

<p>Issued 04-Apr-01</p> <p>Revised 10-Oct.-07</p>	<p>MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION</p> 	<p>M3902</p> <p>Revision #2 Page 1 of 8</p>
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M3902

\*\*\*\*Supersedes BECo Standard E2.12-2.12 and ComElectric Spec 6-0895\*\*\*\*

**SINGLE PHASE PAD-MOUNTED  
DISTRIBUTION TRANSFORMERS**

**1.0 General Requirements**

- 1.1 These specifications cover single-phase deadfront pad-mounted transformers that shall be mineral oil filled, Class OA, 60 Hertz, 65°C average winding temperature rise.
  - 1.2 Transformers furnished under these specifications shall conform to the applicable portions of the latest version of ANSI Standard C57.12.25, except where otherwise specified herein.
  - 1.3 Sound levels for transformers shall meet NEMA TR1, latest revision.
  - 1.4 No changes shall be made in any way that would affect agreement with these specifications after transformer designs have been approved by NSTAR Electric (the Company). No transformer shall be furnished or accepted unless the details of such proposed changes have first been submitted in writing and approved by the Company. Failure to comply with these terms may result in complete or partial removal from the approved supplier list.
  - 1.5 Any exceptions to these specifications shall be clearly indicated with price quotations. Approval drawings shall be submitted upon request.
  - 1.6 Unless otherwise specified on purchase order, transformer warranty must be for a minimum period of one year from date of installation or 18 months from the date of receipt, whichever occurs first. Written warranty policy must be on file with NSTAR Electric's Purchasing Department.
  - 1.7 All units shall have the following additional information on their nameplate: year of manufacture, total weight with oil and volume of oil (in gallons).
  - 1.8 All units shall meet the minimum efficiencies in Table 2 of NEMA Publication TP-1, latest revision, or DOE's final ruling of 10/12/07 as called for on the purchase order. Transformer test reports shall be provided upon request.
  - 1.9 NSTAR North and NSTAR South designs may be distinguished by voltage or characteristic code. The primary voltage for NSTAR North units is either 13800GY/7970 (code 281) or 13800GY/7970 x 4160GY/2400 (code 282). All other voltages and characteristic codes are NSTAR South units.
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## 2.0 Construction

2.1 **NSTAR North** units shall be Type 2 connector and terminal arrangement. **NSTAR South** units shall be Type 1 connector and terminal arrangement with 15.2 kV dimensions applying, regardless of primary voltage.

2.2 All high and low voltage bushings shall be field replaceable.

2.3 High Voltage Bushings:

- A. High voltage connectors shall be externally clamped bushing wells with replaceable stud.
- B. NSTAR North – 15 kV class bushing well inserts shall be installed and properly torqued into each bushing well.  
NSTAR South – Units with a primary voltage of 13200GY/7620, either straight or dual voltage, shall be provided with 15 kV class bushing well inserts, installed and properly torqued.
- C. Inserts shall have grounding tabs bonded to tank ground connector using #14 AWG solid copper wire.
- D. All NSTAR North units shall be arranged for loop feed. All NSTAR South units shall be either loop or radial feed arrangement as detailed in the ordering specifications on the purchase order.
- E. For NSTAR South units: All HV bushings, regardless of primary voltage, shall be spaced for 15.2 kV.

2.4 Low voltage terminals:

- A. Low voltage terminals shall consist of a stud in accordance with Figure 4c of C57.12.25. Each stud will have a jamb nut except the neutral shall have tank ground strap secured between two nuts. Each stud will have a minimum of 1 ½” of available thread beyond the jamb nut(s).
- B. Company approved quick disconnect bus bar connectors with clear insulating cover will be provided – Utilco # PTF6-350CJNUP (thru 50 kVA), Utilco # PTF6-500-CJNUP (above 50 kVA) or approved equivalent.
- C. Low voltage neutral terminal shall be a fully insulated bushing.

2.5 Dimensional requirements for NSTAR North units: Dimension A in Figure 2a of C57.12.25 shall be a minimum of 16” and Dimension D in Figure 2a shall be a minimum of 4”. The base dimensions, including sill, shall be restricted to the following ranges: 32”-37” (side to side) and 34”-42” (front to back).

