



1. APPLICATION

Three-phase, oil-filled, self-cooled, submersible transformers are installed in below grade vaults and above grade vault rooms in the EWEB distribution system.

2. REFERENCE STANDARDS

The transformers supplied shall be manufactured and tested according to the latest editions, revisions, and amendments to IEEE C57.12.24, Department of Energy 10 CFR part 431, and all other applicable standards of NEMA, ANSI, and IEEE, except as modified herein.

3. PRODUCTS

A. Voltage Ratings

- 1) The high voltage rating shall be one of the following:
  - a) 12470 Grounded Y/7200 volts
  - b) 12470 Delta Volts.
- 2) The low voltage ratings shall be one of the following:
  - a) 480Y/277 volts
  - b) 208Y/120 volts

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<b>THREE PHASE SUBMERSIBLE TRANSFORMERS</b>	Oct 30, 2014 <b>ES5-6.1200</b>	<b>REV.</b> <b>0</b>
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B. KVA Rating: EWEB standard ratings are 75, 112.5, 150, 225, 300, 500, 750, 1000, 1500, and 2500 KVA. This rating is based on not exceeding a 55°C average winding temperature rise or a 70°C hot-spot conductor temperature rise. The top oil temperature rise over a 30°C ambient temperature shall not exceed 55°C. The transformers shall have a 65°C temperature rise insulation system.

C. BIL Rating: All transformers shall have at least a 95 kV BIL on the high voltage side and 30 kV BIL on the low voltage side.

D. Construction

1) Enclosure

- a) The transformer shall be designed and built to operate underground suitable for occasional submerged operation.
- b) The tank finish shall be resistant to chipping and corrosion resistant.
- c) Provide a gasketed, bolted hand hole on top of tank.

2) High Voltage Terminals

- a) Provide either three high voltage bushings for radial primary cable feed or six high voltage bushings (when required) for loop primary cable feed as required on the request for quotation or purchase order.
- b) Provide primary bushing wells secured with studs or bolts on the outside of the transformer top. No welded or internally fastened bushing wells shall be accepted.
- c) Provide factory installed 200 ampere load break bushing well inserts in all busing wells, Elastimold catalog # 1601A4, or equal. Bushing inserts shall be covered with dust caps prior to shipment.
- d) Provide one parking stand and one (1) high voltage grounding stud provided for each high voltage terminal.

3) Low Voltage Terminals. Provide spade terminals on top of the tank. Each terminal shall be able to continuously withstand 150% of the rated current without overheating.

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- 4) Grounding.
  - a) Provide grounding pads per IEEE C57.12-24. In one tapped hole of each pad provide a bronze vise-type grounding stud with stainless steel hardware, Hubbell Power Systems GC 207 or approved equal.
  - b) All exposed surfaces of the primary terminals shall be at ground potential
- 5) Arresters: Not required.
- 6) Core & Coil Assembly. The core and coil assembly shall be either five legged or triplex construction.

E. Accessory Equipment

- 1) High Voltage Tap Changer.
  - a) Provide primary voltage taps of +/- 5 percent in four 2 1/2 percent steps.
  - b) The tap changer shall be located near the high voltage terminals, with a two (2) inch NPT plug protruding through the cover.
- 2) High Voltage Overload Device.
  - a) Oil cutout, "Bay-O-Net," type fusing shall be provided to transformers up to 1000 KVA, one (1) for each phase. These overcurrent devices shall be capable of interrupting not less than 3000 amps asymmetrical fault current at 8.3 kV. The overload sensing link shall provide protection against overheating of top oil beyond 145°C independent of current magnitude.
  - b) Transformers larger than 1000 KVA shall be protected by the manufacturer's standard procedure. A spare set of fuses shall be provided.
- 3) High Voltage Switch.
  - a) The high voltage switch, when required on the request for quotation or purchase order, shall be an oil immersed gang

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operated two (2) position (radial feed transformer), or four (4) position (loop feed transformer) load break switch (two – two position load break switches are allowed for loop feed transformers). This arrangement shall allow for connection to either one or the other, or both high voltage sources, or to neither (off). The switch positions shall be plainly visible and permanently marked.

b) The switch or switches shall be operable with a hot-line tool and have the following minimum ratings:

- i. 15 kV line-to-line
- ii. 95 kV BIL
- iii. 200 amperes RMS, continuous
- iv. 200 amperes RMS, interrupting at up to a 60% lagging power factor
- v. 12000 amperes asymmetrical momentary (30 cycles) make and latch

4) Magnetic Type liquid level indicator shall be mounted for easy viewing when standing on vault floor.

5) Oil Drain and Fill.

- a) Provide a one (1) inch upper filter press and filling plug.
- b) Provide a one (1) inch, globe type combination oil drain and bottom filter valve with one (1) inch NPT threads, and a pipe plug in the outer end.

6) Temperature Indicator of the top oil shall be mounted for easy viewing when standing on vault floor.

