SPECIFICATION NUMBER ENG97-04

SPECIFICATION

FOR

SINGLE-PHASE PAD-MOUNT

DISTRIBUTION TRANSFORMERS

167 KVA AND SMALLER

REVISED September 21, 2000

LAKELAND ELECTRIC

ELECTRIC SYSTEM ENGINEERING

LAKELAND, FLORIDA

INFORMATION FOR PURCHASING:

THIS SHEET NOT TO BE INCLUDED IN THE REQUEST FOR QUOTATION

1.0 Items which must be stated in the Request for Quotation

1.1 Size of transformer(s) in KVA. (Section 1.1)

1.2 Rating (Section 2.1 and 2.3)
High voltage and low voltage

1.3 Tap changer - if required (Section 2.2)

SPECIFICATIONS

1.0 SCOPE

1.1 This specification provides for furnishing single-phase, 60 hertz, dead-front, pad-mount (loop-feed), compartmental type, self cooled, mineral oil immersed transformers, 167 KVA and smaller. SIZE SHALL BE SPECIFIED IN THE REQUEST FOR QUOTATION.

1.2 All characteristics, definitions and terminology except as specifically covered in this specification, shall be in accordance with American National Standards Institute (ANSI) C57.12.25 latest revision, and all specifications referenced therein.

2.0 RATINGS

2.1 The high voltage, AS SPECIFIED IN THE REQUEST FOR QUOTATION, shall be:

a. 12470 GRD Y/7200 volts

2.2 IF A TAP CHANGER IS SPECIFIED IN THE REQUEST FOR QUOTATION, it shall have two (2) 2 1/2% taps above and two (2) 2 1/2% taps below stated primary voltage. All taps shall be rated for full transformer KVA and shall be set on stated primary voltage when shipped. The tap changer shall be operable from the primary compartment.

2.3 The low voltage, shall be 240/120 volts.

3.0 INSULATION LEVEL

3.1 The high voltage insulation shall be 15kV class and shall have a minimum basic impulse level (BIL) of 95kV.

3.2 The low voltage insulation shall be 1.2kV class and have a BIL of 30kV.

4.0 IMPEDANCE VOLTAGE

4.1 The percent Impedance Voltage, as measured on the rated voltage connection, shall be as follows:

KVA RATING	IMPEDANCE RANGE	
	MINIMUM	MAXIMUM
25-75	1.50%	3.00%
100-167	1.60%	3.00%

5.0 AUDIBLE SOUND LEVELS

5.1 Transformers shall be so designed that the average sound level will not exceed the following values specified by the National Electrical Manufacturers Association (NEMA)

Standard TRI-Part 0, latest revision, when measured at factory in accordance with conditions outlined in NEMA Standard TRI-Part 9, latest revision.

6.0 TESTING

6.1 Routine tests on all transformers shall be made as specified in ANSI Standard C57.12.00 latest revision. ANSI Standard Test Code C57.12.90 shall be followed for all testing procedures.

6.2 A certified test report (1) shall be provided to the T&D Engineering Supervisor of Electric System Engineering of Lakeland Electric at 501 E Lemon Street, Lakeland, Florida 33801, on each unit prior to payment to vendor. This report shall include the following test data:

a. Percent impedance at 85 degrees C.
b. Percent excitation current .
c. Excitation loss at 85 degrees C and 100% rated voltage expressed in watts.
d. Load loss at 85 degrees C and rated load expressed in watts.

6.3 Prior to the manufacture of transformers, the manufacturer shall submit certified test results that the transformer design to be manufactured for Lakeland Electric has passed the required ANSI short circuit testing requirements. The results shall be submitted to the T&D Engineering Supervisor at Lakeland Electric for approval.

7.0 CONSTRUCTION

7.1 The pad-mounted transformers shall meet the requirements for tamper resistance as set forth in ANSI Standard C57.12.28, latest revision.

