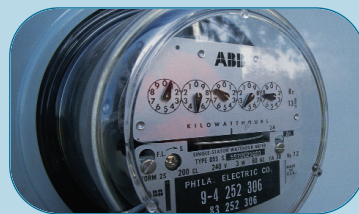


*Supplement to*  
**Specifications for Electrical Installations**  
Underground Residential Distribution (URD)  
Installation and Responsibility Guide

Electric System Bulletin No. 759A

July 2010

(Supersedes all previous versions of ESB 759)



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**URD Specifications and Installation Guide Acknowledgement (Job Spec/Signoff Forms)**

The requirements and specifications outlined in this guide book must be strictly followed. Any requirements not adhered to can pose safety problems, can be detrimental to the installed system and must be corrected before final acceptance. The *Customer* will bear full cost to make corrections to sub-standard installations.

The *Customer* is responsible to provide enough lead time for the *Company* to design job, provide inspections and install *Company* equipment where applicable.

Typical lead times are shown below.

	<b>Lead-Time</b>	<b>Notes</b>
Design and Layout	Eight weeks	Company receives all required plans, load data and easement information
Trench, Conduit and Equipment Inspection New England (New York where applicable)	Three days	Company inspector
Company Installation	Four weeks	After all inspections are approved and permits/easements are procured
Material Pick up (New Hampshire only)	10 Days	Company inspector
<b>NOTE: The above times are estimates only.</b>		

Project Title \_\_\_\_\_

Location \_\_\_\_\_

Owner/Developer \_\_\_\_\_

Customer's Representative \_\_\_\_\_ Date \_\_\_\_\_

Company Representative \_\_\_\_\_ Date \_\_\_\_\_

**Company's Copy**



**URD Specifications and Installation Guide Acknowledgement**

The requirements and specifications outlined in this guide book must be strictly followed. Any requirements not adhered to can pose safety problems, can be detrimental to the installed system and must be corrected before final acceptance. The *Customer* will bear full cost to make corrections to sub-standard installations.

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Material Pick up (New Hampshire only)	10 Days	Company inspector
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Project Title \_\_\_\_\_

Location \_\_\_\_\_

Owner/Developer \_\_\_\_\_

Customer's Representative \_\_\_\_\_ Date \_\_\_\_\_

Company Representative \_\_\_\_\_ Date \_\_\_\_\_

**Customer's Copy**



## 1.0 Scope

The purpose of this specification is to define, interpret and clarify the scope of work and material dealing with providing service to URD's and is a Supplement to Electrical System Bulletin (ESB) 750.

It is important that the Specifications for Electrical Installations book (ESB 750) be obtained and referred to in conjunction with this supplement for these installations. Any reference to the *Company* in this specification shall mean the National Grid. Any reference to the *Customer* or Developer in this specification shall mean the property owner or the designee of the property owner of the URD.

## 2.0 General Requirements

All electrical wiring to be connected to the *Company* equipment shall be installed in accordance with one or all of the following:

- ▶ Local Municipal Inspection Authority
- ▶ State's Electrical Code
- ▶ National Electrical Code
- ▶ National Electrical Safety Code
- ▶ Applicable Distribution Construction Standards of the *Company*
- ▶ National Grid's Specifications for Electrical Installations

There shall be no attempt to deviate from either the Distribution Standards of the *Company* or the *Company* construction plan without the approval of the *Company*. Any specifications noted shall supersede the Specifications for Electrical Installations booklet unless otherwise approved by the *Company*.

It is mandatory that the *Customer* and all parties involved attend a documented pre-construction meeting with a *Company* representative to discuss the project and ensure it a timely completion. A *Company* representative will make the necessary arrangements for the pre-construction meeting. *Company* representatives will also be available throughout the job life cycle to discuss construction problems when requested or during a field visit.

### References:

- ▶ ESB 750 - Specifications for Electrical Installations
- ▶ ESB 754 - Outdoor Padmounted or Vault Enclosed Three Phase Transformer

All ESB's are available at <http://www.nationalgridus.com/electricalspecifications>

The Customer shall be responsible to have all electrical and physical design documents prepared and updated by a design professional, in accordance with Section 1.7 of ESB 750 for the trenching, conduit, transformer pad, and handhole installations.

## 3.0 Type of Service

Electric service shall be single phase, three wire, 120/240V supplied from a padmount transformer or handhole to be located on the *Customer's* premises. The primary electrical service to the URD will be supplied from a pole or cable system owned by the *Company*.

#### 4.0 Plans

When municipal approval is required, the *Company* shall receive final town approved development plans on a scale not less than one inch equal to one hundred feet in both hard copy and CAD format prior to engineering construction plans. Information regarding the total number of houses to be built in subdivision, and whether the development will be installed in phases shall also be provided. The property site plan shall show all proposed and existing overhead and underground utilities, i.e. electric, water, gas, sewer, cable television, telephone, etc.

