Dreiss
2/25/86	Robin Kittel	Revision	Richard Dreiss
2/1/90	Tony Sheiki	Revision	Richard Dreiss
3/27/91	George Martinez	Revision	Richard Dreiss
5/29/92	Steve Booher	Revision	Richard Dreiss
3/29/94	Peter Soosay	Revision	Gary Williams/Peter Soosay
4/20/95	Peter Soosay	Revision	Richard Dreiss/Peter Soosay
2/20/96	Steve Booher	Revision	Richard Dreiss/Peter Soosay
3/18/97	Bill Germany	Revision	Carl Lynch/Peter Soosay
11/7/97	Peter G. Soosay	Revision	Peter Soosay
2/25/98	Peter G. Soosay,	Revision	Matt Monroe/Herman Millican
4/8/98	Peter G. Soosay,	Revision	Matt Monroe/Herman Millican
8/31/98	Peter G. Soosay	Revision	Peter Soosay
8/13/01	Carl A. Nance	Revision	Carl A. Nance
01/30/04	Steven Booher	Revision	Leonard Hough
02/26/04	Steven Booher	Revision	Leonard Hough
04/26/06	Ted Schoenberg	Revision	Ted Schoenberg
04/05/06	Steve Booher	Revision	Ted Schoenberg
02/10/09	Steve Booher	Revision	Greg Troxell
02/10/14	Troy Vessel	Revision	Troy Vessel

REASON FOR REVISION	AFFECTED PARAGRAPHS
Update for New Request For Bids	All
04/27/05: Added Fusing For Radial Feed Transformers.	10.0
04/27/05: Added Warranty Requirements.	25.0
04/27/05: Changed Sticker Requirements	Attachment IV, IVa
04/05/06: Format Revision & updated Fusing & Switch	All
08/05/08: Update for new request for Bids	All
02/10/09 : Add requirement low voltage terminals	3.2
02/10/14: Add requirements for low voltage terminals/ DOE 2016 requirements/Transformer Losses fees	3.2, 6.2, 6.35, 6.36, 6.43b

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75-2500 KVA

1.0 SCOPE AND CLASSIFICATION

1.1 Scope

This specification describes the minimum acceptable requirements for 3-phase, pad-mounted, 60-Hertz, Δ-Y Grd. connected, bio-based biodegradable oil, self-cooled, compartmental type distribution transformers, rated 75 kVA through 2500 kVA.

The transformers supplied under this specification are intended for use on concrete slabs and shall be designed for serving underground distribution electrical facilities.

The City of Austin Electric Utility Department is hereinafter referred to as Austin Energy (AE).

1.2 Classification

Any item supplied under these specifications, but not in complete compliance with these specifications, shall be subject to rejection.

All manufacturers furnishing transformers under these specifications shall have at least five years experience in the manufacture and sale of 3-phase- pad-mounted distribution transformers.

2.0 APPLICABLE SPECIFICATIONS

Transformers supplied in accordance with this specification shall comply with applicable provisions of the latest NEMA, IEEE, ANSI, ASTM, NESC, and NEC standards relating to distribution transformers. In case of conflict between any of the standards mentioned in this specification and the contents of this document, the AE specification shall govern.
All characteristics, definitions and terminology, except that specifically covered in this specification shall be in accordance with the latest revisions of the following standards:

2.1 C57.12.00

General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers

2.2 C57.12.26

Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage, (34,500 GrdY/19,920 Volts and Below and 2500 kVA and Smaller Requirements).

2.3 C57.12.28

Switchgear and Transformers - Pad-Mounted Equipment - Enclosure Integrity

2.4 C57.12.34

IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers (2500 kVA and Smaller) - High Voltage: 34500GrdY/19920 Volts and Below; Low-Voltage: 480 Volt 2500 kVA and Smaller.

2.5 C57.12.70

Terminal Markings and Connections for Distribution Power Transformers

2.6 C57.12.80

Standard Terminology for Power and Distribution Transformers

2.7 C57.12.90

Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers.

2.8 C57.91

Guide For Loading Mineral-Oil-Immersed Overhead and Pad-Mounted Distribution Transformers Rated 500 kVA and Less with 65°C or 55°C Average Winding Rise

2.9 NEMA TR-1

Transformers, Regulators and Reactors

2.10 C.57.147

Acceptance and Maintenance of Natural Ester Fluids in Transformers

3.0 FUNCTIONAL REQUIREMENTS

3.1 FUSING

75 kVA through 500 kVA transformers shall be equipped with Cooper Power System flapper sidewall-mount bayonet draw-out fuse holder assembly #4000361C99FV or buyer approved equivalent with dual sensing expulsion fuse or solid link in series with a partial-range, ester fluid immersed, current-limiting fuse as listed below.

750 kVA through 2500 kVA transformers shall be equipped with a Cooper Power Systems silver-plated bayonet draw-out fuse holder assembly #4038804B03M or buyer approved equivalent with high amp overload expulsion fuse or solid link in series with a partial-range, ester fluid immersed, current- limiting fuse as listed below.