2.6 The impedance, including manufacturing tolerance, shall be 1.6-2.6%.

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2.7 Enclosure integrity shall meet or exceed requirements of the most current ANSI C57.12.28. Transformer doors are to be equipped with stainless steel hinges and pins that are not externally removable. A captive, recessed ½” stainless steel penta-head bolt shall be supplied that can be secured with a padlock. Threaded bolthole or captive nut shall be stainless steel.

2.8 Sill shall be stainless steel.

2.9 Tamperproof knockouts shall be provided in the sill. Design of the knockout shall be such that the knockout hole can be resealed after use.

2.10 All bolts, nuts, clamps and other hardware not exposed to the weather must have corrosion resistant electroplating.

2.11 Lifting bolts shall be installed by the manufacturer into recessed, stainless steel nuts welded to the tank.

2.12 The paint color shall be Green (Munsell Notation 7GY3.29/1.5). Final finish shall exceed the requirements of ANSI C57.12.28 with a minimum dry film thickness of 4 mils on all surfaces and seams. All compartment and transformer surfaces in contact with the pad shall be treated to minimize corrosion.

2.13 Coastal Zone Design transformers shall have tanks, sills, hinges, clamps and all other hardware fabricated of Type 304L stainless steel.

### **3.0 Accessories**

3.1 Transformer taps, if required, will be detailed in the ordering specifications on the purchase order. An externally operated tap changer shall be provided.

3.2 An externally operated, series multiple switch shall be provided on dual voltage units.

3.3 NSTAR North units shall have two parking stands.

3.4 Under oil type heavy duty arresters shall be provided on all units. Dual voltage units shall have arresters sized for the higher primary voltage. See table 1 for arrester ratings.

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Primary Voltage (Phase-Ground kV)	Arrester Class (kV)
2.4	3
4.8	6
7.62	10
7.97	12
13.2 & 14.4	18

Table 1 – Arrester Ratings

3.5 Single voltage unit fusing. See tables 2-6.

- A. For NSTAR North, fusing shall be provided on all units and consist of a hot stick operable Bay-O-Net dual element fuse in series with a partial range current limiting fuse.
- B. For NSTAR South, fusing, when specified, shall be detailed in the ordering specifications on the purchase order and consist of a hot stick operable Bay-O-Net fuse in series with either a partial range current limiting fuse or an isolating link.

3.6 Dual voltage unit fusing. See tables 2-6.

- A. For NSTAR North, fusing shall be provided on all units and consist of a hot stick operable Bay-O-Net fuse in series with a partial range current limiting fuse. The units shall be shipped fused for the higher voltage. For coordination purposes, Table 2 indicates Bay-O-Net fuse size that will be used at the lower voltage.
- B. For NSTAR South, fusing, when specified, shall be detailed in the ordering specifications on the purchase order and consist of a hot stick operable Bay-O-Net fuse in series with either a partial range current limiting fuse (voltages in tables 3&4) or an isolating link (voltages in table 5&6). Units shall not be shipped with fuse cartridge installed. Units shall be shipped with the fuse cartridges (not just the fuse links) for both voltage levels, secured in the primary compartment.

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<b>13,800 Grd Y/7,970 Volts or 4,160 GrdY/2,400 X 13,800 GrdY/7,970 Volts (NSTAR North)</b>		
<b>kVA SIZE</b>	<b>Phase-to-Grd Voltage</b>	<b>BAY-O-NET LINK</b>
25	7970	6A (Cooper 108C04)
50		15A (Cooper 108C07)
100		25A (Cooper 108C09)
167		50A (Cooper 108C12)
25	2400	25A (Cooper 108C09)
50		50A (Cooper 108C12)
100		65A (Cooper 353C14)
167		140A (Cooper 353C17)

Table 2

<b>22,860 GrdY /13,200 or 24,940 GrdY /14,400 Volts (NSTAR South)</b>		
<b>kVA Size</b>	<b>Phase-to-Grd Voltage</b>	<b>BAY-O-NET LINK</b>
25	13,200V	3A (Cooper 358C03)
50		8A (Cooper 358C05)
75		12A (Cooper 108C07)
100		15A (Cooper 108C07)
167		25A (Cooper 108C09)