A copy of a street light proposal must also be provided for the development, approved by the municipality, or written notice from the municipality that street lighting will not be required. If installation is requested after construction is complete, additional costs, including the *Company's* tax liabilities, may be borne by the municipality and/or *Customer* if the tariff does not collect all costs of construction.

Direct Burial Systems in general: the *Company* specifies an arrangement whereby the *Company's* power cables may run parallel with communication and other power cables, but not parallel with other utilities e.g. water, gas, sewer. These utilities shall be in a separate trench. The other utilities must maintain clearances as outlined in the NESC or by mutual agreement. National Grid gas is permitted in the same trench with the following requirements: gas shall be at a minimum depth of 18" and shall maintain a minimum separation of 12" between all other utilities.

Conduit Systems in general: the *Company* requires a spare conduit for all *Company* owned duct systems, as shown in *Company* plans. Other utilities must maintain clearances as outlined in the NESC.

#### 5.0 Permits

In general, all applicable permits necessary to trench and excavate, including street openings and environmental permits, shall be obtained by the *Customer* and made available upon request of *Company* prior to design. The *Customer* shall be responsible for including these padmount and conduit/trench specifications with the wetlands application for developments located in or near wetlands. A copy of the wetlands permit may be requested by the *Company* prior to acceptance of the conduit/trench system by the *Company*.

The *Customer/Company* doing the excavation shall obtain the required DIGSAFE permits before any excavation may take place in a public way. The *Customer/Company* doing the excavation is urged to obtain copies of the applicable statute and become familiar with its requirements. Similarly, the *Customer/Company* shall determine if the municipality in which the excavation is to be done requires that water, sewer or other utility, municipal or private, be contacted separately due to the possibility they may not be members of DigSafe® (for New England) or Dig Safely (for New York). The *Customer* is also responsible to notify the company of all asbuilt changes that may conflict with design).

The *Customer* shall certify to the *Company* that areas in which the *Company* is to perform installation or maintenance work is free of preexisting contamination by hazardous wastes or materials and to indemnify the *Company* for any claims, costs, expensed, suits, demands, citations, fines or damages of any kind arising from the presence of any such contamination.

## 6.0 Division of Responsibility

The division of ownership and responsibility shall be as outlined below by state. Typical installation specifications to reflect installation practices are shown in the back of this guide.

### Massachusetts and Rhode Island

- a. The Company will:
  - i. Develop the plan to provide underground electric service,
  - ii. Supply a list of approved manufacturers and their part numbers for equipment to be supplied by the *Customer*, (See Pages 39-41)
  - iii. Designate the location of all *Company* owned equipment,
  - iv. Provide *Company* owned street light foundations and any cable-in-conduit required for street light applications,
  - v. Provide, install, own and maintain all transformers, *Company* owned street lights, primary and secondary cable, except services,
  - vi. Make all connections to *Company* equipment,
  - vii. Inspect the underground conduit system and equipment foundations installed by the *Customer*,
  - viii. Determine if oil containment shall be required for padmount transformer installation.
- b. The *Customer*, at no cost to the *Company*, will:
  - i. Provide, prior to the start of the *Company's* construction, all applicable documents required for the *Company* to prepare easements for its facilities to be installed on private property,
  - ii. Install foundations and cable-in-conduit, provided by the *Company*, for *Company* owned street lights;
  - iii. Provide and install all other required handholes, box pads, splice boxes, grounding systems, and conduit including spacers, galvanized conduit and sweep for riser pole including bonding clamps and neutral tap, glue and pulling tape, marking tape, etc. as indicated on the *Company's* plan and related construction documents,
  - iv. Supply copies of all invoices, when requested, indicating manufacturer and part number for all such equipment listed above; equipment that is not approved shall not be used without the prior written consent of the *Company*,
  - v. Install, own and maintain all secondary services and service conduit from the *Company's* equipment to each designated meter location,
  - vi. Turn over ownership of the conduit system, excluding the service conduit, to the *Company* upon inspection and acceptance of the conduit system by the *Company*,
  - vii. Provide and install material for oil containment under padmounted transformers where required.

## New Hampshire

- a. The Company will:
  - i. Develop the plan to provide underground electric service,
  - ii. Designate the location of all *Company* owned equipment,
  - iii. Provide *Company* owned street light foundations and any cable-in-conduit required for street light applications,
  - iv. Provide, install, own and maintain all transformers, *Company* owned street lights, primary and secondary cable, except services,
  - v. Make all connections to *Company* equipment; and inspect the underground conduit system and equipment foundations installed by the *Customer*, after *Company* acceptance of conduit system,
  - vi. Determine if oil containment shall be required for padmount transformer installation,
  - vii. Provide required handholes, boxpads, splice boxes, grounding systems, and conduit including spacers, galvanized conduit and sweep for riser pole including bonding clamps and neutral tap, glue and marking tape, etc. as indicated on the *Company's* plan and related construction documents.
  
