

CITY OF AUSTIN ELECTRIC UTILITY DEPARTMENT

PURCHASE SPECIFICATION

FOR

TRANSFORMER, DISTRIBUTION, URD, 1PH, 25-250KVA, 15KV, PADMOUNTED

DATE	PREPARED BY	ISSUANCE/REVISION	APPROVAL PROCESS SUPV. /MATERIALS SUPV.
07/06/99	Gary Noble	Issuance	
07/19/2001	Peter G. Soosay, P.E.	Revision	
09/08/03	Steve Booher	Revision	
02/18/04	Leonard Hough	Revision	
04/26/05	Dennis Patrick	Revision	
4/01/09	Arthur Gonzalez	Revision	
07/22/10	Arthur Gonzalez	Revision	
12/29/10	Arthur Gonzalez	Revision	
09/24/14	Daniel McReynolds	Revision	
3/26/15	Daniel McReynolds	Revision	
5/13/15	Brantley Gosey	Revision	
9/8/15	Dennis Patrick	Revision	Michael Pittman
12/2/15	Dennis Patrick	Revision	Michael Pittman
05/18/16	Brantley Gosey	Revision	
05/19/16	Brantley Gosey	Revision	
11/03/17	Brantley Gosey	Revision	
04/02/18	Obaid Rehman	Revision	Michael Pittman
REASON FOR REVISION		AFFECTED PARAGRAPHS	
Required No-PCB labeling		4.0	
Revised tank labeling instructions and test-report instructions		3.6.8, 10.2, 10.3	
04/26/05: Restructured Data Requirements		6.0	
04/26/05: Added Warranty Requirements		10.4	
04/26/05: Corrected Fusing Table		Attachment II	
04/26/05: Updated Sticker Placement Requirement		Attachment IV	
04/26/05: Updated Sticker Requirements		Attachment V	
4/01/09: Changed Loss Requirements		Attachment 1	
7/22/10: Updated Cooper Fuses		Attachment II	
12/29/10: Updated No Load Losses for 250KVA XFMR		Attachment 1	
09/24/14: Added minimum cabinet depth and updated pad sizing		3.6.3, 3.6.8, 3.6.9	
03/26/15: Terminology update, standard listing update, Paint updates, DOE 2016 updates, audit program.		1.1, 2.5, 3.6.6, 3.6.7, 3.6.13, 4.0, 6.1.10, 10.5, 10.6	
05/13/15: Added Lifting Provisions		3.7	
09/08/15 Added New Signage		Attachment IV, & V.	
12/02/15: Added IFD Requirement		Section 3.6.9	
05/18/16: Added welding requirement to lifting points		Section 3.7	
05/19/16: Remove Section 3.7 (Lifting Provisions)		Section 3.7	
11/03/17: Conduit Layout Dimensions & Lifting Provisions		Section 3.6.3, 3.6.14	
04/02/18: Changed Dielectric Fluid		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This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein.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 PADMOUNTED DISTRIBUTION
25 kVA THROUGH 250 kVA**

1.0 SCOPE

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, natural ester fluid, pad-mounted compartmental type, dead front transformers, rated 25 kVA through 250 kVA at 65° degrees C temperature rise above ambient.

1.2 Classification

1.2.1 No deviations from these specifications on the part of the manufacturer 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 that specifically covered in this specification, shall be in accordance with the latest revisions of the following standards:

2.1 IEEE C57.12.00

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

2.2 ANSI C57.12.25

Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage, 34,500 GrdY/19,920 Volts, and Below; Low Voltage, 240/120 Volts; 167 kVA and Smaller Requirements

2.3 IEEE C57.12.28

Pad-Mounted Equipment - Enclosure Integrity; All characteristics, definitions, and terminology, except that specifically covered in this specification shall be in accordance with the latest revisions of the following standards: ANSI C57.12.00, NEMA TR-1

2.4 IEEE C57.147

Acceptance and Maintenance of Natural Ester Fluids in Transformers

2.5 DOE CFR Title 10, Volume 3, Chapter II, Subchapter D, Part 431, Subpart K

Distribution Transformers

3.0 FUNCTIONAL REQUIREMENTS

3.1 Voltage and kVA Ratings

The voltage ratings shall be in accordance with the following table:

Transformer Rating	HV BIL (kV)	LOW VOLTAGE	LV BIL kV
12470GRDY/7200	95	240/120	30

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 I. All units, exceeding the maximum guaranteed losses will be rejected. There is no additional tolerance allowed on these values.

3.3 Temperature Rise Limits

All materials used shall be of the 65°C (85° C Hot Spot) Class and be thoroughly tested for compatibility with all transformer components. All transformers shall be type OA self-cooled.