KVA	Loop-Feed Cooper Fuse Link #	Both Cooper ELSP #	Radial Feed Cooper Solid Link #
75	4000358C05	3544030M61M	403861C10CB
150	4000358C08	3544065M61M	403861C10CB
225	4000358C10	3544100M71M	403861C10CB
300	4000358C10	3544100M71M	403861C10CB
500	4000358C12	3544150M71M	403861C10CB
750	4038361C03CB	3544125M71M	403861C10CB
1000	4038361C04CB	3544125M71M*	403861C10CB
1500	4038361C04CB	3544125M71M*	403861C10CB
2000	4038361C05CB	3544125M71M*	403861C10CB
2500	4038361C05CB	3544125M71M*	403861C10CB

* Indicates parallel fuse application – use two (2) fuses

Bay-o-net type fuses shall be designed so that the fuses can be removed by using a hot stick. A metal oil-drip shield shall be furnished directly beneath the bay-o-net fuse. Lead connections to the partial-range current-limiting fuse shall be made using bolts, to assure solid electrical and mechanical connections.

3.2 BUSHINGS AND TERMINALS

The primary bushings and parking stands for radial-feed and loop-feed dead-front transformers shall be arranged as per the following:

Radial-feed dead-front transformers shall be constructed according to IEEE C57.12.26, Figures 5A and 7. The transformer shall be provided with three high-voltage bushing wells (IEEE 386), externally clamped, and three parking stands. The high-voltage leads shall be of such length as to permit field replacement of bushing wells.

Loop-feed dead-front transformers shall be constructed according to IEEE C57.12.26 Figures 6A and 7. The transformer shall be provided with six high voltage bushing wells (IEEE 386), externally clamped, and eight parking stands to permit operating the transformer in a looped primary system. The high-voltage leads shall be of such length as to permit field replacement of bushing wells.

All bushing wells shall have a removal stud for field replacement.

Low-voltage line and neutral terminals shall be in accordance with IEEE C57.12.26 Figure 7 and 8(a).

All secondary terminals shall be tin-plated copper and shall be in compliance with IEEE C57.12.26, Figures 9(a), 9(b), or 9(c), except that the number of holes in the terminals shall be as follows:

Transformer	Spade Terminal
75 KVA and below	6-hole
150 KVA and above	10-hole

Ten-hole and larger spades shall be furnished with additional insulated support, at the end farthest from the tank wall, without interfering with the use of any of the ten holes (Attachment III).

The low-voltage neutral bushing shall be an insulated bushing with a removable external ground connection. The ground strap shall be adequate to carry the fault current based on the rating of the transformer.

3.3 INTERNAL BUSHING LEADS

High-voltage bushing leads shall be trained and appropriately insulated to avoid dielectric breakdown between adjacent cables. Spacers, permanently held in place, should be used to prevent cables from failing phase-to-phase or phase-to-ground.

Low-voltage bushing leads shall create good electrical and strong mechanical connections.

3.4 HIGH-VOLTAGE TAPS

All transformers shall be provided with high-voltage taps as shown below:

Low-Voltage Rating	KVA	Number of Taps	Size of Taps above and/or below Rated Voltage
208Y/120 V	75-500	4	2 ½% below
208Y/120 V	750	2	2 ½% above & below
480Y/277 V	All	2	2 ½% above & below

The tap-changer handle shall be mounted for external operation and located in the high-voltage compartment.

3.5 SWITCHING

Loop-feed transformers: A 3-phase, gang-operated, four-position, under ester fluid loadbreak switch shall be supplied on all loop-feed transformers. The switch shall have a minimum loadbreak rating of 200 amps and a 3-shot make-and-latch rating of 10,000 amps, symmetrical. The connections to be made in each switching position are as follows:

POSITION	SOURCE "A"	SOURCE "B"	TRANSFORMER COIL
1 – 12 o'clock	OFF	ON	ON
2 – 3 o'clock	ON	ON	OFF
3 – 6 o'clock	ON	ON	ON
4 – 9 o'clock	ON	OFF	ON

The switch positions shall be clearly marked as to whether the source or coil is on or off. The switch handle shall be located in the high-voltage compartment. The switch shall be operable with a hookstick. The switch shall be a T-Blade Switch, Cooper Part # LS4BH3T12B or buyer approved equivalent.

Radial-feed transformers: A 3-phase, hookstick-operable, gang-operated, two-position, under-oil loadbreak switch shall be supplied on all radial-feed transformers. The switch shall have a minimum load break rating of 200 amps and a make-and-latch rating of 10,000 amps rms, symmetrical, 15-cycle. The switch shall have an open/close indication plate. This switch shall be located in the high-voltage compartment. The switch shall be Cooper Part # LS2B515H3S2B or buyer approved equivalent.

3.6 ACCESSORY EQUIPMENT

The following equipment and devices shall be provided on the size transformers indicated:

3.6.1. All transformers shall have an oil-drain valve, with sampling device, located in the high-voltage compartment. The valve shall be a gate valve, not less than ½".

3.6.2. All transformers sized 300 kVA or larger shall have a liquid-level gauge in the high-voltage compartment. Units less than 300 kVA do not require a liquid-level gauge.