- b. The *Customer*, at no cost to the *Company*, will:
  - i. Provide, prior to the start of the *Company's* construction, all applicable documents required for the *Company* to prepare easements for its facilities to be installed on private property,
  - ii. Install foundations and cable-in-conduit, provided by the *Company*, for *Company* owned street lights,
  - iii. Install all required handholes, boxpads, splice boxes, grounding systems, and conduit including spacers, galvanized conduit and sweeps for riser pole including bonding clamps and neutral tap, glue and pulling tape, etc. as indicated on the *Company's* plan and related construction documents,
  - iv. Install, own and maintain all secondary services and service conduit from the *Company's* equipment to each designated meter location,
  - v. Turn over ownership of the conduit system, excluding the service conduit, to the *Company* upon inspection and acceptance of the conduit system by the *Company*,
  - vi. Provide and install material for oil containment under padmounted transformers where required.



## New York

- a. The *Company* will:
  - i. Develop the plan to provide underground electric service,
  - ii. Supply a list of approved manufacturers and their part numbers for equipment to be supplied by the *Customer* (See Pages 39-41),
  - iii. Designate the location of all *Company* owned equipment,
  - iv. Provide and install *Company* owned embedded streetlight poles and any direct buried cable required for street light applications,
  - v. Provide and install all other required handholes, boxpads, splice boxes, grounding systems, conduit (where applicable) including spacers, galvanized conduit, and sweeps for riser pole, including bonding clam and neutral tap, glue and pulling tape, warning tape, etc. as indicated on the *Company's* plan and related construction documents,
  - vi. Provide, install, own and maintain all transformers, *Company* owned street lights, primary and secondary cable, except services,
  - vii. Make all connections to *Company* equipment,
  - viii. Inspect the underground conduit system and equipment foundations where applicable installed by the *Customer*, prior to backfilling,
  - ix. Inspect the underground cables and equipment foundations where applicable installed by the *Customer*, prior to backfilling,
  - x. Determine if oil containment shall be required and install if deemed necessary for padmount transformer installation.
- b. The *Customer*, at no cost to the *Company*, will:
  - i. Provide, prior to the start of the *Company's* construction, all applicable documents required for the *Company* to prepare easements for its facilities to be installed on private property,
  - ii. In certain circumstances (i.e. road/water crossings), install *Company*-provided conduit and cable per request and specification of *Company*,
  - iii. Supply copies of all invoices, when requested, indicating manufacturer and part number for all such equipment listed above; equipment that is not approved shall not be used without the prior written consent of the *Company*,
  - iv. Install, own and maintain all secondary services and service conduit from the *Company's* equipment to each designated meter location,
  - v. Turn over ownership of the conduit system, excluding the service conduit, to the *Company* upon inspection and acceptance of the conduit system by the *Company*,
  - vi. Install oil containment for padmounted transformers where required.

## 7.0 Easements

In general, *Company*-owned equipment shall not be installed on the *Customer's* property prior to the execution of suitable easement(s). The *Customer* will have to provide to the *Company* (for the purposes of securing an easement) the following items, including but not limited to:

- ▶ Copy of property deed showing: owner, date, book number, page number county registry, and survey and/or plan of record, if available.

Note: When electronic maps are used, the Customer must consult the Company for submittal.

- ▶ Copy of mortgages showing: holder, date, book number, page number and county registry.
- ▶ Copy of any applicable trusts showing: date, book number, page number and county registry, and who is authorized to sign legal documents on behalf of the Trust.

Easement application forms are located on Page 35. Refer to Sections 3.1.3 and 4.1.1 in ESB 750 for further easement requirements applicable to the Applicant or Customer.

## 8.0 Trench Construction Requirements

- a. Layout and Grading
  - i. Final grades shall be established and the binder coat installed, and easement boundaries, street, lot and trench lines staked by the *Customer* before any trenching is started (except for *Company* inspected road crossings).
- b. Trenching and Backfilling
  - i. The Customer shall adhere to the construction plan specifying trench locations and depths, with any deviation being subject to approval by the *Company*.
  - ii. Minimum burial depths specified for all electrical conduit and direct burial trenches shall be maintained during all phases of construction. Temporary mechanical protection over buried conduit during construction to prevent conduit crushing or damage due to unusually heavy construction equipment shall be the responsibility of the *Customer*.
  - iii. Trench detail shown in attached *Company* Standards shall be adhered to. The trench bottom shall be solid, undisturbed earth. Earth showing signs of peat, cinders, rubble or any conditions not suitable for a stable foundation shall be reported to the *Company* Representative for recommendation. Pockets of unsuitable soil shall be replaced with compacted sand.
  - iv. For work done by *Customer*, a *Company* representative shall be notified in advance of the backfilling of any electric facility, i.e., conduit, foundation, handhold, pull-box, cable-in-conduit, grounding, cables, etc.