7.2 The construction of the tank shall conform to ANSI Standard C57.12.25, latest revision, with the following exceptions:

a. A one half inch (1/2") captive, spring loaded, penta head bolt of stainless steel or silicon bronze material with NC class two threads, shall be supplied in each transformer. This penta head bolt shall be made captive in a metal cup that is permanently attached to the cover. The nut with NC class two threads shall be attached to the sill in a manner that will allow it to be replaced. The method of containing the nut shall be designed so that it shall not be possible to insert a wire through or around the nut into the cable compartment when the bolt is not in place. A minimum sized hole of one half inch (1/2") shall be provided in the cup for the padlock. The locking mechanism shall be designed so that the penta head bolt must be tightened before the padlock can be installed. The hasp must be positioned so that the lock cannot be installed on it without also engaging the cup. This locking device shall be suitable for locking with a Sterling Junior rotary ring lock with a one quarter inch (1/4") shank.
b. The front compartment shall be easily removable and shall have a safety device to prevent the door from being accidentally removed from its hinges. The front compartment shall have hinges made of 300 series grade stainless steel with a 300 series grade stainless steel hinge pin of 3/8 inch minimum diameter and three inch overall length. The hinges shall be welded and be of 12 gauge or greater.
c. The faceplate of the transformer tank shall be full height and solid so that no opening remains from the bottom of the oil compartment to the base of the transformer.

d. All internal hardware (ie.. clamps, bolts, nuts, bails, etc.) shall be made of corrosion resistant 300 series grade stainless steel.

e. The sill shall be a removable design constructed of 300 series grade stainless steel.

7.3 Lifting provisions on all units shall be 5/8" - 11 threaded flush mounted inserts of corrosion resistant material and so arranged to provide suitable balanced lift for the completely assembled unit.

7.4 All transformers shall be provided with one of the following pressure relief devices:

Manufacturer	Catalog Number
Beta	1712K-3 or 1750K-3
Qualitrol	202-037-01 or 202-030-01

This device shall be located in the upper right hand corner of the secondary voltage compartment.

Units shall be filled with the proper quantity of new or highly refined, non-detectable PCB insulating oil as per latest EPA definition, containing a minimum of 0.2% inhibitor. At the time of installation, the oil shall have a minimum dielectric strength of 26,000 volts. Insulating oil tests shall conform to ANSI Standards C57.106, latest revision.

7.5 Material Safety Data Sheets (MSDS) shall be provided to the City of Lakeland, Electrical Apparatus Shop at 1140 E. Parker Street, Lakeland, Florida 33801 on all oil contained in transformers. A single MSDS will suffice for each entire order provided no changes are made to the oil referenced on the MSDS.

7.6 The high voltage compartment shall have one RTE Flapper Bay-O-Net fuse assembly equipped with the appropriate externally removable oil fuse shown in the Fusing Schedule (Appendix A). Inside each unit, RTE ELSP, Combined Technology SP-Limiter or A. B. Chance K-MATE TL oil submersible back-up current limiting fuses shall be installed as shown on the Fusing Schedule (Appendix A.). They shall be connected before and in series with the Bay-O-Net fuses

7.7 A nonconductive oil drip shield shall be provided beneath the Bay-O-Net fuse to prevent oil from dripping on a primary bushing or terminator when installed on the bushing. The oil drip shield shall be constructed such that it is easily positioned and fastened to the exposed end of the Bay-O-Net holder without removal of the fuseholder. The oil drip shield shall be located such that it does not interfere with the switching operations of the unit. The oil drip shield shall not hold oil captive.

7.8 All 120/240 volt transformers 50 KVA and smaller shall have interlaced secondary design.

7.9 Amorphous Core Transformers are not acceptable.

8.0 BUSHINGS AND TERMINALS

8.1 The high voltage bushings, terminals and parking stands shall be arranged according to ANSI Standard C57.12.25, latest revision.