3.4 Core and Coil

3.4.1 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.

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

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

3.4.4 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.

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

3.4.6 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. The HV lead length shall be sufficient to allow for 3.0" withdrawal of the bushing well from the initial front plate position prior to disconnecting.

3.4.7 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.

- 3.4.8 Low Voltage (LV) bushing leads shall be cold or thermally welded, where joined to the winding material.
- 3.4.9 Aluminum low voltage leads shall be connected to their bushings, with hardened aluminum connectors which have been cold or thermally welded to the leads.
- 3.4.10 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.

3.5 Bushings

- 3.5.1 The high voltage bushing wells shall have removable studs and shall be Central Maloney, Part Number 70191972 or AE Engineer approved equal. Bushing wells shall be for a round removable stud bushing. The bushing arrangement shall be Type 1 as shown in Figure 1 of ANSI C57.12.25.
- 3.5.2 The low voltage section shall include three fully insulated secondary bushings for connecting the secondary windings for series operation. The secondary terminals shall be threaded copper studs, 5/8" x 11 for 25-75 kVA and 1" x 14 for 100-250 kVA transformers. The low voltage bushing arrangement shall be Type 1 as shown in Figure 1 of ANSI C57.12.25.
- 3.5.3 All HV and LV bushings shall be constructed and attached to the tank in such a manner that no loosening of the bushings shall result from normal installation practices.

3.6 Tank

- 3.6.1 A top-hinged door shall be provided. The door hinges shall be stainless steel. Flip top weather covers shall have at least 4 degrees of slope design to shed water. Water ponding on the flip top weather cover is not permitted.
- 3.6.2 An insulating barrier shall be provided between the high voltage and low voltage cable termination areas.
- 3.6.3 The primary/secondary connection side of the transformer shall have a minimum cabinet depth of 14 3/4" from the edge of the sill flange to the primary/secondary connection wall and minimum cabinet width of 30".
- 3.6.4 In addition to regular padlocking provisions, the door shall be secured by a recessed, captive, pentahead bolt.
- 3.6.5 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 C57.12.28 requirements.
- 3.6.6 Most oil restraining welds shall be horizontal and preferably robotically applied to limit weld oil leak and corrosion incidence.
- 3.6.7 The transformer tank shall be of rectangular shape and shall only have internal bracing for structural rigidity to prevent external corrosion, reduce external welding and improve paint coverage, with the exception of units with cooling radiators. External bracing is not allowed.

3.6.8 Enclosure Security

The enclosure security shall be as per IEEE C57.12.28.

3.6.9 Pressure Relief Valve

All transformers shall be equipped with a resettable device (which can be reset by trained personnel only) which detects and provides an 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.

3.6.10 Tank grounding provisions shall be in accordance with ANSI C57.12.25.

3.6.11 Transformers shall have dimensions which allow them to fit appropriately on 60" x 60" concrete pad.

3.6.12 The Vendor shall place all labels required by AE Distribution Construction Standard #1000-13, and shown in Attachments IV and V, on the cabinet doors of each transformer. This includes the "HIGH VOLTAGE SIGN," "SIZE kVA," "ONE-CALL SYSTEM" "CLEARANCE REQUIRED," and "NO PCBs" labels.

3.6.13 Paint Requirement

The transformer shall be painted with rust-resistant paint. The unit shall be painted Munsell Number 7GY 3.29/1.5 pad-mount green. The paint coating system shall be in compliance with IEEE C57.12.28. Coal Tar Epoxy coating or any tar based coating system, shall not be accepted.

3.6.14 Lifting Provisions

The transformer cabinet shall be manufactured with recessed welded nut and detachable bolt lifting provisions. The recessed welded nut and detachable bolt shall be sized to adequately support the weight of the transformer when being lifted safely. There shall be a minimum of two recessed welded bolt provisions, one for each side of the transformer. The lifting provisions shall be located such that the transformer can be lifted safely and effectively. Each detachable bolt shall come tightened into the recessed welded nut on the transformer cabinet.

4.0 **TRANSFORMER DIELECTRIC OIL**

The dielectric fluid shall be a mineral oil, electric insulating and cooling liquid. The coolant shall be a listed less-flammable fluid meeting the requirements of National Electric Code Section 450-23 and the 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 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.