3.6.3. All transformers sized 300 kVA or larger shall have a temperature indicator in the high-voltage compartment. Units less than 300 kVA do not require a temperature indicator.

3.6.4. All transformers shall have a pressure-relief device located on the low-voltage side of the terminal compartment. The device shall be capable of automatically venting 35 scfm at 15 psig, as per IEEE C57.12.26.

3.6.5. TERMINAL MARKING AND ANGULAR DISPLACEMENT

Terminal designations shall be as per IEEE C57.12.70. Terminals shall be clearly marked with oil-resistant yellow paint.

The identification of terminal connections shall be shown on the nameplate.

The angular displacement between the high- and low-voltage terminals shall be as per Figure 10, IEEE C57.12.26.

3.6.6. NAMEPLATE

As described in IEEE C57.12.00, the contractor shall affix a durable metal nameplate to each transformer. The nameplate shall be located in the low-voltage compartment and shall be readable with the cables in place.

The nameplate shall be made from anodized aluminum or non-rust stainless steel. The information contained on the nameplates shall be inscribed and painted black.

The nameplate shall conform to IEEE C57.12.00: Nameplate B for 500 kVA and below and Nameplate C for 750 kVA and above. All information shall be in English and ft-pound-seconds (fps) non-metric units of measure.

The nameplate shall indicate the current-limiting fuse on a circuit diagram.

The nameplate shall contain a permanent bar code that meets the following requirements:

Information: The bar code shall display the Manufacturer Identification Code (see Attachment I) and manufacturer's serial number.

Durability: The bar code shall last the lifetime of the transformer, as specified by IEEE C57.12.00, regarding the nameplate. The bar code shall be constructed such that, when using a contact-type bar code reader, the bar code shall be capable of a minimum of thirty successful scans.

Dimensions: The height of the bar code shall be either 0.24 inches or 15% of the bar-code length (L); whichever is greater (see Attachment II).

Character Size: The bar code print quality shall be in accordance with ANSI X3.182. The permanent bar code shall be of medium density, ranging from 4 to 6.9 characters per inch.

Bar Code Symbology: The bar code symbology shall be Code 39, also referred to as 3-of-9 bar code, using the 43-character ASCII set, in accordance with ANSI X3.4.

Orientation of the Bar Code Characters: The bar code characters shall be arranged in one line. A start character shall precede the manufacturer's code and a stop character shall follow the transformer serial number (see Attachment II).

Quiet Zones: A minimum quite zone of 0.25" shall immediately precede and follow the bar codes.

Human-Readable Interpretation: A human-readable interpretation line shall be provided directly beneath the bar code, in accordance with ANSI MH10.8M. The interpretation of the 3-of-9 bar code shall be clearly identifiable with the bar-code symbol above. The preferred shapes of the human-readable interpretation shall conform to either ANSI X3.17 or ANSI X3.49. As an alternative, any human-readable font with characters no less than 3/32" in height is acceptable.

4.0 PERFORMANCE

4.1 INSULATION LEVEL

4.1.1. The high-voltage insulation shall be as follows:

Rated High Voltage (Volts)	BIL (kV)	Insulation Class (kV)
12470 Δ	95	15

4.1.2. The low-voltage insulation level shall be as follows:

Low Voltage Rating (Volts)	BIL (kV)	Insulation Class (kV)
208Y/120	30	1.2
480Y/277	30	1.2

4.2 TEMPERATURE RISE LIMITS

The Temperature rise and loading conditions shall be in accordance with IEEE C57.12.00 section 5.11.

4.3 IMPEDANCE

The impedance voltage is the voltage required to circulate rated current through one of two specified windings of a transformer when the other winding is short-circuited, with the windings connected as for rated-voltage operation (IEEE C57.12.80).

In accordance with IEEE C57.12.00, section 9.2, the allowable impedance-voltage tolerance for any individual transformer shall be as follows:

KVA Rating	Impedance Voltage
75 - 500	2.0% ± 10.0% (1.8% to 2.2%)
750 - 2500	5.75% ± 7.5% (5.3% to 6.2%)

Any unit that is outside of the tolerance shown will be rejected. There is no additional tolerance allowed on these values.

5.0 MATERIAL

5.1 Core and Coil Construction

The transformer coils shall be designed to maintain the nameplate kVA rating throughout the temperature range. All materials used shall be of the 65ºC (85ºC Hot Spot) Class and shall be thoroughly tested for compatibility with all transformer components before use in the design. Only thermally upgraded, one hundred percent conduction, particle tested kraft paper shall be used for secondary layer insulation. Provisions shall be made for securing the sheet windings and the primary windings in position during construction and for short-circuit conditions. Insulating paper shall be thermally cured under pressure, epoxy coated, diamond pattern type.

The core shall be manufactured with burr-free, grain-oriented silicon steel. Amorphous core shall not be permitted.

5.2 Core-Coil Assembly

The core and coil, after assembly, shall be mounted in a rigid steel frame, constructed in such a way as to hold the coil in a rigid position within the core window without placing undue stress on the core or short circuiting the laminations at any point.

