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C3801

******This standard supercedes BECo CS2.12-2.18, COM/E 4-0835 NE-2 and COM/E 1-0796 NE-13, NE-13A, NE-14**

INSTALLATION OF PRECAST PAD FOUNDATIONS FOR 4KV, 15KV, & 25KV PAD MOUNTED, THREE-PHASE DISTRIBUTION TRANSFORMERS

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1.0 PURPOSE

This standard illustrates the approved construction practices for the installation of precast pad foundations for three-phase distribution transformers up to 2500 kVA installed outdoors.

2.0 BILL OF MATERIALS

Material Description	Catalog ID
Precast Concrete Pad Foundation Pad #1 (Transformers up to 300kVA) Pad #2 (Transformers 500 to 2500kVA)	14706 14715
1/2" Thick Plywood - 60" x 24" (minimum size) 42" x 15" (cutout opening for Pad #1) 54" x 15" (cutout opening for Pad #2)	N/A, See M3801
1-1 1/2" Diameter Crushed Stone	N/A
5/8" x 8' Ground Rod	9229
4/0 AWG Bare Copper Wire	104
1/0 AWG Bare Copper wire	100
4/0 to Ground Rod Connector, 4/0 Wire – Rod	597
Sand/Topping Concrete Mix, Quickrete Product No. 1103 or approved equal	N/A
Sikaflex – 1a Concrete Sealant or equal	N/A
4" Diameter Insulated Grounding Bushing	1188
5" Diameter Insulated Grounding Bushing	1189
#4 AWG Bare Copper Wire	114
Ground Wire Connector – 4/0-1/0, 1/0-#4 Cu	608

3.0 GENERAL NOTES

- 3.1 Prior to backfill **NSTAR inspection** and **approval** of grounding and pad installation **is required**. The contractor shall be responsible for ensuring that NSTAR inspection is scheduled and completed.
- 3.2 The installation (including grounding), using the appropriate precast pad, (based on transformer size, see "Bill of Materials" above) is detailed in Figures 1 & 2. Grounding connection between the ground rods and 4/0 ground wire shall be direct burial rated Hy-Ground compression, Cadweld, or mechanical grounding connectors as approved by NSTAR.

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- 3.3 All Catalog IDs that are “N/A” shall be furnished by contractor.
- 3.4 Ground surface shall be level for at least two feet away from the edge of the pad on all sides. Top of pad shall be 4” min., 5” max. above finished grade.
- 3.5 If possible, avoid locating pad at low points in final grade or on abrupt slopes. A pre-cast retaining wall (Catalog ID 14672) may be required if there is a possibility of equipment being undermined or covered over. Avoid locations likely to be covered by plowed snow or made inaccessible.
- 3.6 Pad shall be set on mechanically compacted 1 - 1 ½” diameter crushed stone (refer to appropriate figure for depth of stone) over virgin or mechanically compacted soil. All deleterious soils including organics, ashes, cinders, shells or frozen materials shall be removed and replaced with suitable backfill before installing the foundation.
- 3.7 For recommended minimum clearances from foundation (pad) to buildings, building openings, landscaping, or traveled ways refer to NSTAR Construction Standard C3802 for Clearance Requirements around Padmounted Electrical Equipment.
- 3.8 A maximum number of eight (8) secondary conduits shall be permitted with conductor sizes up to 750 kcmil copper or aluminum. For installations with more than eight sets of secondary conductors (in parallel), a secondary bus transclosure cabinet is required. The secondary bus transclosure cabinet shall be sized and installed in accordance with the National Electrical Code and state/local requirements. Refer to Figure 3 for location.
- 3.9 When installed the front (door side) of the distribution transformer will cover the pad cutout. Primary cable sweeps shall terminate within the pad cutout below the primary compartment of the transformer (the left side of the pad cutout when looking at the front of the transformer). The secondary conduit risers shall terminate within the pad cutout below the secondary compartment of the transformer (the right side). Refer to Figures No. 1 & 2 for typical positioning of installed conduits within the precast pad cutout.
- 3.10 Plug all conduit ends to prevent moisture and debris from entering conduits prior to transformer installation. Do not install mule tape in new conduits until after the bottom of the cutout is sealed with sand/topping concrete mix per 3.11.

