

C3814

******This standard supersedes the following standards of COM/E 4-0835 & COM/E 1-0796; NE-2, NE-5 NE-12, NE-16C & NE-16D, and sections of BECo 2.10-10.3**

INSTALLATION OF HANDHOLES & BOX PADS

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1.0 Purpose

This purpose of this standard is to provide installation methods and materials required for the installation of fiberglass, high density polyethylene (HDPE) or composite (polymer concrete) handholes and box pads. The handholes and box pads may be used for service connections, primary splices, transformer foundations, switching stations, or miscellaneous equipment foundations. All fiberglass box pads shall herein be referred to as box pads.

2.0 Safety

Providing a work environment free of recognized hazards is a value at NSTAR. Therefore, prior to the start of any work, ensure that you are familiar and knowledgeable with any and all NSTAR Safety Rules, Policies and Procedures that are applicable to the work and tasks at hand and perform a job brief at the job site, prior to commencing work.

PPE requirements to protect the worker shall be followed as required in the NSTAR Incident Prevention Manual.

3.0 NSTAR approved Handholes and Box Pads

Figure No.	Page No.	Description & Application (Dimension are for top surface x ht.)	Catalog ID	Compatible Unit
Handholes				
1	7	Fiberglass handhole: 15"x10"x12"	840	NHHPS
1	7	Fiberglass handhole: 23"x14"x15"	9571	NHHPM
1	7	Fiberglass handhole: 30"x17"x18"	841	NHHP
1	7	Composite handhole: 30"x17"x18"	9572	NHHC
Box Pads				
2	9	Fiberglass box pad for 15kV PME-9 Switches manufactured after January 2001: 75"x72"x36" (top opng = 65"x62")	14024	NPDS-F75x72
n/a	n/a	Base fiberglass cover for use with Cat. ID 14024	14078	NFDS-F75x72COV
2	9	Fiberglass box pad for use with older 15kV PME-9 switches manufactured prior to January 2001	1621	NFDS-F69x65x36
n/a	n/a	Base fiberglass cover for use with Cat. ID 1621	1350	NPDS-F69X65COV
3	10	Fiberglass box pad for use with 25kV PME-9 Switchgear: 86"x84"x36" (two pieces)	14556	NFDS-F86-84
n/a	n/a	Fiberglass base cover for use with Cat. ID 14556	14557	NFDS-F86x84COV

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4	11	Fiberglass box pad: 43"x37.5"x32" Use for NSTAR North Single Phase Transformers. Also as base for old compact style Cable Switching Station (CSS) Enclosures (top opening = 26"w x 32"d)	1622	NPDX-FN
4	11	Fiberglass box pad/splice box: 43"x37"x32" Use for NSTAR South Single Phase Transformers (top opening= 26"w x 26"d)	16955	NPDX-FSO
Figure No.	Page No.	Description & Application (Dimension included are top surface x ht.)	Catalog ID	Compatible Unit
4*	n/a	Fiberglass box pad/splice box: 43"x37.5"x15" Use for NSTAR North Single Phase Transformers (shallow depth) or splice box (top opening = 26"w x 32"d) *similar to Fig. 4	7747	NPDX-FNS
n/a	n/a	Fiberglass cover (Use with Cat. IDs 1622 & 7747)	1349	NPDX-F1PCOV
5	12	Fiberglass box pad for single phase primary splice or three phase primary splice (with 3 - #1 AL only): 43"x37.5"x32"	1622	NPDX-FN
6	13	Fiberglass box pad for 3 phase primary splice box: 75"x72"x36" (top opng = 65"x62")	14024	NPDS-F75x72
n/a	n/a	Pad Adapter Plate (15 KV only) to fit new PME-9 switches on old fiberglass bases	14025	n/a
7	14	Fiberglass box pad for use with 15kV PVI-9, SF-6 Switchgear: 102"x60"x36"	15568	NPDS-F60x102
8	15	Single Phase Primary Cable Switching Station, 4 position multitap, 15kV	9533	U2MJCAB – 1PH
8	15	Single Phase Primary Cable Switching Station, 4 position multitap, 25kV	9534	U2HJCAB – 1PH
9	16	Three Phase Primary Cable Switching Station, 3x4 position multitap, 15kV	2590	U2MJCAB – 3PH
9	16	Three Phase Primary Cable Switching Station, 3x4 position multitap, 25kV	9536	U2HJCAB – 3PH
Grounding Accessories				
n/a	n/a	5/8" Dia. Ground Rod	9229	UGN4x4
n/a	n/a	1/0 Copper Ground Wire	100	"
n/a	n/a	Ground Wire Connector, 1/0-1/0 Cu Wire	608	"
n/a	n/a	Ground Rod to 1/0 Cu Wire Connector	9009	"

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4.0 General

- 4.1 This standard references cat IDs (for handholes and box pads) typically required for a specific application, i.e. various handholes and box pads which are used for splicing, pulling, equipment foundation, enclosures, etc. If specific application/equipment requires unique installation details they should be referenced in the specific installation standard or in the NSTAR plans or work order.
- 4.2 The handholes and box pads to be installed shall be approved NSTAR items, refer to list of approved NSTAR items with corresponding Catalog ID's in the Bill of Materials.
- 4.3 Location of handholes and box pads shall be in accordance with NSTAR Standard, "D3820, 200 Amps UDS Design Standard" and NSTAR's "Information and Requirements for Electric Service", latest version. Final approval required by NSTAR before installation.
- 4.4 Do not locate handholes, pads or splice boxes at low points in the final grade, on abrupt slopes, in a paved way, in the line of or close to driveways or where they are likely to be covered by plowed snow or otherwise endangered or made inaccessible.

5.0 Excavation

- 5.1 All excavation shall be done In accordance with this standard and all applicable local and state regulations. When conflicts exist between local/state regulations and this standard the more stringent requirement shall be adhered to unless otherwise directed by NSTAR.
- 5.2 DIG Safe marking and notification regulations are to be understood and adhered to prior and during all construction.
- 5.3 All NSTAR safety standards as well as all applicable OSHA and DOT worker safety requirements shall be adhered to at all in times.
- 5.4 Test pits shall be dug at proposed location for all box pads when the depth of excavation required for installation is greater than 24 inches or if ledge/large rock outcrops are in the immediate vicinity. Test pits shall extend 12 inches beyond the extreme length and width and depth of the proposed pad.
- 5.5 The excavation shall be made to fully accommodate the proposed pad, allowing for a minimum of 12 inches clear all around. The depth of the excavation shall be a minimum of 6 inches (3 inches for handholes)



deeper than the installed underside of the pad to allow for a minimum of 6 inches (3 inches for handholes) of bedding.

- 5.6 Excavated materials, shall be kept at least two (2) feet back from the edge of the excavation cut and shall be piled so as not to endanger the work or restrict, hamper or inconvenience owners or tenants of property or interfere with the normal flow of traffic. All excess materials not suitable for backfill shall be removed and disposed of as directed by NSTAR.
- 5.7 Box pads shall be installed using properly rated lifting equipment (when required), adhering to OSHA work safety methods. The box pads shall be set level on firm well compacted bedding.
- 5.8 Proper clearances shall be maintained around all sides of handholes and boxpads allowing unobstructed access for operation and/or maintenance.