5.3 Tank

The transformer tank shall have high- and low-voltage cable terminating compartments. The transformer tank and compartment shall be of sufficient construction to conform to IEEE C57.12.28.

The tank shall be of sufficient strength to withstand a internal pressure of 7 psig without permanent distortion and 12 psig without permanent rupturing or displacing other components of the transformer or affecting cabinet security.

A one-inch pipe plug shall be provided, for filling, taking oil samples, and pressure testing. This plug shall be located in the lower left hand corner of the high voltage compartment.

The tank cover may be either the bolted-on or welded-on type, as per IEEE C57.12.26. The welded-on cover shall have handhole(s) as per IEEE C57.12.26.

Tank grounding shall be as per IEEE C57.12.26.

All exterior nuts and bolts shall be of a corrosion-resistant material.

The transformer shall be of sealed-tank construction, which seals the interior of the tank from the atmosphere and which insures constant gas volume and oil volume. The transformer shall remain effectively sealed for a top-oil temperature range of -5°C to 105°C.

All required gaskets shall be made of high temperature Viton.

The Vendor shall place all labels required by AE Distribution Construction Standard #1000-14, and shown in Attachments IV and IVa, on the cabinet doors of each transformer. This includes the “3 in 1 - Danger High Voltage, One Call, Clearance Required," "kVA Size," and "NO PCBS" labels.

5.4 Dielectric Fluid

The dielectric fluid shall be bio-based biodegradable electrical insulating and cooling liquid. The Coolant shall be a listed less-flammable fluid meeting the requirements of National Electrical Code Section 450-23 and National Electric Safety Code, section 15. The fluid shall be Factory Mutual Approved and be UL Classified.

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

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. A decal shall be placed on the transformer in accordance with Attachments IV and IVa. 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".

5.5 Doors

Only conventional vertical-hinged, two-door design is acceptable. Door shall have a recessed, captive penta-head bolt that secures all access to doors. Hinges shall be stainless steel. All other designs, including clam-shell and flip-top door designs, are not acceptable.

The high voltage compartment door shall have a 19/64" hole drilled in the upper left hand corner 10" from the top and 10" from the left hand side. This hole shall have a field removable plug so that the transformer will accommodate a fault indicator light. The plug shall be designed so that if the plug is not removed the integrity of the enclosure still complies with IEEE C57.12.26 and C57.12.28 requirements. (Attachment IV b)

5.6 Primer and Paint

All primer and paint shall be lead-free. The enclosure security and coating system shall be as per IEEE C57.12.28, as a minimum requirement. In addition to this IEEE standard, the unit shall be painted Munsell Green, with a minimum thickness of 5 mils.

5.7 HIGH-VOLTAGE AND LOW-VOLTAGE COMPARTMENTS

Doors on the high-voltage and low-voltage compartments shall be of sufficient size to provide adequate working space when opened.

With the low-voltage compartment door opened or removed, adequate safeguards shall isolate the high-voltage compartment. The high-voltage compartment shall be accessible only by releasing a pentahead bolt to allow the compartment door to be opened, or by some other equally secure method. If an insulating material is used for the barrier, it shall be supported or braced on all sides with metal strips.

The compartments shall have the following minimum dimensions:

KVA	HV Compartment	LV Compartment
75 - 2500	40.0” wide x 26.0” deep	30.0” wide x 26.0” deep

The opening on the bottom of all transformers shall have the following minimum dimensions:

KVA	HV Compartment	LV Compartment
75 - 2500	38.5” wide x 23.0” deep	28.5” wide x 23.0” deep

5.8 HANDLING AND MOUNTING FACILITIES

The transformer base shall be arranged for rolling in two directions, parallel to and at right angles to the centerline of the high-voltage bushings.

The lifting provision shall be in accordance with IEEE C57.12.26.

The base of the assembly shall be provided with a suitable flange to permit anchoring the unit on the pad from within the cable-terminating compartments.

6.0 ROUTINE AND DESIGN TESTS

6.1 Routine Tests

The contractor shall perform the routine tests, on all transformers, that are specified in Section 8 of IEEE C57.12.00. All testing shall be performed as per IEEE C57.12.90.

6.2 Design and Other Tests

The contractor is to perform the following design and other tests on all transformers, as per Section 8, Table 21 of IEEE C57.12.00: Lightning Impulse (BIL), No-Load Loss, Load Loss, Excitation Current, and Impedance Voltage. All testing shall be performed as per IEEE C57.12.90.

All transformers supplied to AE shall meet or exceed the efficiency values in accordance with Department of Energy (2016 requirements) 10 CFR 431 part III - Energy Conservation program for Commercial Equipment: Distribution Transformers Energy Conservation Standards table I.1. Certified test data by serial number shall be provided with each transformer.

Contractor shall provide at time of bid certification that all transformer components are compatible with Dielectric Fluid provided.

AE may require the contractor to perform additional design and other tests on an as-needed basis. If so, AE will list the tests as a separate line item in the bid. All such testing shall be performed as per IEEE C57.12.90.