If any facility is backfilled without the *Company's* prior approval, the *Company* reserves the right to require re-excavation of the facility.

- aa. Sand for conduit installation - A minimum of three inches of sand shall be placed, under, beside, around and on top of all electric conduit. The sand shall pass through 3/8 inch mesh screen and shall not contain any sharp stones.

Sand shall be placed and suitably tamped over installed conduit in reasonably small quantities (not a front end loader bucketful all at once) to avoid conduit damage. Sand shall be evenly distributed between and around all electric conduits.

- bb. Sand for direct burial installation - A minimum of two inches of sand shall be placed at the base for the cables to be installed on top of. A minimum cover of four inches of sand be placed on top of the cables. The sand shall pass through 3/8 inch mesh screen and shall not contain any sharp stones.

Sand shall be placed and suitably tamped over installed cable in reasonably small quantities (not a front end loader bucketful all at once) to maintain minimum cover. Sand shall be evenly distributed between and around all electric cables.

- v. Remainder of backfill shall not contain stones greater than once inch and shall not contain ashes, cinders, shell, or frozen material,
- vi. Trenches shall be immediately backfilled following cable or conduit system inspection and approval by authorized Company representative,
- vii. Backfilling shall be accomplished in a continuous manner from one terminal, i.e., riser pole, foundation, handhold, etc. to the next,
- viii. Backfilling shall not take place over any open-ended (unplugged) conduits,
- ix. Company approved red cable "Warning" or "Marking" tape shall be installed in the trench 12 inches below finished grade and directly above the cable or conduit.

### 9.0 Trench and Conduit System Inspection

In the applicable area, a designated *Company* inspector shall be responsible for the inspection of the trench and/or conduit system being prepared and installed by the *Customer* at various stages of installation. The *Customer* shall provide the *Company* inspector with a minimum of 24 to 72 hours notice.

Inspections shall be conducted:

- 1) After conduit, ground system are completed; but before concrete is poured
- 2) After concrete is poured, but before backfilling if applicable
- 3) After backfilling

The inspection shall include, but not be limited to the following:

- ▶ All trenches and excavations
- ▶ All material supplied by the *Customer*
- ▶ All backfill and base sand material during or after installation as applicable
- ▶ All foundations, pull-boxes, boxpads, handholes, and other facilities, after setting in place, but prior to backfilling

- ▶ All galvanized steel riser pole and sweep conduit installations, all conduit, including cemented joint, bends, sweeps, bell-ends, and conduit spacers, prior to backfilling, or concrete encasement
- ▶ All conduit terminations and supports at boxpads, pull-boxes, handholes, riser poles, streetlight foundations, and at other applicable locations
- ▶ The pouring of any required concrete encasement and subsequent backfilling around the conduit runs
- ▶ All backfilling operations
- ▶ Witnessing mandrelling of all conduits

### 10.0 Conduit Installation

- a. Conduit shall be installed in accordance with Standards and Construction Plans which accompany this specification package.
- b. Plastic spacers shall be used to separate all duct where more than one duct is installed. Spacers shall not exceed eight foot intervals. Spacers shall be placed at each coupling. Spacers are required to maintain proper separation from adjacent conduits and to aid in proper sand placement for thermal reasons.
- c. Type DB conduit shall be employed whether duct is direct buried or encased in concrete.
- d. All galvanized steel sweeps at risers shall have a minimum radius of 36 inches. 48 inch radius sweeps are required at transformer foundations and secondary handholes. See Page 17 for details.
- e. Curves and bends in conduit runs shall be gradual, and the radius of curvature shall not be less than 40 feet. Only five Degree Angled Couplings shall be used to make these gradual bends.
- f. Conduit grade shall be such as to cause all ducts to drain toward one or both equipment foundations, pullboxes or handholes. Minimum pitch shall be three inches per 100 feet. Pullboxes may be required near riser pole if grade at pole is low compared to the first boxpad to alleviate water buildup in riser.
- g. Conduit shall have a maximum penetration inside walls of pull/splice boxes, equipment foundations or handholes of three inches. All unused conduits and conduit knockouts shall be sealed with conduit plugs. Bell ends shall be installed at the end of all conduit runs.
- h. The minimum separation between electrical conduit and foreign conduit or pipes shall be as follows:
  - ▶ Communication systems – 12 inches
  - ▶ Water, Gas and Sewer – 12 inches where the paths of these utilities intersect electrical conduits at approximately right angles. A minimum separation of 24 inches shall be maintained between parallel placement of any of these utilities and electrical conduits.