6.0 Concrete Thrust Block

- 6.1 Due to the occasional shifting and movement of the conduit sweeps as cable is pulled through the conduit a concrete thrust block shall be cast-in-place and formed around the conduit sweeps as shown on the corresponding Figures Nos. 2 through 7. The top of the concrete block shall be a minimum of 2 inches below the bottom flange of the box pad.
- 6.2 A ready mix batch of 2500 psi concrete shall be used to form the thrust block which shall be installed as follows:
 - A. Prepare the forms to the dimensions shown in the applicable figure. Make sure all ducts are temporarily capped.
 - B. Carefully place the mixed concrete into the forms to a depth not less than 2 inches below the installed bottom elevation of the fiberglass box pad. This is to allow for the installation of the grounding pig tails which shall be installed over the thrust block and under the box pad.
 - C. Let concrete set a minimum of 15 minutes before backfilling.

7.0 Backfill Material

- 7.1 Backfilling shall not be started until approval from NSTAR has been obtained and once approved, shall be commenced promptly.
- 7.2 Backfill shall be the best of excavated material. All deleterious soils including organics, ashes, cinders, shells or frozen materials shall be removed and replaced with suitable backfill before installing the foundation.

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7.3 Backfill material around the sidewalls of the pad shall be placed in uniform, mechanically compacted layers not more than 12 inches thick.

8.0 Pavement Cuts

8.1 All cuts in bituminous or concrete pavement shall be vertical and made with the proper tools to ensure minimum repaving. The pavement cut shall be straight and uniform.

8.2 Excavated pavement and street base, if any, shall be kept at least two (2) feet back from the edge of the excavation cut and shall be piled so as not to endanger the work or restrict, hamper or inconvenience owners or tenants of property or interfere with the normal flow of traffic. All excess materials not suitable for backfill shall be removed from the job site and disposed of as directed by NSTAR.

9.0 Sod Removal

9.1 Sod shall be removed carefully, when possible, in regular and uniform blocks with sharp edged tools. It shall be placed in uniform piles along the excavation and kept moist until time for relaying. The Contractor shall be responsible for suitable reseeding, if necessary and shall maintain until grass has grown.

10.0 Landscaping Restoration

10.1 Provide sod for grass areas disturbed by construction activity and replace shrubbery and trees damaged, removed or disturbed by construction activity.

10.2 Restore existing grades where disturbed. Sidewalks and paved areas shall be restored to its original (or better) condition. Permanent street paving shall be by the governing municipality.

11.0 General Requirements for installation of Hand Holes

11.1 Refer to Figure 1, page 7 for typical installation details of fiberglass HDPE (high density polypropylene) and composite handholes. Grounding is not required for splices on secondary cables installed within handholes.

A. Types of hand holes. Dimensions are for top by inside depth:

1. Fiberglass or High Density Polyethylene (HDPE) :

15"x10"x12" (inside depth) – cat ID 840 (street lighting only)

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- 23"x14"x14" (inside depth) – cat ID 9571
- 30"x17"x18" (inside depth) – cat ID 841 (standard use)

Fiberglass and HDPE handholes must be installed in unpaved areas, areas not subject to any incidental traffic, traveled ways or sidewalks. These handholes are typically made from a plastic/fiberglass material or similar and shall be installed 2 inches above final grade.

2. Concrete Composite Hand hole:
Concrete composite hand holes are rated for H-20 vehicle load, and are to be used in light traffic or paved areas only (e.g. – parking lots, sidewalks). They are not intended for roadways.

30"x17"x18" (inside depth) – cat ID 9572

B. Application:

This composite handhole is rated acceptable for incidental traffic, (H20 Loading) such as in a driveway, parking lot, or on a sidewalk. It is not rated for constant vehicular traffic, such as would be typical in a public roadway. The composite handhole is made from fiberglass/concrete composite materials or similar and shall be installed flush with final grade.

- 11.2 Covers shall be made of material compatible with its use and securely fastened with a minimum of two penta head bolts.

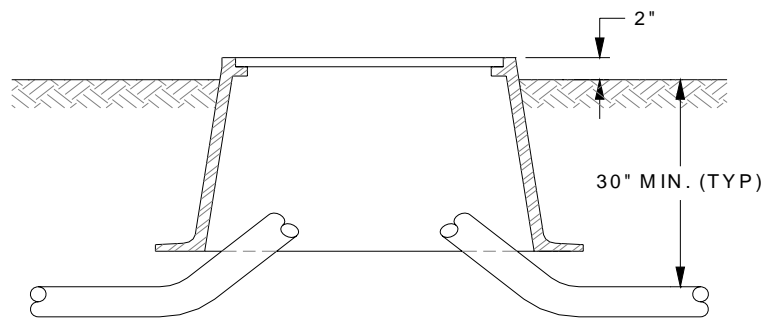


Figure 1 - Typical Handhole Installation

Notes:

1. 3/4" dia crushed stone bedding 6 inch (min) depth below base of handhole.
2. Within paved/sidewalk areas, install top of handhole flush with grade.

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12.0 General Requirements for Installation and Grounding of Box Pads:

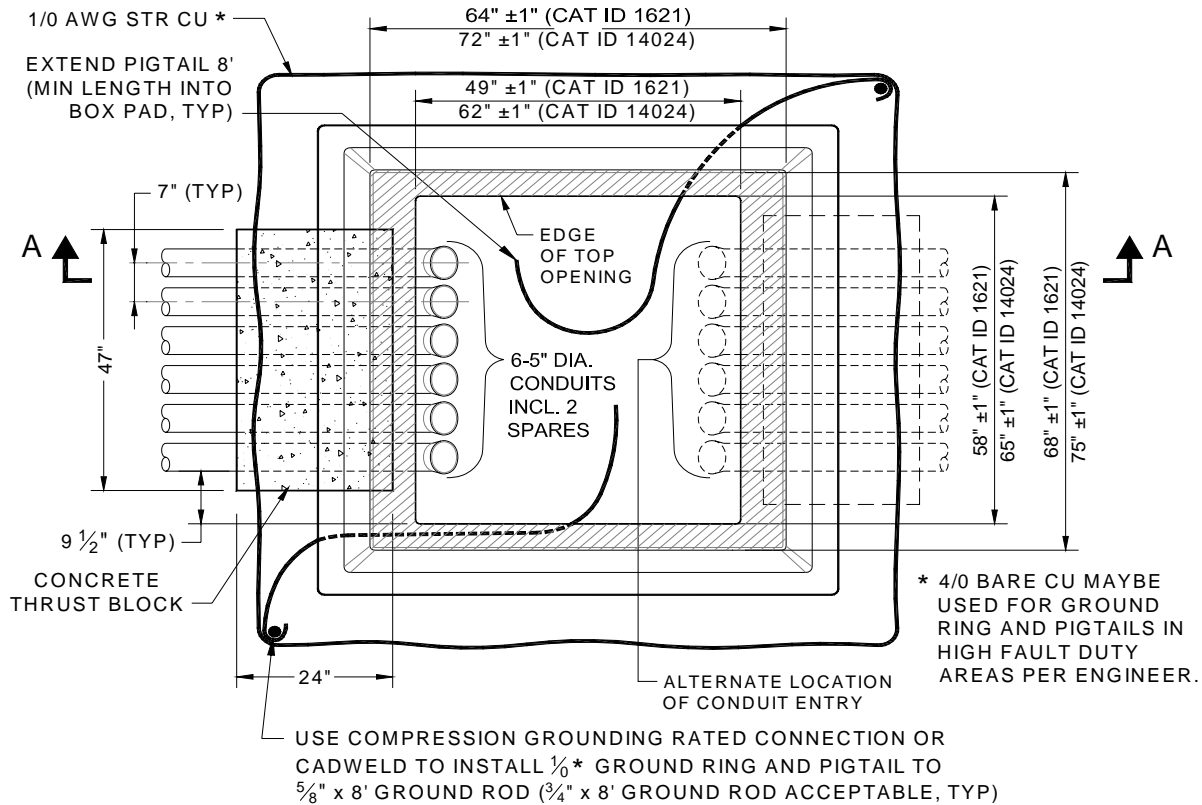
- 12.1 Installation requirements specific to the equipment installed (or how the boxpad is used) shall be as contained within this standard.
- 12.2 All pads enclosing splices or supporting equipment shall be located to allow unobstructed safe access to all sides for operation and safe passage. For guidance on clearance refer to Standard C3802, "Recommended Minimum Clearances from Three-Phase Distribution Transformer Foundation to Building Openings, Landscaping or Traveled Way". Location of all pads shall be approved by NSTAR Inspector before installation.
- 12.3 The box pad's top surface shall be a minimum of 2" (4" maximum) above the surrounding grade. This minimum clearance is needed to open compartment doors. The orientation shall be such that the doors open toward the roadway unless otherwise specified by the engineer.
- 12.4 Grounding of all boxpads require the installation of two 5/8" diameter copperweld ground rods (3/4" diameter acceptable) outside the perimeter of the box pad, 18" min. below grade at opposite corners of the box pad.
- 12.5 A 1/0 AWG copper ground wire shall be fastened to the ground rods by Cadweld or with compression grounding connections. Any connectors used must be bronze/copper, rated for grounding and direct burial.
- 12.6 Locations where conduits have been installed under a proposed pad location shall be inspected to ensure that the backfill over the installed conduit has been thoroughly compacted and firm.
- 12.7 Backfill material to be used for bedding shall be 12 inches (minimum) of 3/4" diameter crushed stone.

13.0 Special Requirements for Installation of 600V Secondary Bus Enclosure

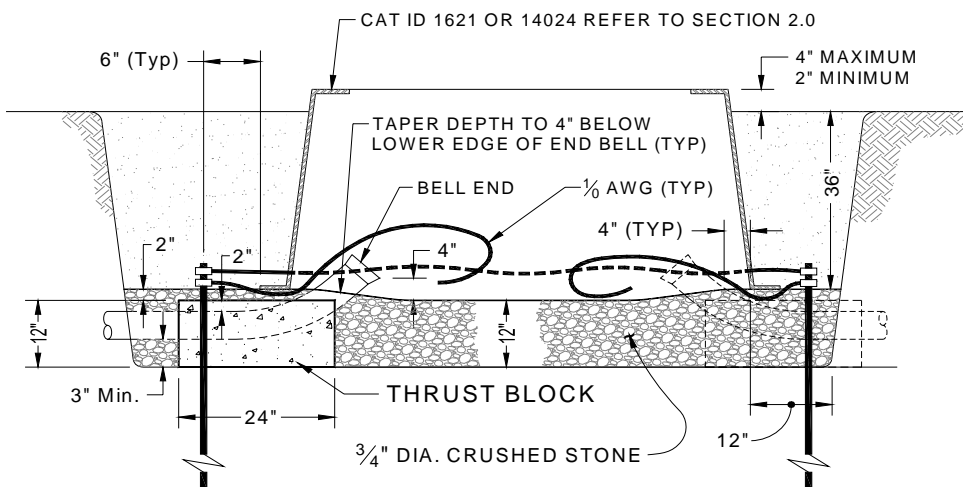
- 13.1 There is no NSTAR specified Catalog ID for the fiberglass box pad to be used for this installation.
- 13.2 The installation requirements of the fiberglass box pad and the grounding requirements shall be similar to the details in Figure 5 of this standard.
- 13.3 Secondary Bus Enclosure (SBE) (reference NSTAR Material Standard M2301) shall be installed on a Fiberglass Box Pad sized to satisfy the manufacturers' dimensional requirements of the structural supporting frame as well as the fiberglass enclosure which houses the secondary bus.