6.3 REQUIRED INFORMATION

For each item, the Bidder shall supply the following information on the bid sheet:

6.3.1. *Guaranteed No-Load Losses*, in watts, corrected to 20°C: Those losses which are incident to the excitation of the transformer. They are the losses of the transformer excited at rated voltage and frequency, but not supplying load. No-load losses are to be measured as per IEEE C57.12.90.

6.3.2. *Guaranteed Load Losses*, in watts, corrected to 85°C: Those losses which are incident to the carrying of a specified load. They are the losses of the transformer excited at rated voltage, frequency, and current. Load losses are to be measured as per IEEE C57.12.90.

6.3.3. *Guaranteed Total Losses*, in watts: The sum of the No-Load and Load Losses.

6.3.4. *Bid Amount*, per individual transformer.

6.3.5. *Adder for No-Load Losses*, per individual transformer: This amount is equal to (Guaranteed No-Load Losses, in watts) x ($6.461 per watt).

6.3.6. *Adder for Load Losses*, per individual transformer: This amount is equal to (Guaranteed Load Losses, in watts) x ($3.379 per watt).

6.3.7. *Total Owning Cost per Individual Transformer*: This amount is equal to the sum of the Bid Amount, the Adder for No-Load Losses, and the Adder for Load Losses.

6.3.8. *Total Owning Cost for the Estimated Annual Usage*: This amount is equal to (Total Owning Cost per Individual Transformer) x (Estimated Annual Usage).

6.4 ACCEPTANCE OF TRANSFORMER DELIVERY AND LOSSES EVALUATION

6.4.1. Manufacturer's Test Report

Prior to the delivery of a transformer, the vendor shall provide a manufacturer's test report to the AE Distribution Standards Engineer. The test report shall contain the information as shown in Attachment V. The test report shall be emailed to the AE Distribution Standards.

The vendor shall also ship a paper copy of the test report with each transformer delivery.

AE will review each manufacturer's test report and will either reject any transformer that does not meet the requirements of this specification or pay a reduced price for the transformer, as calculated by the method in section 6.4.3 of this specification.

6.4.2. Incoming Inspection by AE

AE may test transformers at the point of delivery to verify and adjust, if necessary, the manufacturer's test-report data. AE will use the verified or adjusted data to assure compliance with this specification and to perform the transformer loss evaluation.

6.4.3. Transformer Loss Evaluation

In accordance with IEEE C57.12.00, section 9.3, actual losses on each individual transformer shall not exceed the vendor's guaranteed losses by more than the following percentages:

a) No-Load Losses.....10%
b) Total Losses.....6%

Any individual transformer having actual losses that exceed these limits will be subject to the following:

a) An immediate fee of $350.00
b) Possible return of the transformer to the vendor, at the discretion of AE

Should AE elect to keep the transformer, a losses fee will be assessed on the individual transformer to offset the increased total owning cost of the high-loss transformer. The fee will be calculated according to the following formula:

Losses Fee = ($6.461/W)(Measured No-Load Losses - Guaranteed No Load Losses)
+ ($3.379/W)(Measured Load Losses - Guaranteed Load Losses)

6.4.4. Impedance Voltage Evaluation

Any individual transformer having a voltage impedance that does not fall within the acceptable range given in section 4.3 of this specification will not be accepted by AE and will be returned to the vendor at the vendor's expense.

6.4.5 Any transformers not complying with Department of Energy efficiency ratings shall be rejected in accordance with section 6.2 of this specification.

ATTACHMENT I

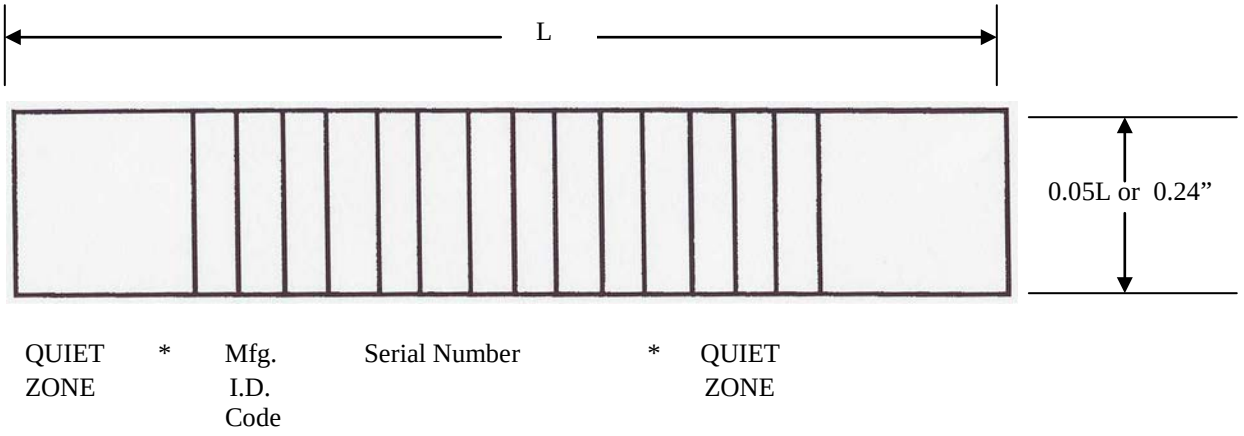
MANUFACTURER IDENTIFICATION CODES

AB	-	Asea Brown Boveri
CM	-	Central Moloney
CP	-	Cooper
GE	-	General Electric
HI	-	Howard Industries
KU	-	Kuhlman

The Manufacturer Identification Codes suggested above represent, in part, codes that are utilized for bar coding distribution transformers. The above listing does not represent a complete list of distribution transformer manufacturers.