- i. All road crossings shall, when practical, be perpendicular to the sidelines of the road.
- j. All road crossings shall have 30 inch minimum burial depth, top of conduit to finished grade, for primary and 24 inch minimum for secondary voltages. (including street lighting cable-in-conduit) Main electric trench shall maintain conduit depths as shown in on Page 32.
- k. Where foreign objects threaten to interfere with the installation of conduit in the sidewalk area or other areas, the Company may require concrete encasement of the conduit.

### **11.0 Direct Burial Installation NY**

- a. Cable installation shall be installed in accordance with Standards and Construction Plans which accompany this specification package.
- b. All primary cable rising up a pole shall be installed in a galvanized steel pipe and galvanized sweep with a minimum radius of 36 inches. (3" conduit for single phase conductor and 4" conduit for three phase installations)
- c. The minimum separation between electrical cables and foreign cables, conduit or pipes shall be as follows:
  - ▶ Communication systems – 12 inches
  - ▶ Water, Gas, Sewer – 12 inches where the paths of these utilities intersect electrical conduits at approximately right angles. A minimum separation of 24" inches shall be maintained between parallel placement of any of these utilities and electrical cables.
- d. All road crossings shall, when practical, be perpendicular to the sidelines of the road and installed in conduit.
- e. All road crossings shall have 30 inch minimum burial depth, top of conduit to finished grade, for primary and 24 inch minimum for secondary voltages. (including street lighting C-I-C) Main electric trench shall maintain conduit depths as shown in on Page 32.
- f. Where foreign objects threaten to interfere with the installation of cable in the sidewalk area or other areas, the *Company* may require the cable to be installed in conduit concrete encased.

## 12.0 Transformer Box Pad Installation

- ▶ All foundations shall be level and installed in accordance with drawing on Pages 16-17.
- ▶ A minimum of four inches base course of crushed stone (3/4 in maximum stone size) shall be placed under all transformer foundation excavations and thoroughly compacted using a vibratory compactor. Certain soil conditions may require removal below normal depth and subsequent additional clean sand or stone added and compacted to insure sound base course for foundation. For direct burial cable installation, cables are to be surrounded by at least 4" of sand at base area crossing from the trench into the box pad.
- ▶ Transformer foundation top surfaces shall be four inches above final grade. In no instance shall final grades hamper proper access or operation of equipment.
- ▶ A buried ground grid shall be installed in accordance with details shown on Pages 18 and 19. Ground loop around transformer to be buried 12" below finish grade (not at foundation base depth). Telephone Company bond wires shall be tied to the ground grid. Such bonding or connection shall not interfere with connecting *Company* equipment.
- ▶ Retaining walls or other devices shall be installed where slopes exist that would undermine or cover equipment, such as transformers due to sharp drop-off or rise.

**NOTE:** *In most instances, the Company shall require that equipment easements on private property be reasonably level. Also, all retaining walls shall fall outside of equipment easements and in no case shall they hamper door openings or placement of such equipment. Retaining wall design shall be approved by the Company.*

- ▶ Upon completing the installation of the transformer foundation, the top opening shall be securely sealed with a suitable matching cover.
- ▶ Transformer foundation shall be completely backfilled prior to commencing any cable pulling.

In some locations oil containment may be required for box pad installation, Pages 24 and 25 show installation procedure.

### **13.0 Transformer Secondary**

*Customer* secondary service wires entering the box pad shall be in accordance with the NEC and shall be approved by the wire inspector or AHJ (Authority Having Jurisdiction) of the town or city involved. Maximum size of secondary cable to be physically connected to the *Company's* pad-mounted transformer is 500 kcmil. No more than six secondary services shall be connected at any *Company* supply point. Cables shall be left with five feet of slack coiled inside the pad in order to reach to the secondary connection points on the transformer.

### **14.0 Transformer Grounding and Bonding**

The ground grid shall be number 2, bare, soft drawn, seven strand copper wire. The wire shall be installed 12 inches below finished grade and located around the transformer pad as shown on Page 18. Bond to all exposed metallic conduit and leave three feet of wire above pad for grounding transformer.

Two  $\frac{5}{8}$  inch diameter, eight feet long copper weld ground rods and approved connectors shall be installed to 12" below finished grade. Leave the ground rods and grid exposed until inspected by the *Company*. The ground grid is to be complete and backfilled prior to energizing the transformer. Connections to ground grid to be made with compression connectors as shown on Pages 18 and 19. However exothermic welding ("cad weld") shall be an acceptable alternative to a compression connection. Bolted connectors are only acceptable for the ground grid connections to the ground rods. The *Company* shall install the ground taps onto the transformer.