14.0 Construction Drawings

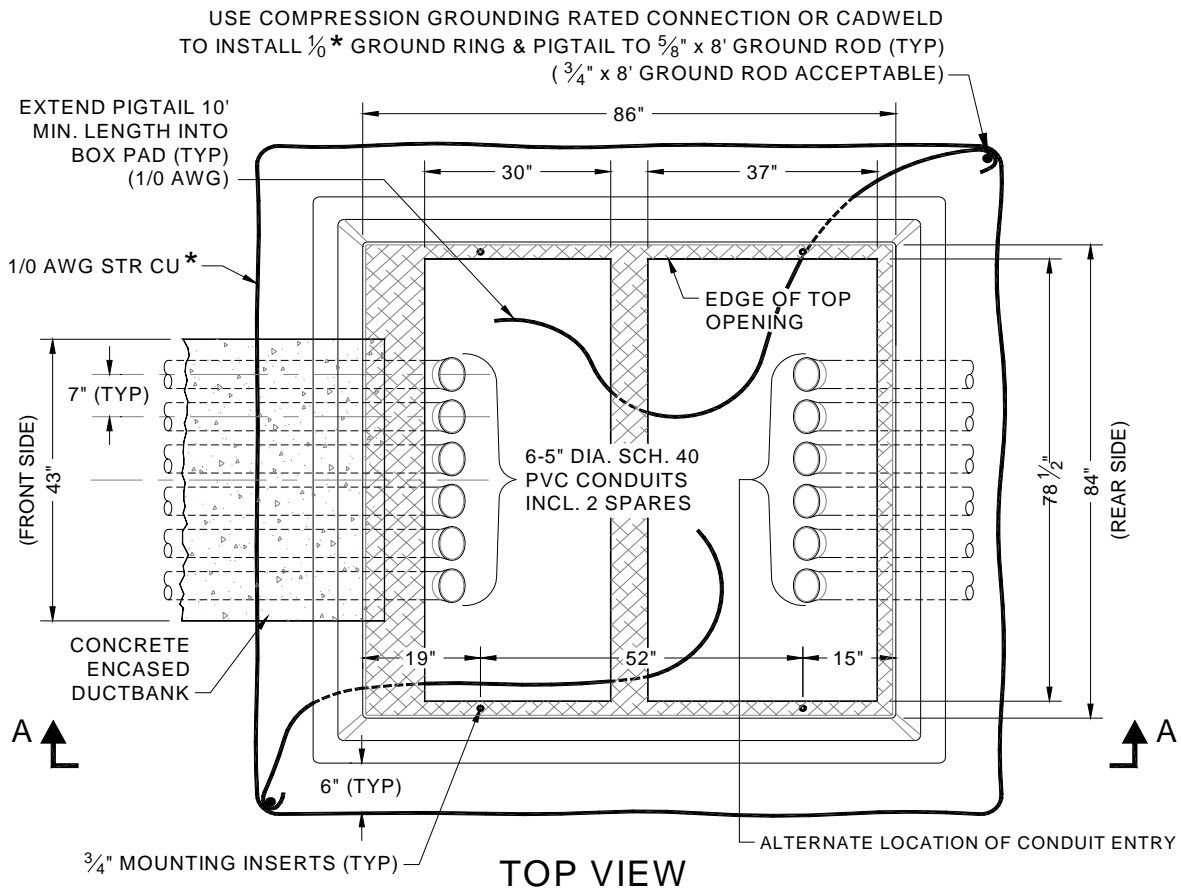


TOP VIEW



SECTION A-A

Figure 2 – Typical Fiberglass box Pad Installation Details to support 15kV PME-9 Switches



* 4/0 BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER

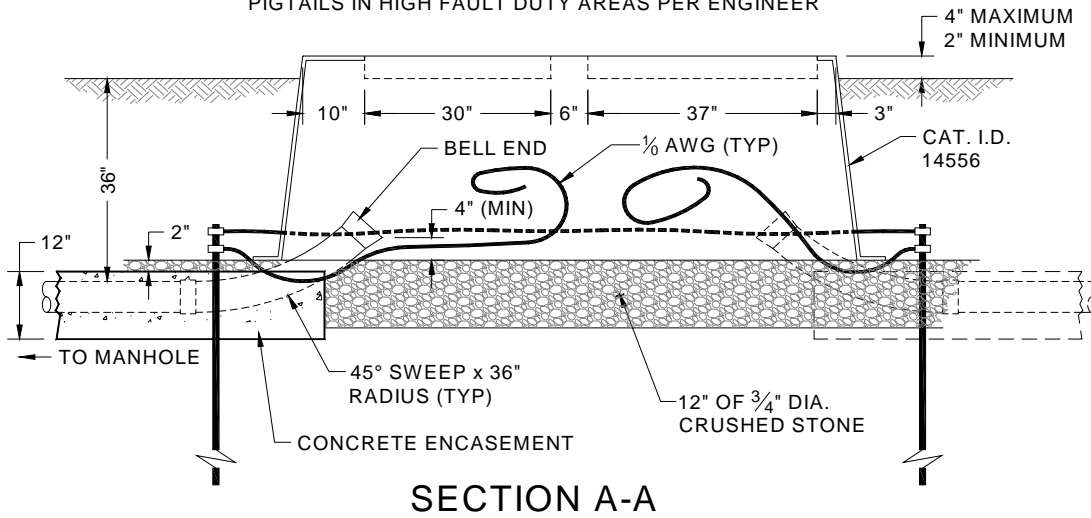
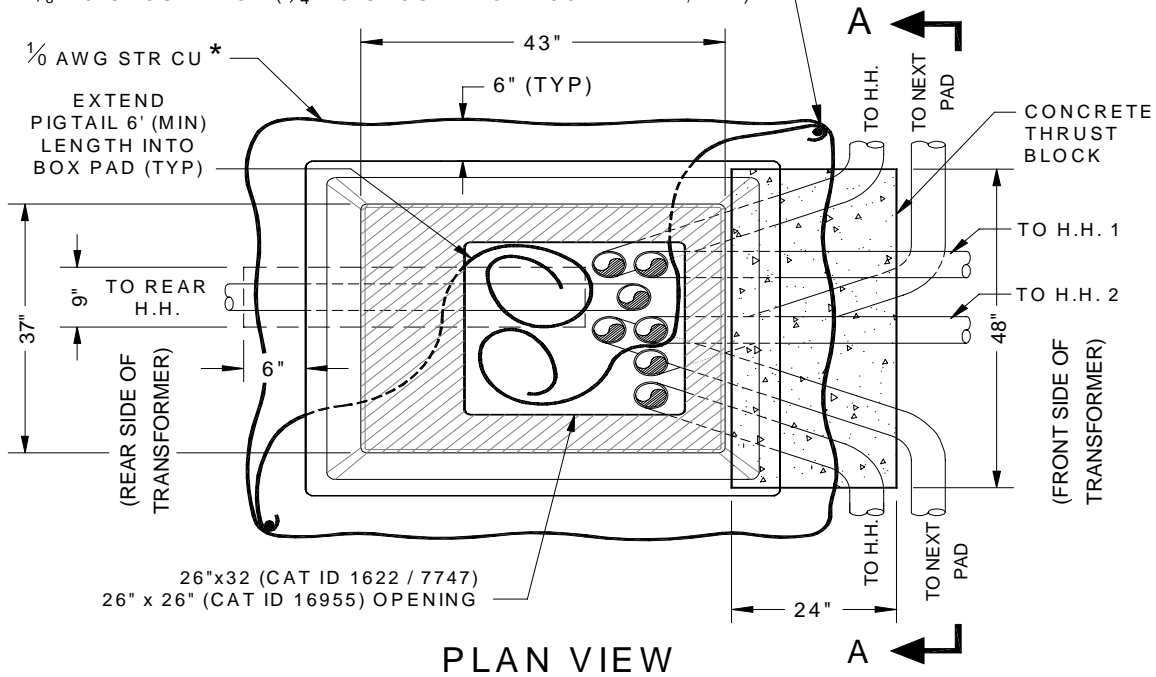


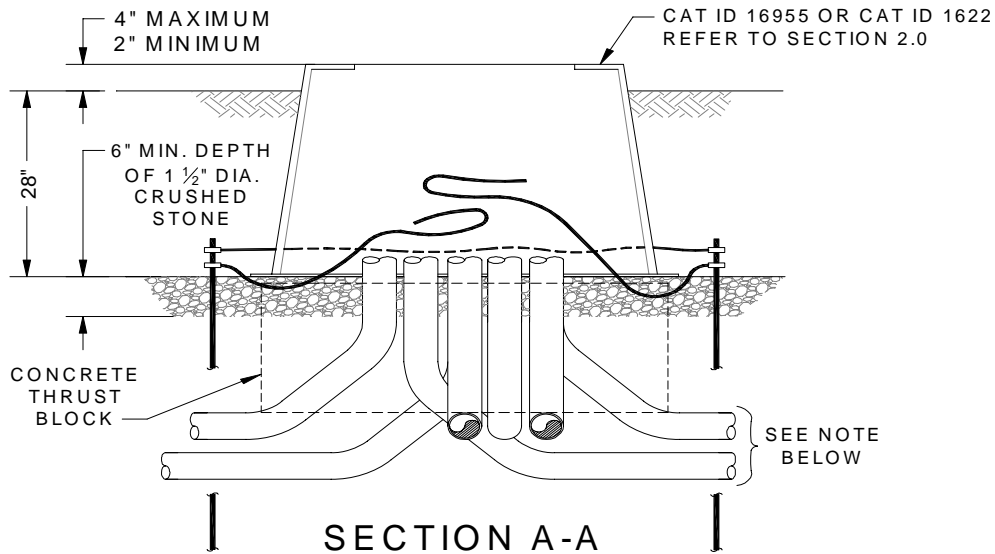
Figure 3 – Typical Fiberglass box Pad Installation Details to support 25kV PME-9 Switches