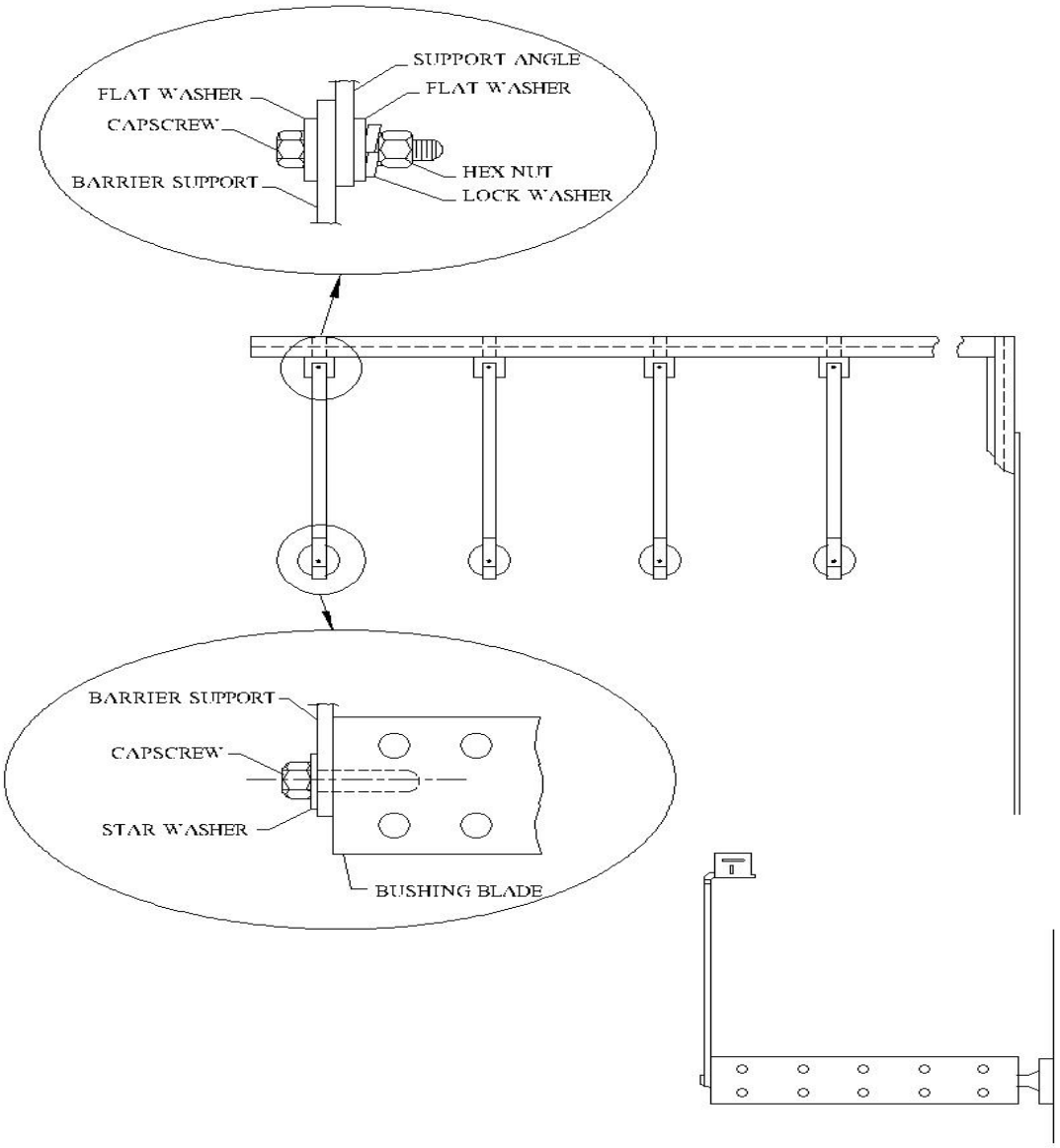
ATTACHMENT II

ORIENTATION OF BAR CODE CHARACTERS



* Start/Stop Character

ATTACHMENT III
TRANSFORMER SPADE SUPPORTS DRAWING

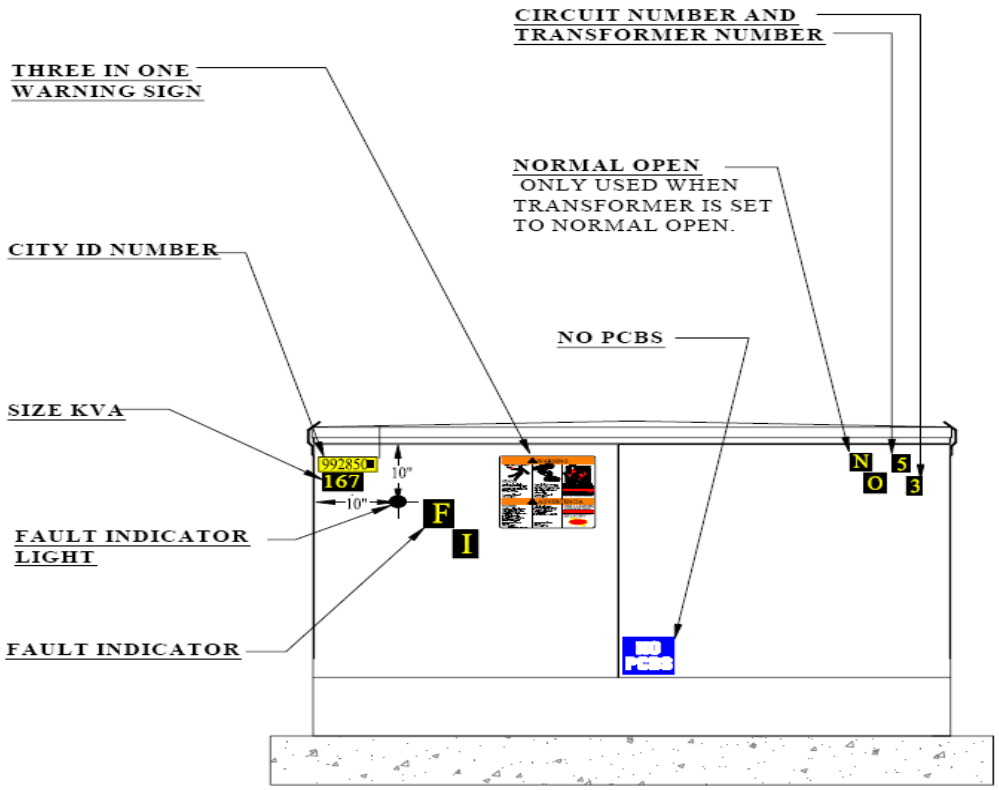


ATTACHMENT IV

AUSTIN ENERGY	GENERAL INFORMATION	1000-14A
	SIGNAGE	Sheet 1 of 1
Rev: 07/24/08	SIGNAGE-PAD MOUNT 3PH	11/01

1000-14A SIGNAGE-PAD MOUNT 3PH

TYPICAL SIGNAGE PLACEMENT FOR 3 PHASE TRANSFORMER



3 PHASE PAD MOUNTED TRANSFORMER LID/DOOR SIDE

ATTACHMENT IVa

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 (polyvinylflouride) 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. 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 background.

"3 in 1" decal: Dimensions will be approximately 10" wide X 10.5" tall. Sign shall be worded as followes: WARNING To Report Problems Call (512) 322-9100 HIGH VOLTAGE Hazardous voltage inside. Can shock, burn or cause death. Keep out if open or unlocked, immediately call electric power and light company. ADVERTENCIA Para Reportar Problemas Llame al: (512) 322-9100 ALTA TENSION Contiene voltaje peligroso. Puede producir descarga o sacudida eléctrica, quemaduras o ausar muerte. Prohibida la entrada. si está abierto o sin llave, inmediatamente llame a la central eléctrica. WARNING To Report Problems Call: (512) 322-9100 Keep shrubs and structures at least 10 feet away from this side of equipment for safe utility maintenance and operation. ADVERTENCIA