### **15.0 Spacing of Boxpads, Pullboxes, and Handholes**

All communication boxes shall be a minimum of 2' away from any *Company* boxpad, pullbox or handhole. Also, communication equipment shall not be placed in front of any *Company* equipment.

## 16.0 Proper Transformer Pad and Conduit Layout

Figure 16.0-1 Preferred Location of Equipment in Easement Area

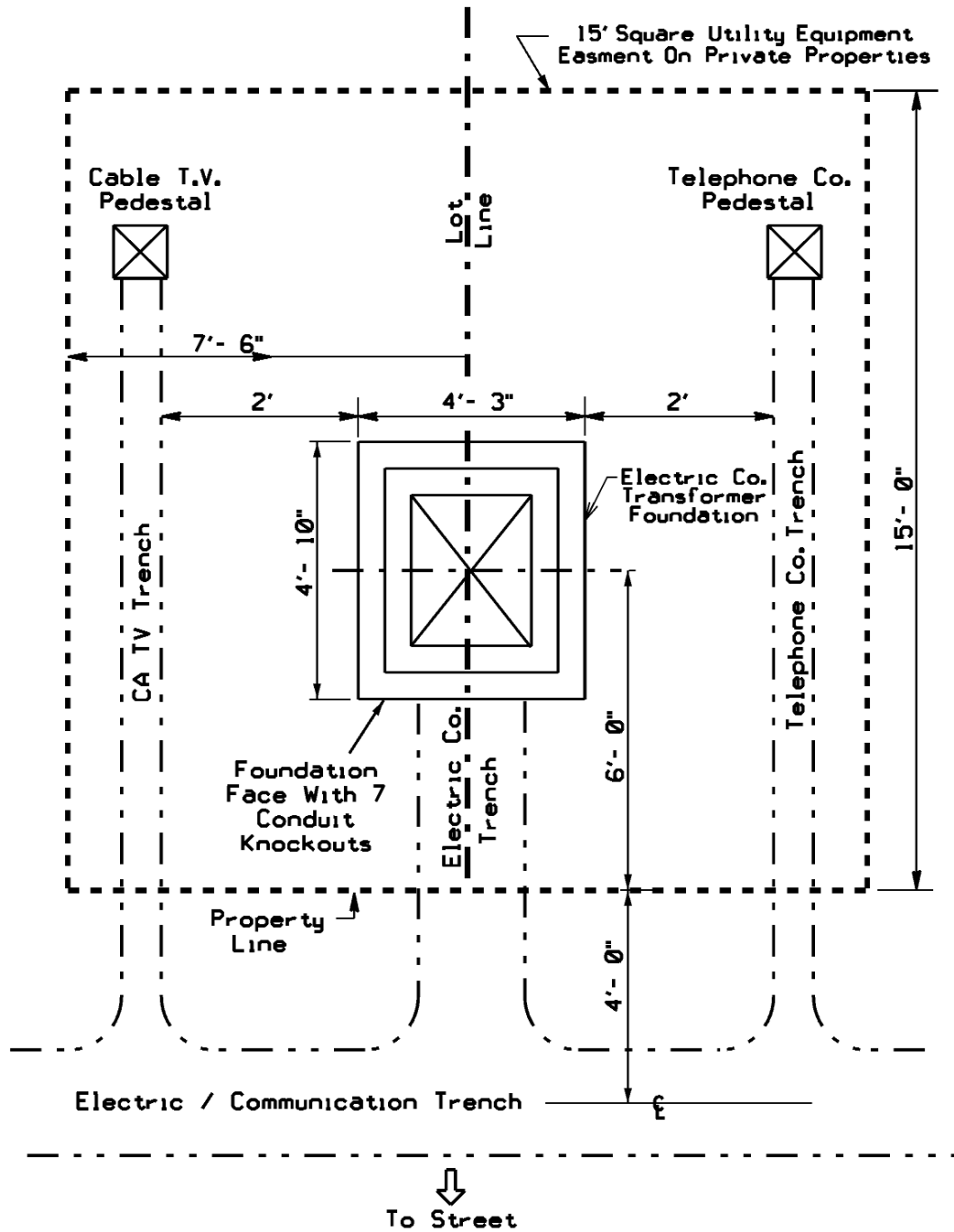
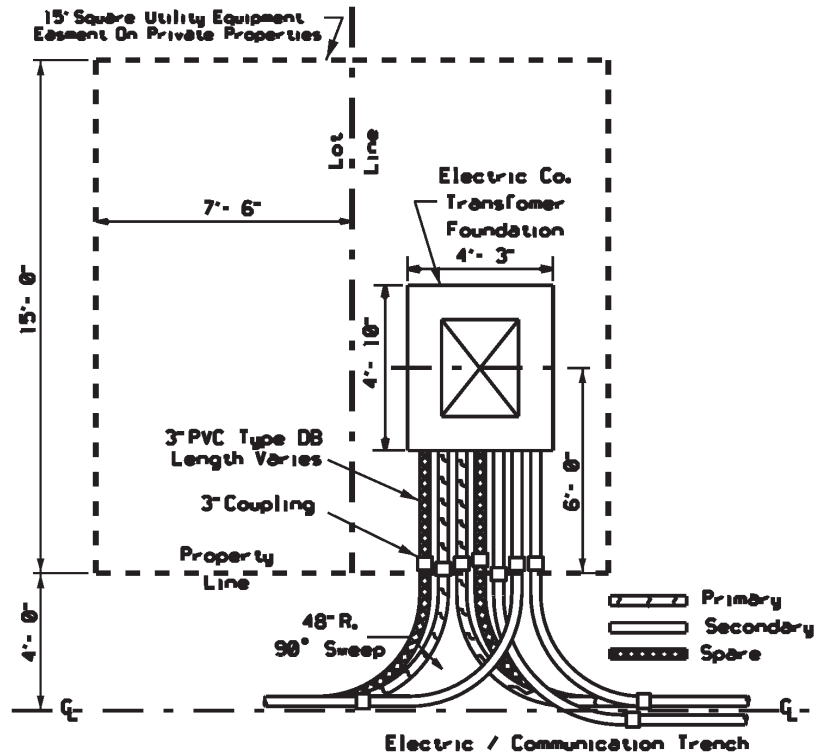
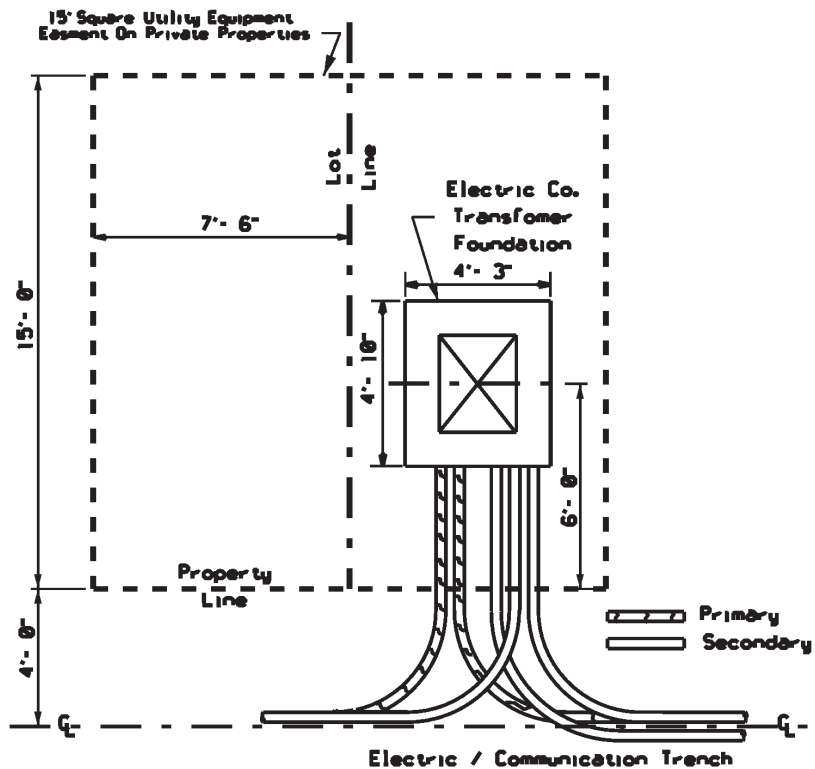