Table 3

<b>13,200 GrdY /7,620 Volts (NSTAR South)</b>		
<b>kVA Size</b>	<b>Phase-to-Grd Voltage</b>	<b>BAY-O-NET LINK</b>
25	7620	8A (Cooper 358C05)
50		15A (Cooper 108C07)
75		25A (Cooper 108C09)
100		25A (Cooper 108C09)
167		50A (Cooper 108C12)

Table 4

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3.0 Accessories, cont'd

<b>3740GrdY/2160 or 4,160GrdY/2400 or 7620GrdY/4400 or 8,320GrdY/4800 Volts (NSTAR South)</b>		
kVA Size	Primary Voltage	BAY-O-NET LINK
25	2160 or 2,400 Ph – Grd	25A (Cooper 108C07)
50		50A (Cooper 108C09)
75		65A (Cooper 353C14)
100		65A (Cooper 353C14)
167		140A (Cooper 353C17)
25	4400 or 4,800 Ph – Grd	12A (Cooper 108C06)
50		25A (Cooper 108C09)
75		50A (Cooper 108C12)
100		50A (Cooper 108C12)
167		65A (Cooper 353C14)

Table 5

<b>2,400 or 4,800 delta (NSTAR South)</b>		
kVA Size	Primary Voltage	BAY-O-NET LINK
25	2400 Ph – Ph	15A (Cooper 108C07)
50		25A (Cooper 108C09)
75		50A (Cooper 108C12)
100		50A (Cooper 108C12)
167		65A (Cooper 353C14)
25	4800 Ph – Ph	8A (Cooper 358C05)
50		15A (Cooper 108C07)
75		25A (Cooper 108C09)
100		25A (Cooper 108C09)
167		50A (Cooper 108C12)

Table 6

3.7 An internal flapper valve shall be provided for all units with Bay-O-Net fuses. An external drip cup shall be provided to catch excess oil when fuses are removed.

3.8 All transformers must be supplied with two (2) case grounding lugs installed, Anderson #GTCS-34A or approved equivalent.

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3.9 All units will have an automatic pressure relief device with a minimum flow rate of 50 SCFM at 15-psi pressure.

3.10 Hold down cleats shall be provided for anchoring the transformer to a pad.

#### 4.0 Labeling/Marking

4.1 A PCB information statement will be placed either on the transformer's nameplate or on a separate distinct and equally durable label. In addition, a separate company approved, durable, weatherproof, UV resistant ,No-PCB label shall be affixed to the outside of the transformer on the right side of the tank. The label shall read "No-PCB Less than 2PPM" in large bold-type white lettering on a green background.

4.2 A permanent bar code label meeting the latest revision of ANSI C57.12.35 shall be provided.

4.3 Each transformer shall be stenciled with numbers that identify the "KVA-CODE" of the transformer. This is in lieu of the "KVA" only stencil. The "KVA-CODE" shall be designated on the purchase order. Flat black, UV light resistant paint shall be used. The lettering shall be approximately 2.5" high and will be located 3" from the top hinge, towards the handle, centered.

Stenciling Examples: 25-223, 50-213

4.4 Two approved warning decals advising field personnel to vent transformer prior to operating bayonet fuses shall be installed and located on each unit as follows:

- A. Directly to the right of the bayonet fuse location.
- B. Inside the cover, below captive bolt/latching area.

4.5 The manufacturer shall install an external warning label (Electromark # BOS044-W-PT-A72) and an internal danger label (Electromark # BOS045-W-PT-112). Outer label shall be located on the door, above the lock. Inner label shall be located on the tank wall adjacent to the low voltage bushings.

4.6 Each transformer shall be marked with the cat id using durable, weather proof, UV resistant labels or painted stencils. The lettering shall consist of 1 inch high bold black characters. Cat id shall be located above the No PCB label.

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## 5.0 Delivery

- 5.1 Unless otherwise specified on purchase order, all deliveries shall be made in an open top truck. Each unit shall be shipped on a wooden pallet. The stacking of transformers may be cause for rejecting an entire shipment, unless otherwise approved.
- 5.2 All transformers shall be secured to a wooden pallet for forklift unloading and shall be stored and shipped with the proper quantity of approved transformer oil. Paint finish shall be protected from damage due to any steel bands used for shipment.
- 5.3 Transformers are subject to inspection by the Company upon delivery.

Approved by:           Amin Jessa            
Director, Distribution Engineering

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