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- 3.11 After pad is installed and set level on the crushed stone with the conduits in place, one inch depth of the crushed stone shall be removed (and properly disposed of) from the entire area within the bottom of the cutout. A sand/topping concrete mix (refer to Bill of Materials) shall be placed within the cutout to seal the bottom as shown in Figures 1 & 2. All conduits shall be sealed with PVC fitted caps before the mix of concrete is placed within the cutout. The sand/topping mix of concrete shall be hand troweled and pitched so that the middle of the cutout bottom is lower than the surrounding edges. The purpose of sealing the bottom of the cutout is to prevent small amounts of leaking and dripping transformer fluids from seeping through the crushed stone beneath the precast pad. A cleanup of small amounts of transformer fluids can be cleaned up more efficiently and less costly within the cutout.
- 3.12 Grounding bushings shall be installed on all primary and secondary conduits. A #4 AWG Bare Copper Wire shall be mechanically connected to all conduit bushings and to the 1/0 AWG Bare Copper Grounding Wires within the cutout as shown in Figures No. 1 & 2.
- 3.13 Around the perimeter of the cutout opening apply a ½” wide x ½” high bead of “Sikaflex-1a” polyurethane elastomeric sealant/adhesive (or approved equal). This caulking material is to be applied ¼” from the edge of the opening. The purpose of this “dam” is to divert small oil leaks away from the cutout out and to the edge of the pad where the leak will be noticed sooner. Allow material to cure before installing diamond plate cover.
- 3.14 Cable pulling mule tape may be installed after all prior steps are complete. Temporary caps may be used until all cable is pulled in, but known spare ducts must be plugged with expanding type plugs that seal against the inner duct wall. Coil all ground wires and mule tape ends inside cutout.
- 3.15 Opening in top section of pre-cast pad shall be completely covered with ½ thick plywood and secured with ½ diameter bolts aligning with the predrilled inserts in the pre-cast pad. Plywood cover shall remain in place until the transformer is installed. Refer to M3801 “Material Standard for Precast Pads” for plate details.