Para Reportar Problemas Llame al: (512) 322-9100 Mantenga arbustos y construcción por lo menos a 10 pies de distancia de este lado del equipo para seguridad en el mantenimiento y operación. ONE CALL SYSTEM of TEXAS 1-800-545-6005 CALL BEFORE YOU DIG IT'S THE LAW UNA LLAMADA SISTEMA de TEXAS 1-800-545-6005 LLAME ANTES DE EXCAVAR ES LA LEY. Base film: .0035 cast polyvinylchloride with uv inhibitors mil-m-22106a. (cyasorb uv-9 light absorber c14h1203). Gloss 80 ul 94 rated. Overlamination: .002pvf (polyvinylflouride). Tedlar uv screening film from e.i. dupont. Cold seal bonded. Adhesive .002 permanent acrylic hi-tack with high temperature resistant elasticisors for adhesion at 40 degrees f. Pstc test method: #1 modified for a 15 min dwell time with 2 mils of adhesive 56 oz/inch width rating. Ink: silkscreen type 4 with automotive grade pigments and binders .0004" thick dry +/- .0001" high pigment volume concentration total pvc 40-50 (copper phthalocyanines). Liner: .0007" +/- .001" kraft coated one side. Chemical resistance: salt spray 240 hours 5% at 100 degrees f if 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 degrees f. Labels shall have a two year shelf life and a minimum lifetime exterior durability of 15 years from installation date with proper surface preparation. All stick on signs will have a written guarentee of no fading or pealing for 15 years or they will be replaced in the field free of charge.