USE COMPRESSION GROUNDING RATED CONNECTION OR CADWELD TO INSTALL 1/0 * GROUND RING AND PIGTAIL TO 5/8"x 8' GROUND ROD (3/4"x 8' GROUND ROD ACCEPTABLE, TYP)

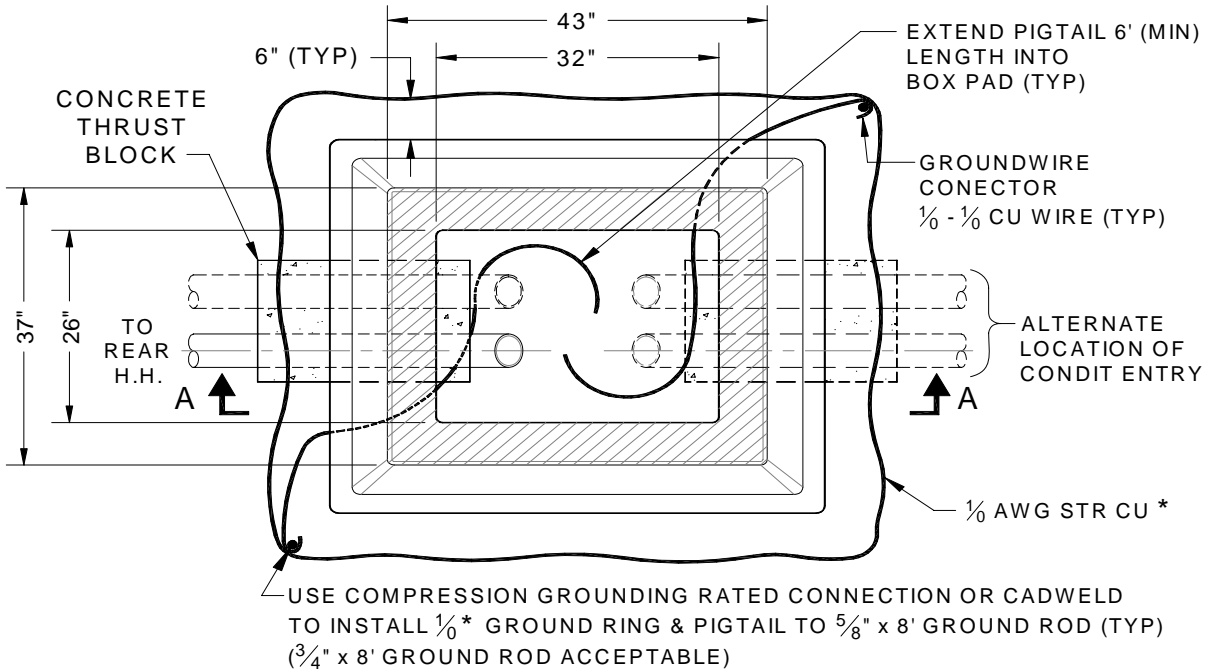


* 4/0 BARE CU MAYBE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER.



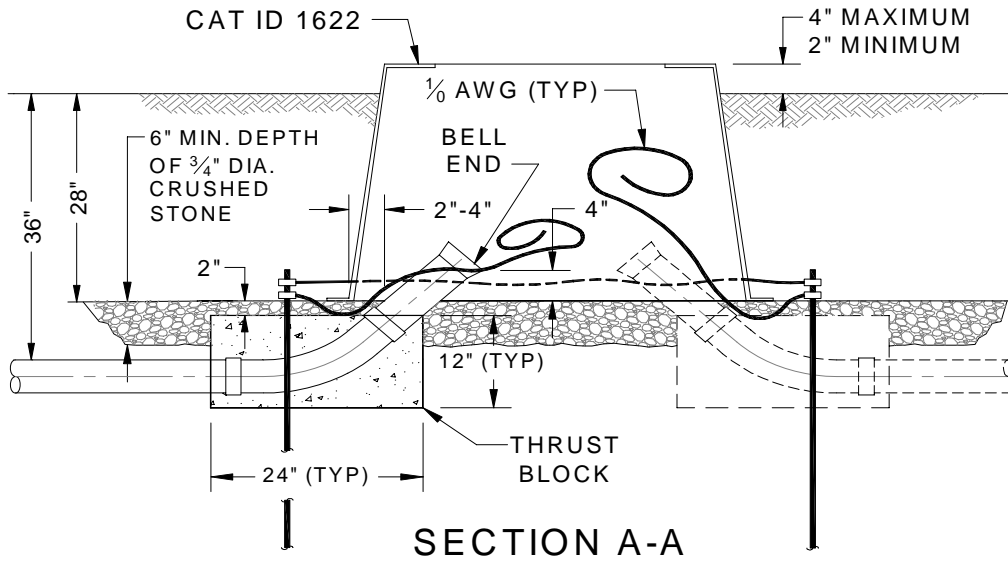
Note: Depth of Conduits shall vary as they pass over or under exiting the pad, but shall transition to 36" depth of cover when clear.

Figure 4 – Typical Fiberglass box Pad Installation Details to support Single Phase Transformers