4.0 CONSTRUCTION DRAWINGS

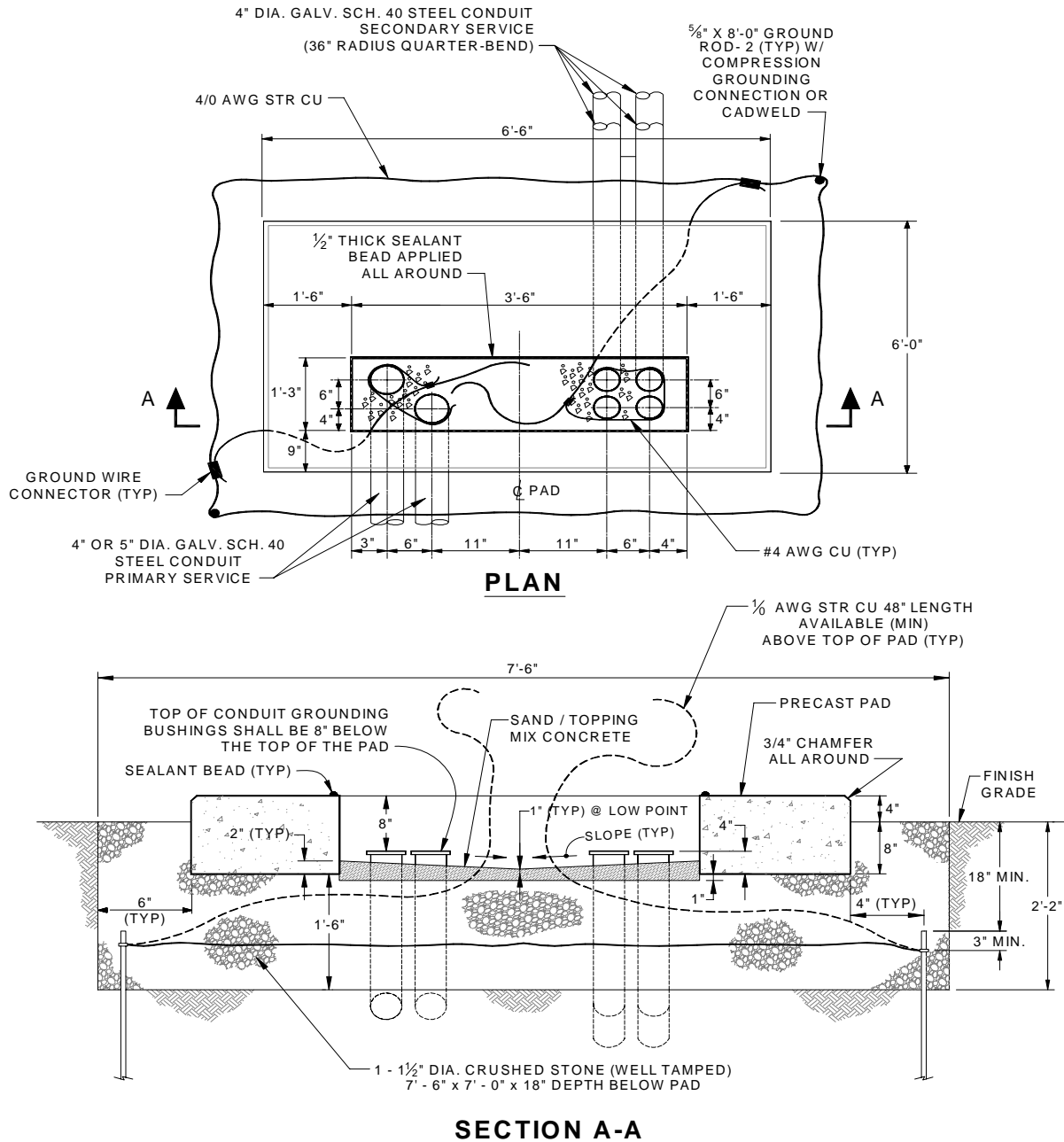


Figure 1 – Pad #1: Three-Phase 75 - 300kVA Transformer Precast Pad Installation & Grounding Detail

Note: Contractor is responsible to obtain NSTAR approval before backfilling conduit and precast pad.

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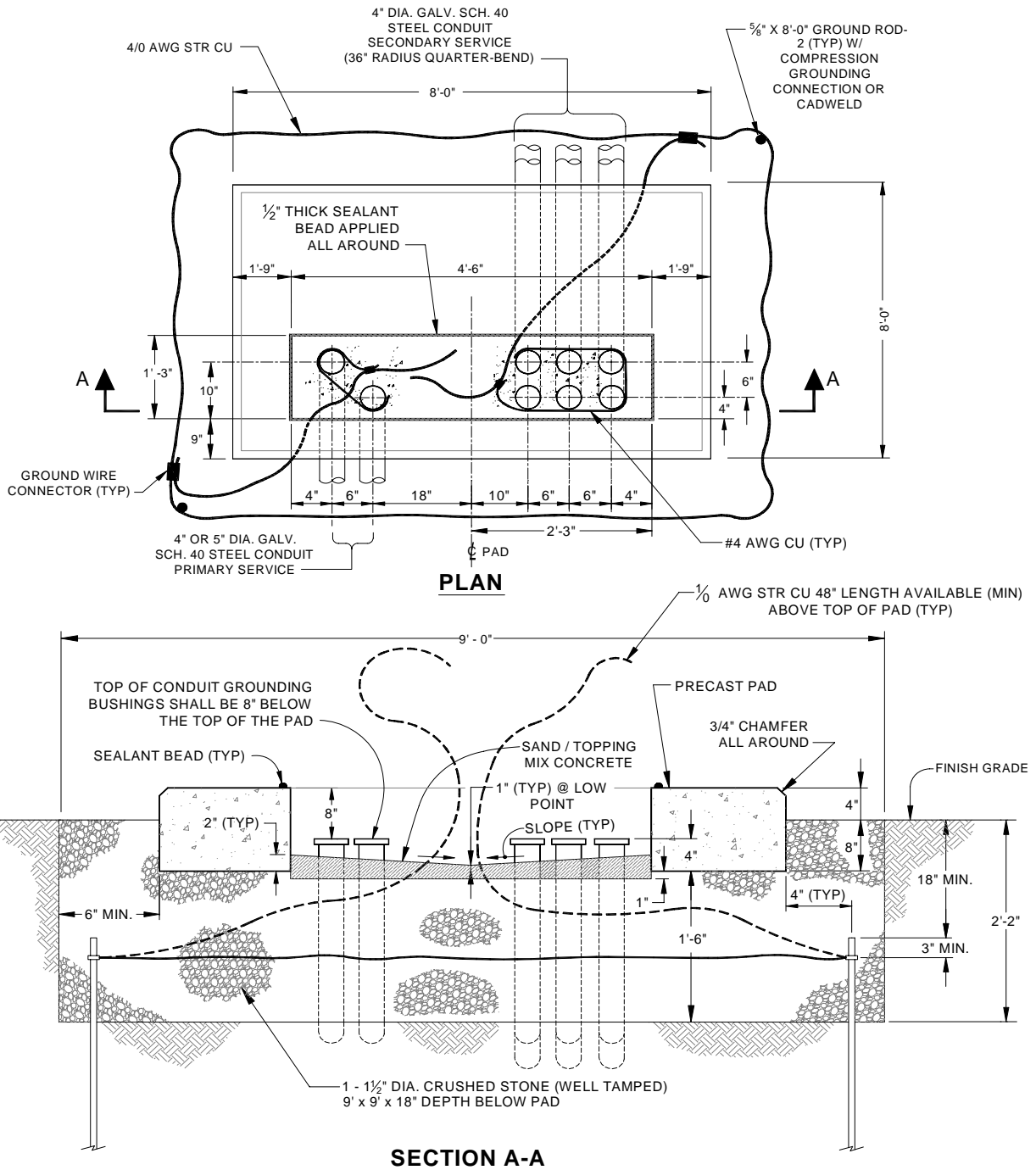