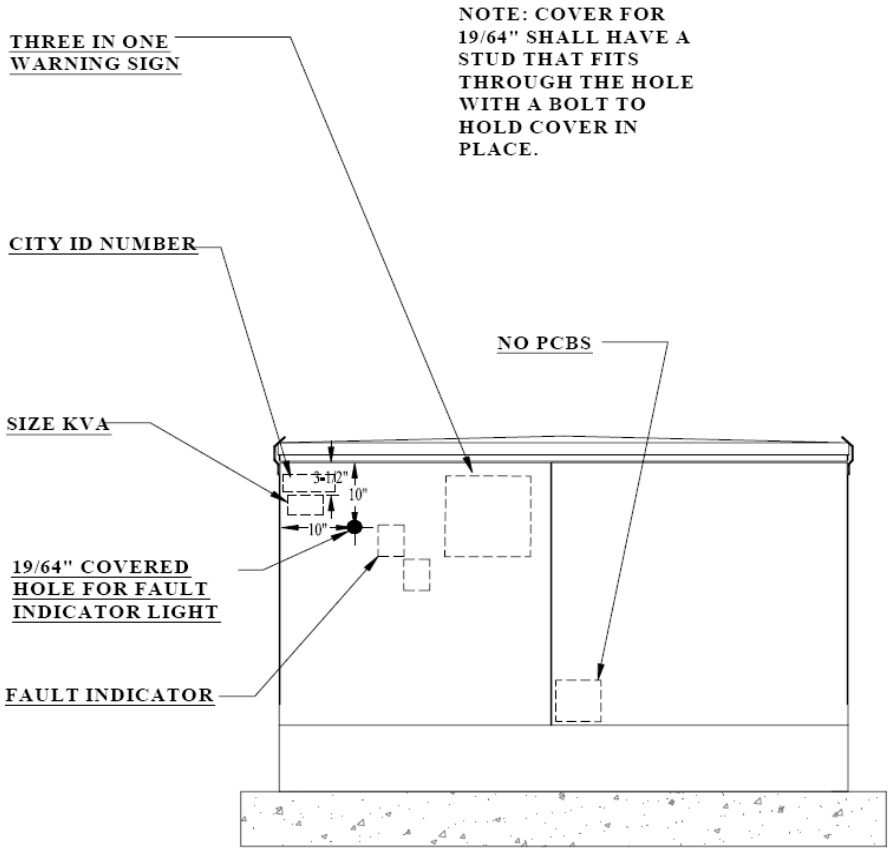
Approved Manufacturer or equal: Uticom, no catalog number
Electromark, no catalog number
Mitrographers, no catalog number

ATTACHMENT IV B

1000-14B	GENERAL INFORMATION	AUSTIN ENERGY
Sheet 1 of 1	SIGNAGE	
11/01	SPECIFICATION-PAD MOUNT 3PH	Rev: 07/24/08

1000-14B SPECIFICATION-PAD MOUNT 3PH

TYPICAL SIGNAGE PLACEMENT FOR 3 PHASE TRANSFORMER



ATTACHMENT V

AUSTIN ENERGY TRANSFORMER TEST REPORT FORM

(insert name of manufacturer)
CERTIFIED TRANSFORMER TEST REPORT

VENDOR NAME: _____
VENDOR PURCHASE ORDER NUMBER: _____
AUSTIN ENERGY PURCHASE ORDER NUMBER: _____
AUSTIN ENERGY STOCK NUMBER: _____

MANUFACTURER ORDER NUMBER: _____
MFG CATALOGUE NUMBER: _____
MANUFACTURER INVOICE NUMBER: _____
MFG DRAWING NUMBER: _____
TEST DATE: _____
SHIP DATE: _____

TYPE	PHASE	FREQUENCY	KVA	LOW VOLTAGE	HIGH VOLTAGE
ANSI 1	3PH	60 Hz			

			LOSSES			%REGULATION AT			DOE
SERIAL NUMBER	PERCENT IMPEDANCE	EXCITING CURRENT	MEASURED NO-LOAD LOSS	MEASURED LOAD LOSS	MEASURED TOTAL LOSS	80% PF	100% PF	BIL (KV)	EFF %

GUARANTEED LOSSES: | | | |

NOTES:

1) Losses are measured at 100% of rated voltage. No-load loss data corrected to 20° C. Load Loadd data corrected to 85°C.
2) All transformers were manufactured using insulating fluid containing less than 1 PPM PCB. ASTM D4059 Test Certification available.
3) The winding temperature rise above ambient temperature does not exceed 65°C.
4) Exciting current is measured at 100% rated load.
5) All transformers listed have received and passed the following test, in accordance with ANSI/IEEE C57.12.00, latest edition: Continuity, Ratio, Leak, Polarity and Phase Relationship, Routine Impulse, Induced Voltage, Applied Voltage.

THE MANUFACTURER CERTIFIES THAT THIS TEST REPORT IS A TRUE AND ACCURATE RECORD OF FINAL PRODUCTION-LINE TEST THAT WERE CONDUCTED IN ACCORDANCE WITH CURRENT ANSI TRANSFORMER TEST STANDARDS, AND THAT THE ABOVE TRANSFORMERS WITHSTOOD THESE TESTS.

NAME OF CERTIFYING INDIVIDUAL: _____