5.0 **PROTECTION**

- 5.1 High voltage protection shall be a Bay-O-Net type draw out the fuse in a flapper valve holder. Fusing shall be dual sensing, or an approved equal, in series with an internal partial range current limiting fuse.
- 5.2 Bay-O-Net fuse shall be externally replaceable by simple hot stick withdrawal.
- 5.3 Transformers shall be provided with a removable drip shield to catch and hold oil lost during the removal of the Bay-O-Net. The drip shield shall keep oil off the high voltage terminating elbows. The shield shall have no sharp metallic corners and be designed for easy draining when desired.
- 5.4 Fusing shall be in accordance with Attachment II.

6.0 DATA REQUIREMENTS

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

- 6.1 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:
 - 6.1.1 Serial Number
 - 6.1.2 kVA Rating
 - 6.1.3 Voltage Rating
 - 6.1.4 Core (Iron) losses at rated load, corrected to 85°C
 - 6.1.5 Copper losses at rated load corrected to 85°C
 - 6.1.6 Percentage (%) impedance
 - 6.1.7 Exciting current at 100% rated voltage
 - 6.1.8 Percentage (%) regulation at 80% power factor and rated load
 - 6.1.9 Exciting current at 100% rated voltage
 - 6.1.10 Gallons of natural ester dielectric fluid used in the transformer
 - 6.1.11 Percentage (%) efficiency @ DOE efficiency criteria

6.2 The following items shall be provided in a yearly report with every first shipment of every year:

- 6.2.1** Drawings
- 6.2.2** Total transformer weight, filled with oil and with arrester mounted
- 6.2.3** Winding Material
- 6.2.4** Core Material
- 6.2.5** Conductor temperature at rated load (Design Test)
- 6.2.6** Hot Spot temperature at rated load (Design Test)
- 6.2.7** Top Oil temperature at rated load (Design Test)
- 6.2.8** Thermal time constant (Design Test)
- 6.2.9** Short-Circuit Withstand Capability (Design Test)
- 6.2.10** Exciting current at 110% rated voltage (Design Test)
- 6.2.11** Radio Influence Voltage (RIV) at 110% rated voltage (Design Test)

7.0 NAMEPLATE

A stainless steel or anodized aluminum instruction nameplate shall be located at a convenient spot on the inside of the low voltage compartment and shall be readable with cables in place. The nameplate of the transformer shall be in accordance with IEEE C57.12.00, Table 10 (Nameplate A). The following additional information shall also be provided on the nameplate:

- 7.1** Bar Code (§ 8.0)
- 7.2** PCB content (No-PCB or Less than 1PPM)

8.0 PERMANENT BAR CODE

The bar code shall be in accordance Attachment III 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

9.0 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.

10.0 OTHER REQUIREMENTS

- 10.1** The Vendor shall provide five (5) references of Manufacturer's current customers [address (es), name(s), and telephone number(s)].
- 10.2** The Vendor shall provide the information in Section 6 (numerical values 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-1581) the Vendor is referencing and the type of transformer (Padmount).

- 10.3** Prior to delivery, the vendor shall provide Austin Energy certified factory test reports for all transformers. These reports shall be sent to the AE Distribution Standards Engineer. Failure to provide these reports may result in the rejection of the shipment.
- 10.4** 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 reasonably 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.
- 10.5** 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 Program 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.
- 10.6** In addition to inspections and tests on incoming raw material, parts, sub-components, and sub-assemblies, the manufacturer shall have a finished product quality audit program to assure a well-designed, safe, reliable and durable finished product. Records shall be kept to determine the level of quality of products being manufactured and be made available to the Company upon request.

ATTACHMENT I

MAXIMUM GUARANTEED TRANSFORMER LOSSES

Transformer (kVA)	No-Load Losses (Watts)	Load Losses (Watts)	Impedance (%) @ 85° C
25	71	228	2.3
50	105	404	2.3
75	167	456	2.5
100	181	683	2.5
167	248	1234	3.0
250	453	1555	3.0