7) Angular Displacement and instruction nameplate shall be located on one side of the tank for easy viewing from vault floor level.

F. Oil:

1) Dielectric fluid shall be natural ester-based that meets the minimum acceptance testing requirements described in the latest edition of IEEE C57.147 Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers. New transformers provided with natural ester-based fluid shall meet the National Electrical Code requirements for less-

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flammable liquid-insulated transformers. Fluid shall be Cargill Envirotemp FR3, or equal.

- 2) Provide a label indicating the transformer is filled with natural ester-based fluid.
- 3) The nameplate shall be stamped certified "NO DETECTABLE PCB. LESS THAN ONE PART PER MILLION PCB". The manufacturer shall provide non PCB certification.

#### 4. TESTS

A. Factory Tests: In addition to the ANSI and IEEE specified tests, each unit shall successfully pass the following tests:

- 1) No load and Load Losses Tests: Each individual transformer manufactured shall be tested for No Load (core) losses at 100% rated voltage, and for load (copper) losses at 85°C and full load current. These tests shall be conducted at the nominal tap setting.
- 2) Full Wave Impulse Test on high voltage terminals at 95 kV, as specified in IEEE C57.12.90.
- 3) Suitable test to verify sealed tank construction.
- 4) Certification that each unit was subjected to and successfully passed all tests as specified shall be forwarded via SMTP email to EWEB Transformer Department not later than transformer shipment.
- 5) A durable test tag, sticker or stamp, shall be attached to each transformer; stating that the transformer, after final assembly, has been tested and is suitable for normal use at rated voltage.

B. EWEB Acceptance Tests

- 1) Upon receipt, all transformers will be inspected for leaks, breakage, or damage, and checked for adherence to EWEB's material specification. All transformers will be turns-ratio-tested and meggered. Transformers failing these tests will be rejected and returned at the supplier's expense.
- 2) EWEB will complete inspections and testing within five (5) business days after delivery of transformers. Transformers will be accepted after they pass inspections and tests.

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3) If EWEB finds goods furnished to be incomplete or not in compliance with the Contract, EWEB, at its sole discretion, may either reject the goods, require Vendor to correct any defects without charge, or negotiate with Vendor to sell the goods to EWEB at a reduced price, whichever EWEB deems equitable under the circumstances.

5. WARRANTY

- A. Provide a warranty period of eighteen (18) months minimum after the date of acceptance.
- B. Unless otherwise stated, all equipment shall be free and clear of any lien or encumbrances and shall be new and the current model and shall carry full manufacturer warranties.
- C. Vendor warrants to EWEB that any transformers furnished will operate and function in the manner represented by Vendor and will achieve the performance stated in the material specification when operating within the design conditions described therein.
- D. Vendor warrants the transformers furnished are free from defects in material and workmanship, and agrees to repair or replace any unit that is unsuitable for operating or fails in operation during normal and proper use, including all parts and labor at no cost to EWEB.

6. PACKAGING AND DELIVERY

- A. EWEB's Transformer Shop shall be notified a minimum of two working days (48 hours) before delivery day. The successful bidder will be given the name and phone number of the Transformer Shop contact person at the time of the award of the contract.
- B. Delivery hours are 9:00 a.m. until 2:00 p.m., Monday through Friday.
- C. All transformers shall be secured to a hardwood pallet rated to support its weight.
- D. Transformers shall be covered during transit to protect them from dirt and grime, either by covered van or tarped open flatbed truck.
- E. Transformers that are delivered in trucks that do not meet the instructions above may be assessed damages and supplier shall be required to correct damage. A

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minimum charge of \$50 per transformer may be assessed for each transformer delivered improperly.

7. SUBMITTALS

A. Submit the information required in Exhibit A.

8. EWEB STORES INFORMATION

A. This material specification shall be used to purchase the material with the following stock codes:

496-0001975 through 496-0001986

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**EXHIBIT A**

**SPECIFIC INFORMATION REQUIRED WITH BID  
THREE PHASE SUBMERSIBLE TRANSFORMERS  
(Submit Separate Sheet for Each Item)**

Manufacturer: \_\_\_\_\_

KVA \_\_\_\_\_ High voltage \_\_\_\_\_ Low voltage \_\_\_\_\_

1. No load losses at 100% rated voltage  
(Core losses) \_\_\_\_\_ watts
2. Load losses at 85°C and full-load current  
(Copper losses) \_\_\_\_\_ watts
3. Number of Primary Bushings \_\_\_\_\_
4. Impedance \_\_\_\_\_ %
5. Quantity of oil per transformer \_\_\_\_\_ gal.
6. Total weight with oil \_\_\_\_\_ lbs.
7. Limiting overall dimensions:  
    Height \_\_\_\_\_ inches  
    Width \_\_\_\_\_ inches  
    Depth \_\_\_\_\_ inches
8. Type of tank material and thickness \_\_\_\_\_ inches
9. Type of finish \_\_\_\_\_
10. Tap changer voltage steps \_\_\_\_\_ %

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