8.2 The high voltage terminations shall be 8.3/14.4kV - 125kV BIL deadfront, externally clamped, universal type Central Moloney or Cooper Power Systems bushing wells with removable stud. The minimum current carrying capabilities of components for the looped primary cable system shall be 200 amps (continuous) and 10,000 amps symmetrical (momentary).

8.3 The high voltage bushing wells shall be externally replaceable except on those units designed with bolted covers providing access to the internal clamps and connections. On these units the bushings may be internally clamped.

8.4 The high voltage bushings shall have an external clamp with protruding tabs on each quadrant that is sufficient in length and hole size to tie down a superclose feedthrough insert.

8.5 The low voltage line and neutral terminals shall have a 5/8" - 11 copper stud with jam nut for 75 KVA and smaller and a 1" - 14 copper stud with jam nut for 100 and 167 KVA. On 75 KVA and smaller, the stud shall protrude at least 1 1/4 inches beyond the end of the bushing. On 100 and 167 KVA units, the stud shall protrude at least 1 3/4 inches beyond the end of the bushing. The bushings shall be (1) externally replaceable cast epoxy bushings, (2) externally re-placeable porcelain bushings, or (3) on those units designed with bolted covers providing access to the internal clamps and connections, internally clamped bushings may be provided.

8.6 The low voltage neutral bushing shall be fully insulated with a removable copper ground strap or cable connected between the neutral bushing and a ground pad on the outer surface of the tank. This strap shall be sized for the rating of the transformer.

9.0 LABELS AND MARKINGS

9.1 The high voltage bushings and low voltage terminals shall be labeled with the appropriate letters and numbers as indicated in ANSI Standard C57.12.25 and C57.12.28, latest revision. These labels shall be clearly shown adjacent to each bushing in positions which will be visible with cables installed and door open.

9.2 All tap changers shall be labeled with a "De-Energize Before Operating" label.

9.3 The transformers shall be provided with the National Electrical Manufacturers Association (NEMA) "Mr. Ouch" transformer markings. A "warning" label shall be installed on the outside of the transformer near the door handle and a "danger" label shall be installed inside the transformer on the tank wall to be visible when facing into the transformer. The label shall be made of a tamper resistant, durable, highly reflective ten year rated minimum UV resistant film.

9.4 No recommended fuse size or schedules shall be stenciled, stamped or otherwise marked on or attached to the units, except current limiting fusing as described in this specification.

10.0 INSTRUCTION NAMEPLATE

10.1 The instruction nameplate and information thereon shall meet all the requirements as specified in ANSI C57.12.00, latest revision. The month and year of the date of manufacture shall be uncoded and stamped on the nameplate.

10.2 Current limiting fusing shall be shown on the nameplate only.

11. 0 TANK

11.1 The tank surfaces are to be phosphatized or shot blasted to remove oil, dirt, and rust, and to improve the paint to metal bond. The primer shall be a rust resistant coating of 1 mil minimum thickness and to be a color other than the finish coat. The top coat shall be olive green Munsell 7GY3.29/1.5 in color, and applied to a minimum 2 mils thickness. The paint finish shall be smooth, even, and free of any grainy appearance or paint runs. The quality of the paint finish shall meet the following American Society for Testing and Materials (ASTM) environmental and physical tests:

a. Salt fog cabinet test (ASTM B-117, latest revision)
b. Accelerated weathering test (ASTM G-53 & D-523, latest revision)
c. Mandrel flexibility test (ASTM -2794, latest revision)

11.2 A tar base pitch or zinc rich (85% minimum) undercoating, 1.5 mil minimum thickness, shall be applied under the regular finish to the tank bottom and all surfaces that are in contact with the mounting pad for a minimum height of TWO (2) inches; both inside and outside of the tank and sill. The tar base pitch can be applied over the regular finish.