ATTACHMENT II

**TRANSFORMER FUSING
 FOR
 SINGLE-PHASE DISTRIBUTION TRANSFORMER**

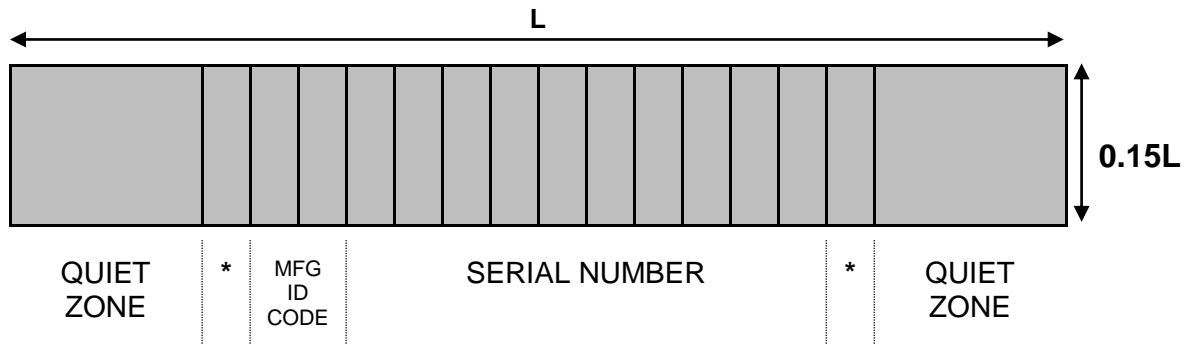
Transformer (kVA)	Bay-O-Net Fuse (Cooper)	Fuse Amp Rating	Partial C/L Fuse	
			Cooper	Hitech
25	4000358C05 (Dual Sensing)	8	3543040M61	HTDS232040
50	4000358C08 (Dual Sensing)	15	3543080M71	HTDS232080
75	4000358C10 (Dual Sensing)	25	3543065M61*	HTDS332125
100	4000358C10 (Dual Sensing)	25	3543080M71*	HTDS332150
167	4000358C12 (Dual Sensing)	50	3543080M71*	HTDS332150
250	4038361C03CB (High Amp Overload)	65	3543080M71*	HTDS332150

*Two fuses are required in parallel.

ATTACHMENT III

BAR CODING AND MANUFACTURING CODES FOR SINGLE-PHASE DISTRIBUTION TRANSFORMERS

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
CM	–	Central Maloney
CP	–	Cooper
GE	–	General Electric
HI	–	Howard Industries
KU	–	Kuhlman

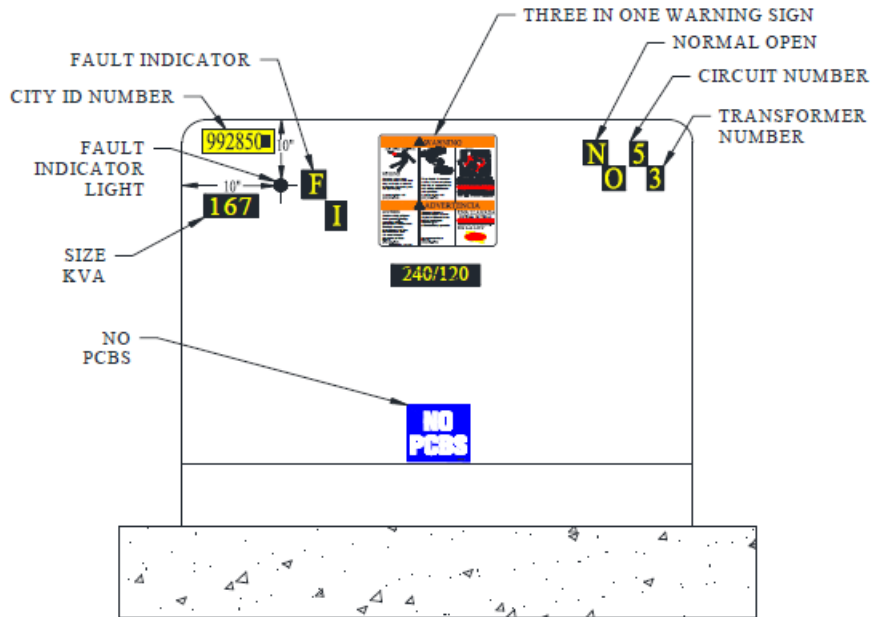
ATTACHMENT IV

SIGNAGE FOR SINGLE-PHASE PAD-MOUNTED TRANSFORMERS (AE DIST. CONST. STANDARD #1000-13)

1000-13A	GENERAL INFORMATION	
Sheet 1 of 1	ENGINEERING NOTES AND SIGNAGE	
05/15/06	SIGNAGE-PAD MOUNT 1PH	Rev: 7/30/15

1000-13A SIGNAGE-PAD MOUNT 1PH

TYPICAL SIGNAGE PLACEMENT FOR 1 PHASE TRANSFORMER



**1 PHASE PAD MOUNTED
 TRANSFORMER LID/DOOR SIDE**

ATTACHMENT V

TYPICAL EXTERNAL SIGNAGE MATERIAL REQUIREMENTS OF SINGLE-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. 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.

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

“3 in 1” decal: Dimensions will be approximately 10” wide X 10.5” tall. Sign shall be worded as follows: 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 (polyvinylfluoride). 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 peeling for 15 years or they will be replaced in the field free of charge.

Approved Manufacturer or equal: Electromark, part number AUS028-W-PT-BC4 Rev. 1.