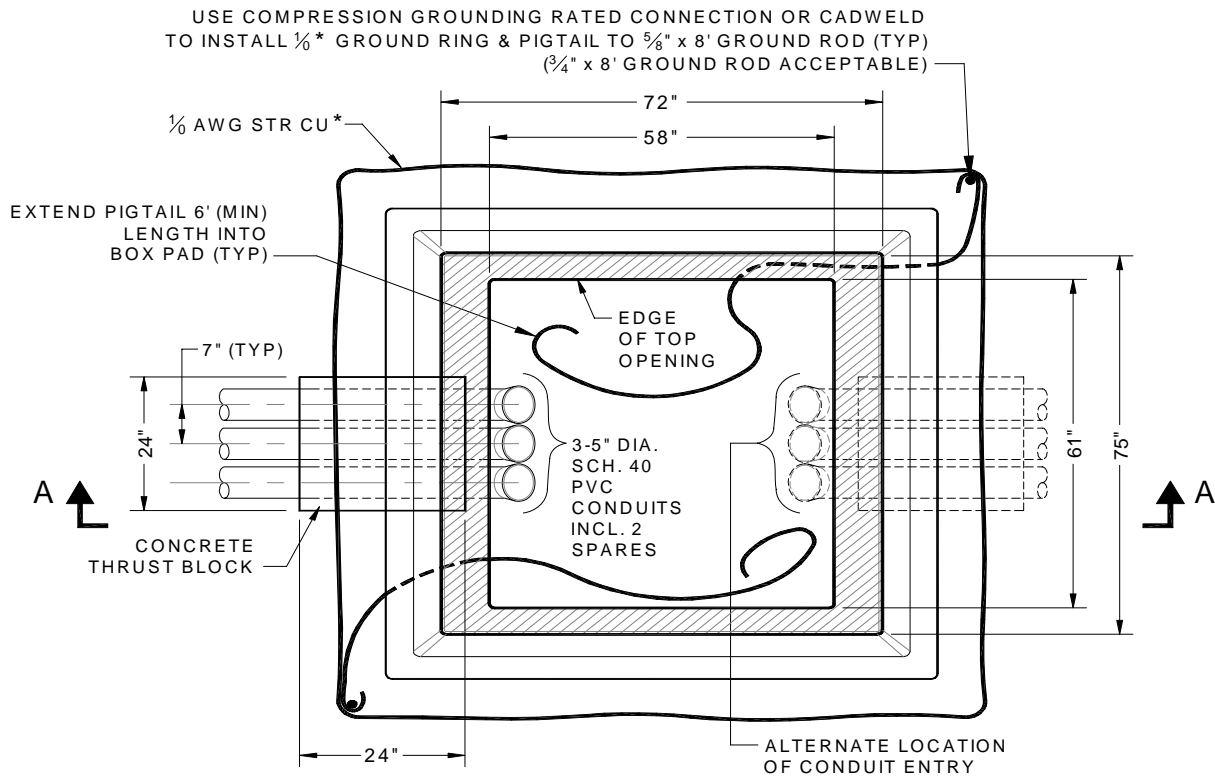
PLAN VIEW

* 4/0 BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER



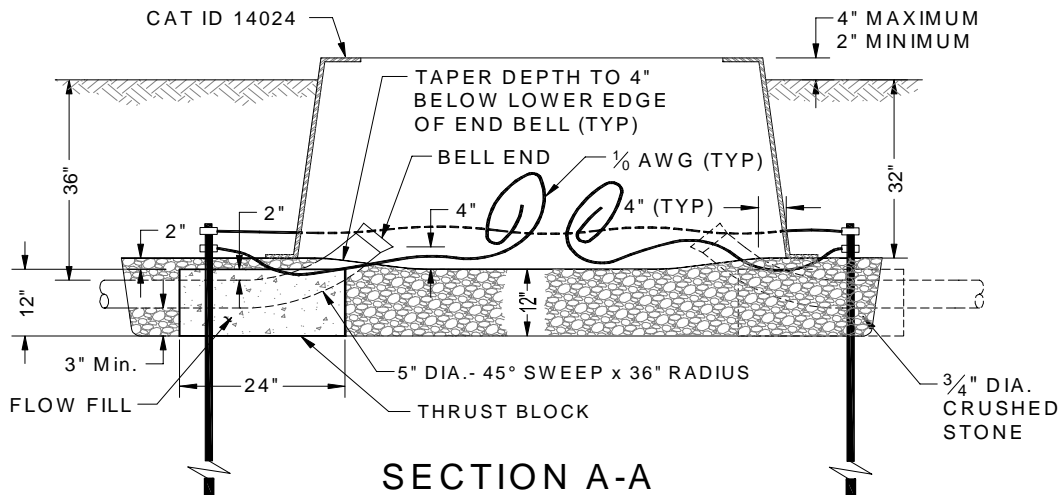
SECTION A-A

Figure 5 – Typical Fiberglass box Pad Installation Details to support Single Phase Primary Splice or Three Phase Primary Splice (with 3- #1 AL only)



TOP VIEW

* 1/8" BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER



SECTION A-A

Figure 6 – Typical Fiberglass box Pad Installation Details to support Three Phase Primary Splice



USE COMPRESSION GROUNDING RATED CONNECTION OR
CADWELD TO INSTALL 1/0 GROUND RING AND PIGTAIL TO
5/8" x 8' GROUND ROD (3/4" x 8' GROUND ROD ACCEPTABLE, TYP)