11.3 The coating system shall meet ANSI Standard C57.12.28, latest revision.

12.0 SHIPPING AND ACCEPTANCE

12.1 All units shall be stacked and shipped in such a manner that no chafing or shifting is allowed. Each unit shall be securely attached to a single weather resistant pallet by metal bands or bolts.

12.2 Receipt of the order by the Purchasing Department, City of Lakeland, is not acceptance. Acceptance will be at the option of the T&D Engineering Division of Lakeland Electric.

13.0 EVALUATION

13.1 The economic evaluation will be based on the following evaluation factors for losses.

a. $ 2.61 /watt for excitation loss at 100% rated voltage and 85 degree C.

b. $ 0.60 /watt for load loss at 85 degree C and rated load.

14.0 EXCEPTIONS TO THESE SPECIFICATIONS

14.1 Should the manufacturer wish to make exceptions to these specifications, he shall provide complete written specifications and any supporting drawings on the equipment he is submitting the proposal on. Written approval on any exceptions must be obtained from the T&D Engineering Division of Lakeland Electric.

14.2 After initial approval of a specific design, any design changes shall be approved by the T&D Engineering Division of Lakeland Electric, prior to manufacture.

15.0 LOSS ADJUSTMENT PROCEDURES

15.1 Each manufacturer is expected to supply distribution transformers which do not exceed the quoted values for excitation loss or load loss as described in paragraph 16.5 and as submitted in the bid proposal. Any unit(s) delivered by a manufacturer to Lakeland Electric that possess any parameter outside the quoted values as specified shall, at the option of Lakeland Electric:

a. Be returned to the manufacturer, freight collect, for replacement with unit(s) meeting quoted values.

b. Be retained by Lakeland Electric subject to a loss adjustment charged to the manufacturer. The adjustment shall be equal to the levelized present value of the difference in loss costs (using actual parameter versus quoted parameter) evaluated at the present cost of money for Lakeland Electric over a 20 year period but not to exceed the current price of the unit(s). The adjustment will be based only on losses over the quoted values. Credit will not be given for losses under quoted values. The loss adjustment amount will be deducted from the total invoice and payment made on the balance.

15.2 Any manufacturer who delivers distribution transformers which fail to meet the manufacturers quoted losses may be suspended from bidding on the next fiscal years requirements for which quotes are requested. Any manufacturer who continually or willingly delivers distribution transformer shipments to Lakeland Electric which fail to meet manufacturer's quoted losses, will be deleted as an approved supplier of distribution transformers.

16.0 INFORMATION REQUIRED WITH PROPOSAL

16.1 Unit price FOB Lakeland for each size unit.

16.2 Delivery Schedule.

16.3 Dimensional data on each size unit.

16.4 Weight of each size unit.

16.5 Guaranteed losses as specified in a and b below at 85 degrees C. The average of the losses of the total transformers for each KVA design shall not exceed the quoted values for excitation loss or load loss. The losses of an individual unit in the shipment may not exceed the tolerances specified in ANSI Standard C57.12.00, latest revision.

a. Excitation Loss: The no load power loss of the transformer at 100% rated voltage, expressed in watts at 85 degrees C.

b. Load Loss: The I^2R winding loss of the transformer at rated load, expressed in watts at 85 degrees C.

16.6 Percent impedance at 85 degrees C.

APPENDIX A

FUSING SCHEDULE
SINGLE PHASE PAD-MOUNT
DISTRIBUTION TRANSFORMERS

1 PHASE	7200 VOLT	
KVA	BAY-O-NET	ELSP
5	C03	40
10	C03	40
15	C03	40
25	C05	40
37.5	C08	65
50	C08	80
75	C10	130[3]
100	C10	160[3]
167	C12[2]	200[3]

1. Bay-O-Net Fuses are Dual (load) Sensing RTE 4000358C ___ M or G. E. 9F54LFC ___, unless noted.
2. Bay-O-Net Fuse is Current (fault) Sensing RTE 4000353C ___ M or G. E. 9F54MFC ___.
3. Parallel Fuses.