Figure 2 – Pad #2: Three-Phase 500 - 2,500 kVA Transformer Precast Pad Installation & Grounding Detail

Note: Contractor is responsible to obtain NSTAR approval before backfilling conduit and precast pad.

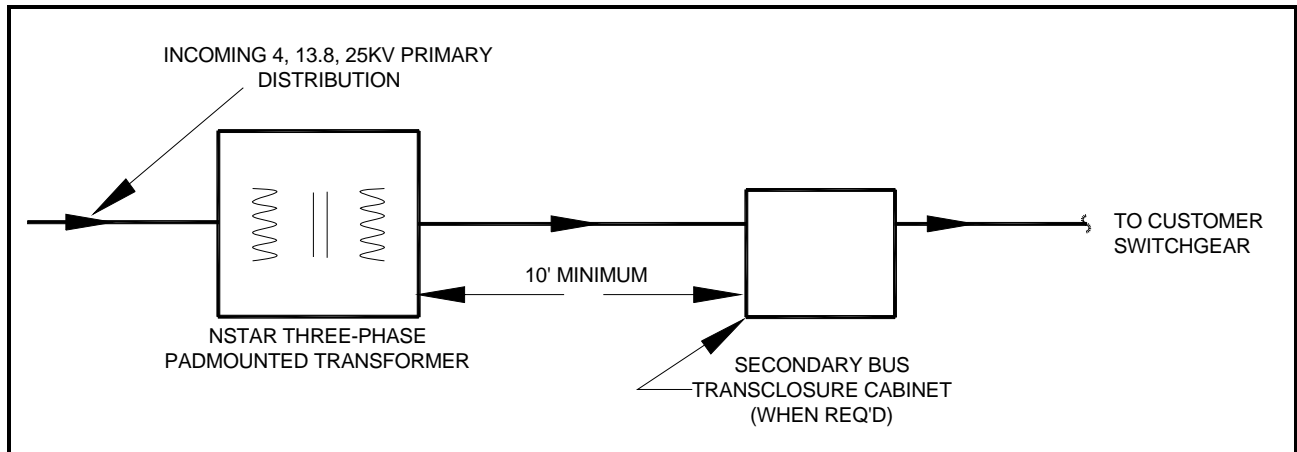


Figure 3 - Transformer Pad and Transclosure Cabinet Detail

5.0 RELATED STANDARDS

- 5.1 M3801 Material Standard for Precast Pads and Covers
- 5.2 M3907 Three Phase Distribution Padmount Transformers 300-2500kVA
- 5.3 C3802 Clearance Requirements Around Padmounted Electrical Equipment
- 5.4 C1100 Distribution Duct Bank Construction and Materials
- 5.5 D3820 200 Amp Underground Distribution Design Standard

6.0 APPROVALS

Approved by: Amin Jessa
 Director, Distribution Engineering