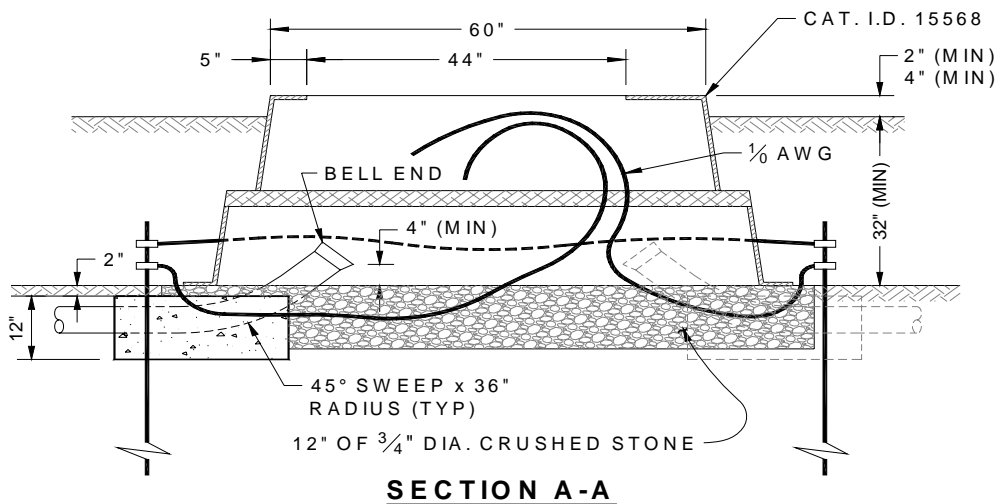
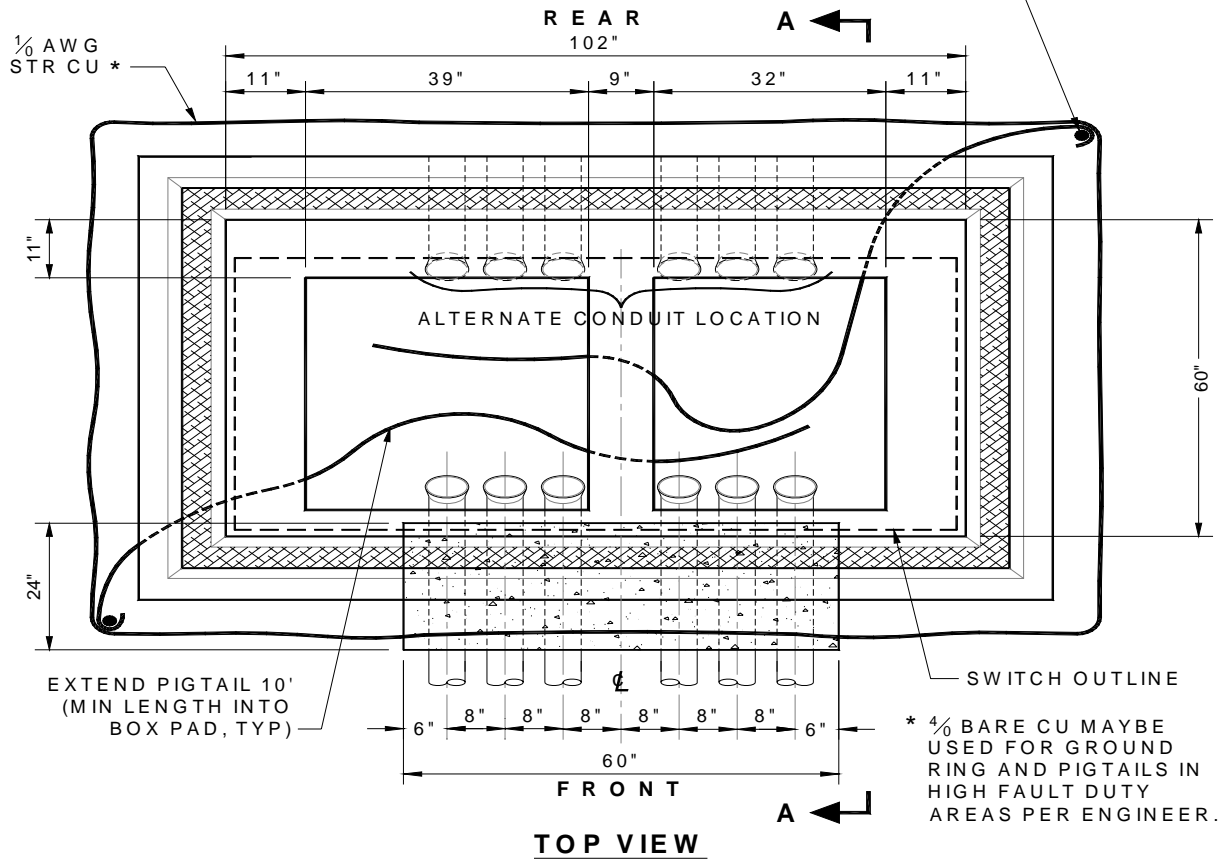
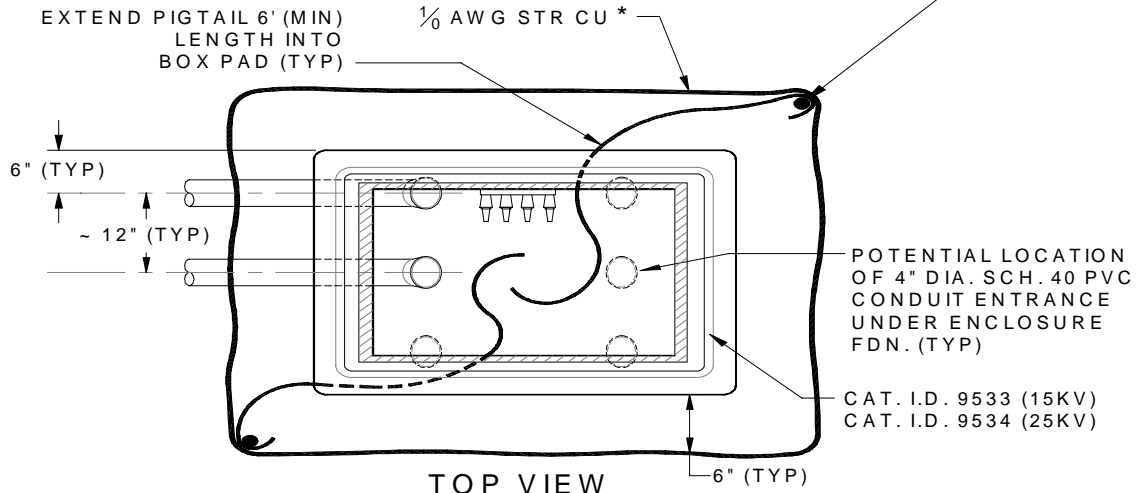


Figure 7– Typical Fiberglass box Pad Installation Details to support 15kV, G & W Model PVI-9, SF-6 Switch



USE COMPRESSION GROUNDING RATED CONNECTION OR CADWELD TO INSTALL 1/0 * GROUND RING & PIGTAIL TO 5/8" x 8' GROUND ROD (TYP)
(3/4" x 8' GROUND ROD ACCEPTABLE)



* 4/0 BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER

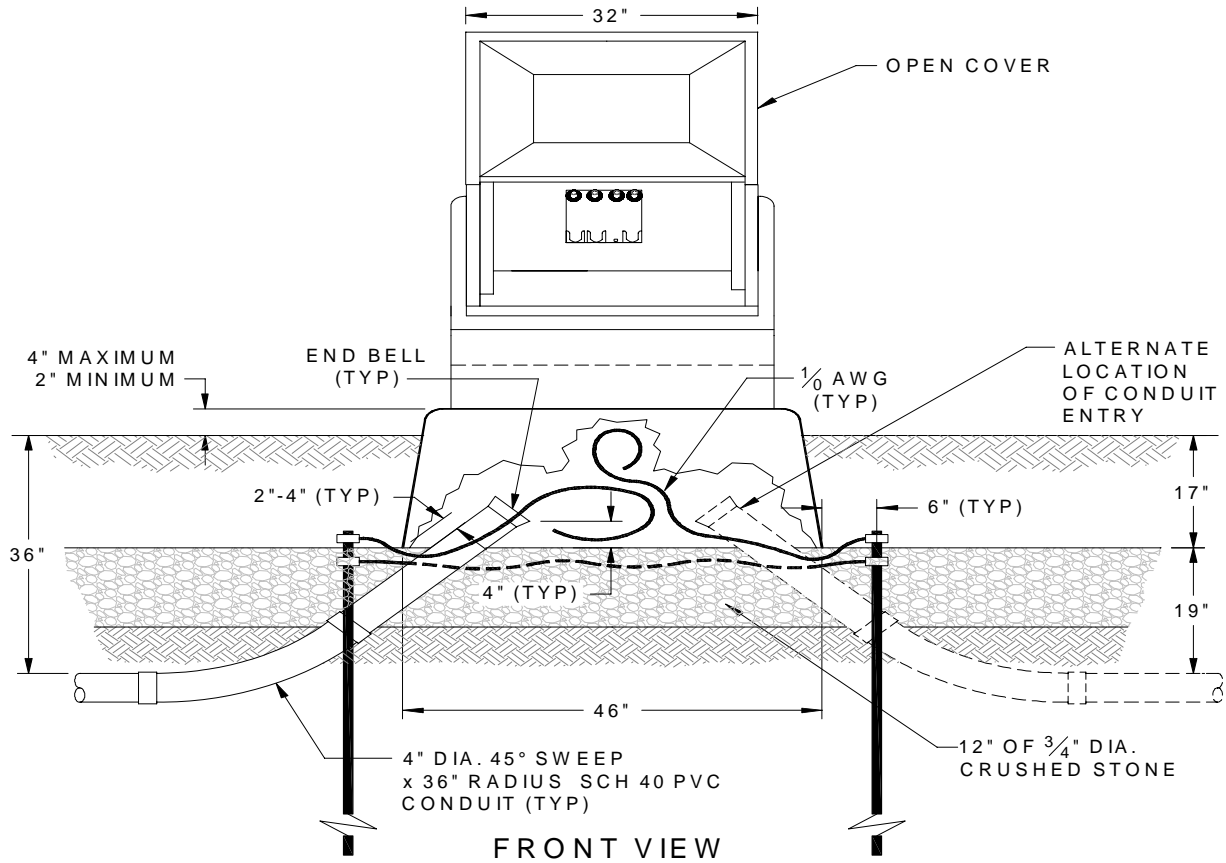
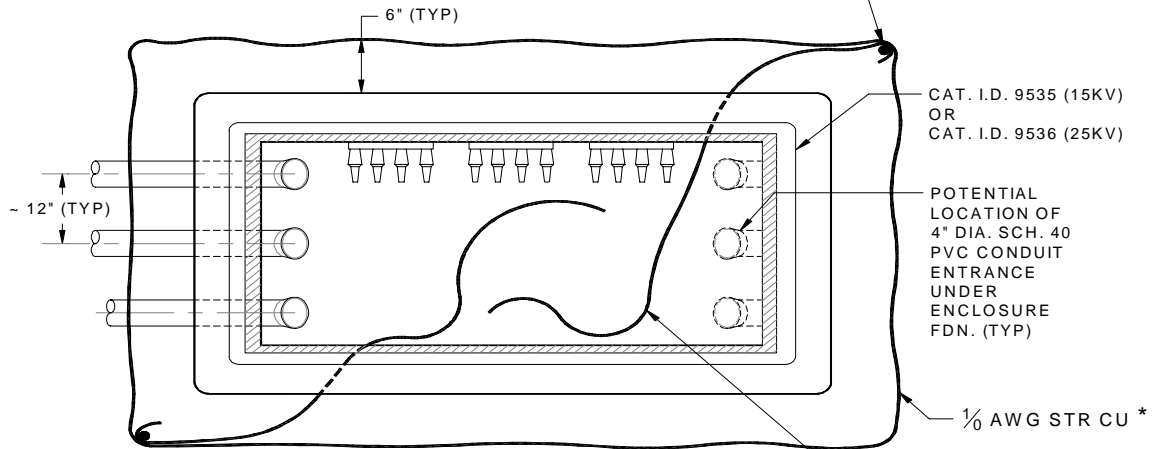


Figure 8 – Single Phase Primary CSS Junction/Enclosure Installation (15kV or 25kV)



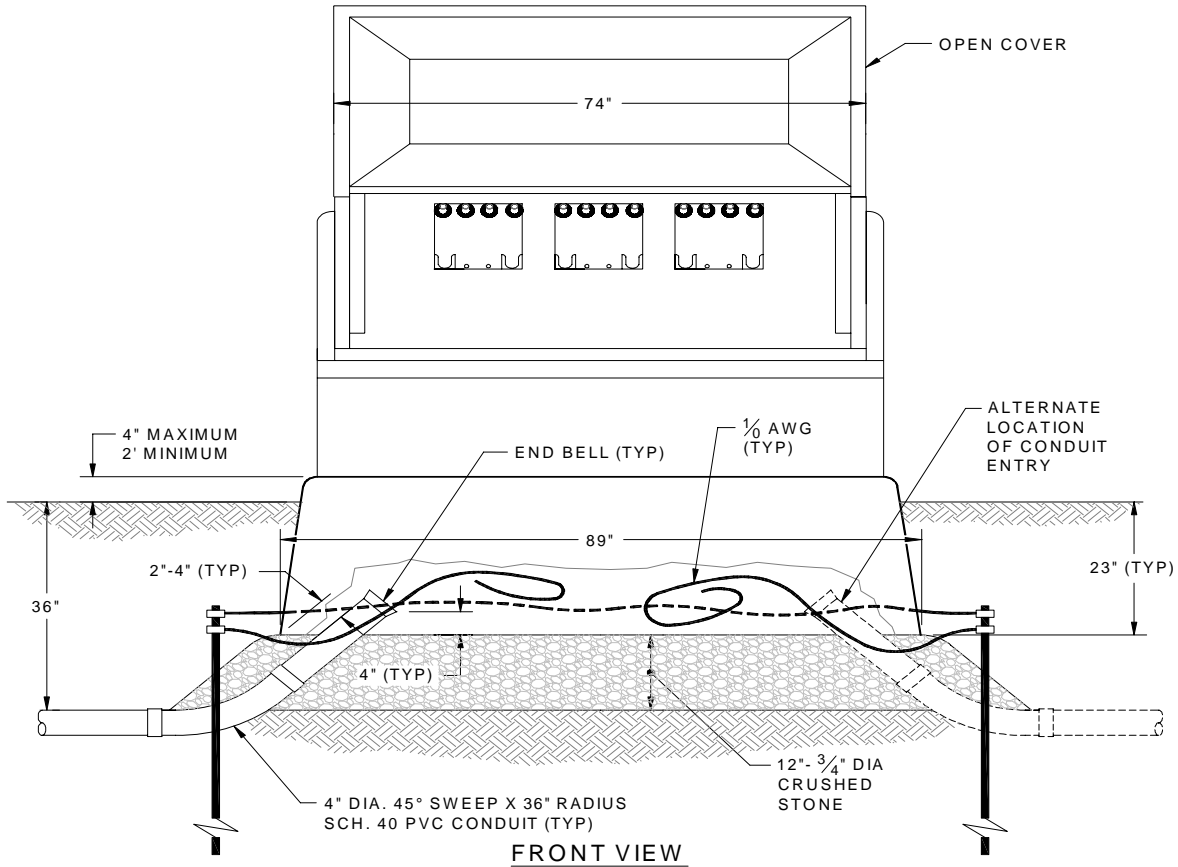
USE COMPRESSION GROUNDING RATED CONNECTION OR CADWELD TO INSTALL 1/0* GROUND RING & PIGTAIL TO 5/8" x 8' GROUND ROD (TYP)
(3/4" x 8' GROUND ROD ACCEPTABLE)



TOP VIEW

* 4/0 BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER

EXTEND PIGTAIL 6' (MIN) LENGTH INTO BOX PAD (TYP)



FRONT VIEW

Figure 9 – Three Phase Primary CSS Junction/Enclosure Installation (15kV or 25kV)

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15.0 References

- 15.1 For PME-9 Switch Fiberglass Box Pad selection and additional switch installation requirements refer to Construction Standard *“C3800, Installation of a PME-9, Pad Mounted Switch, 15 & 25kV, 600 Amp, Manual or Motor-Operated Source Transfer Switch (Including RADSEC with either Power Fuses, Current Limiting Fuses or Fault-Filters)”*.
- 15.2 For PVI-9 Switch installation requirements refer to Construction Standard *“C3810, Installation of G & W Model PVI-9, 15kV, 600 Amp, Unfused, Padmounted, Front Access, SF-6 Switch”*.
- 15.3 For recommended minimum clearances from transformers, switches and other equipment to buildings openings, landscaping or traveled ways refer to Construction Standard, *“C3802, Recommended Minimum Clearances from Three-Phase Distribution Transformer Foundation to Building Openings, Landscaping or Traveled Way”*.
- 15.4 For Secondary Bus Enclosure (SBE) refer to Material Standard *“M2301, 600V Secondary Cable Termination and Buswork Padmount Enclosure”*.

16.0 Approval Signature

Approved by: Amin Jessa
Director, Distribution Engineering