Figure 16.0-2 Single Phase Padmount Transformer — Typical Layout

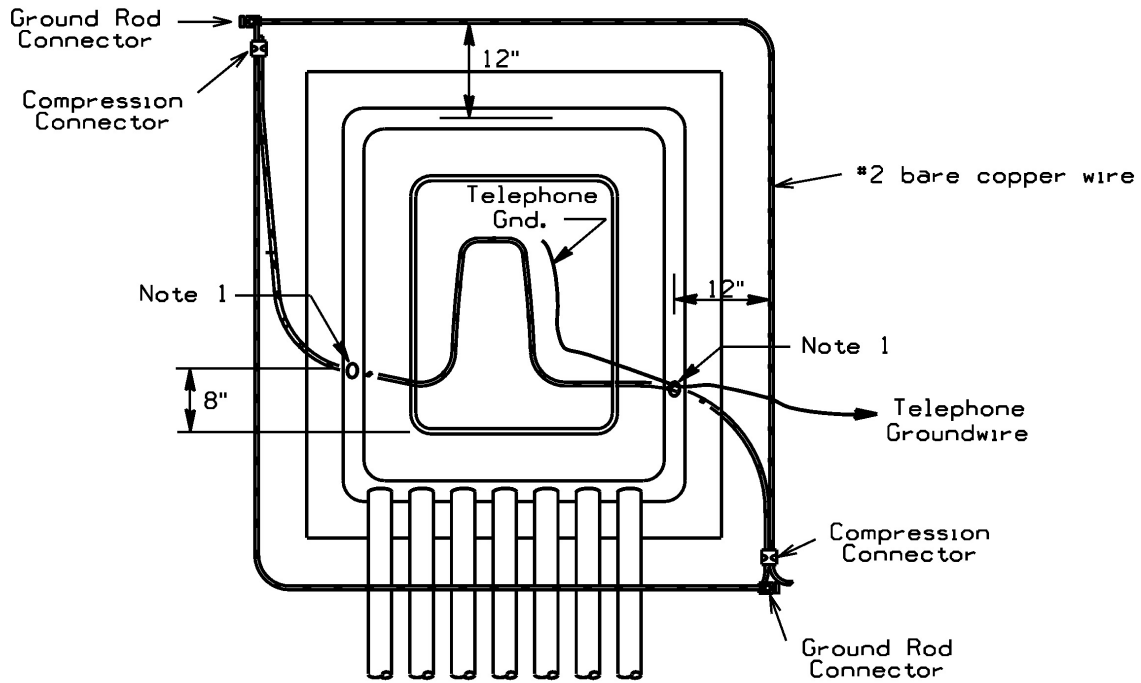


16.0-3 Single Phase Padmount Transformer — Direct Burial Layout



## 17.0 Transformer Ground Grid Bonding

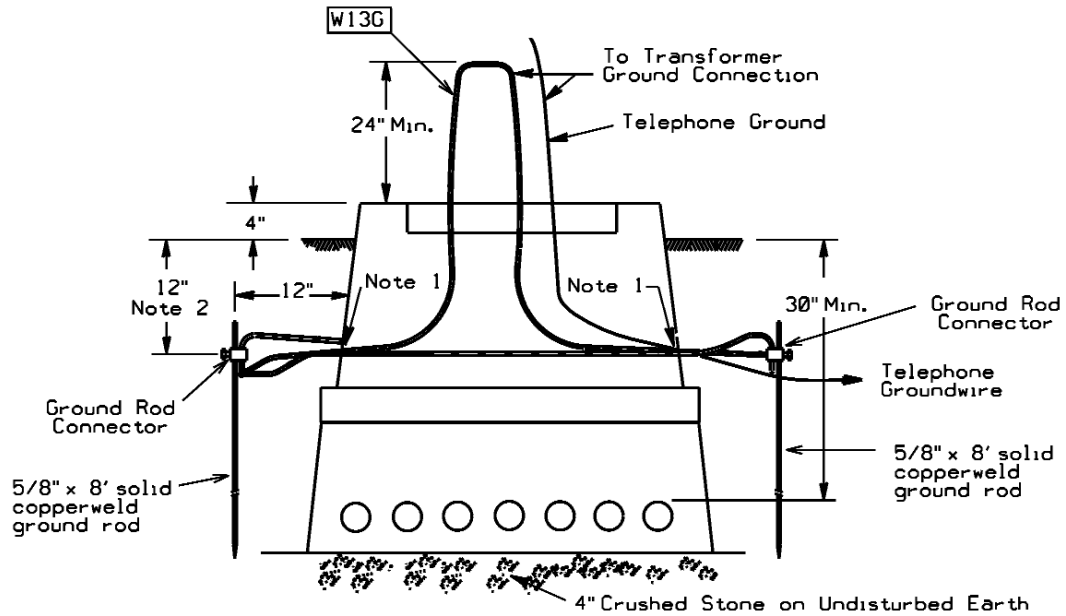
Figure 17.0-1 Single Phase Padmount Transformer Ground Grid



### Notes:

1. Drill 5/8 inch diameter holes as shown in sides of foundation if not provided by foundation manufacturer.
2. Ground loop around foundation to be buried 12 inches below finish grade.
3. Although conduit system is shown, direct buried systems shall incorporate the same ground grid.

Figure 17.0-2 Single Phase Padmount Transformer Ground Grid – Front Elevation



Notes:

1. Drill 5/8 inch diameter holes as shown in sides of foundation if not provided by foundation manufacturer.
2. Ground loop around foundation to be buried 12 inches below finish grade.
3. Although conduit system is shown, direct buried systems shall incorporate the same ground grid.

## 18.0 Proper Transformer Pad and Conduit Installations

### 18.0-1 Proper Conduit Bank Installation (Pre-Backfill)



### 18.0-2 Proper Installation of Conduit with Pullbox used for Drainage (Pre-backfill)





### 18.0-3 Proper Conduit and Handhole Installation (Pre-backfil)





### 18.0-4 Properly Completed Transformer Installation (Final Grade)



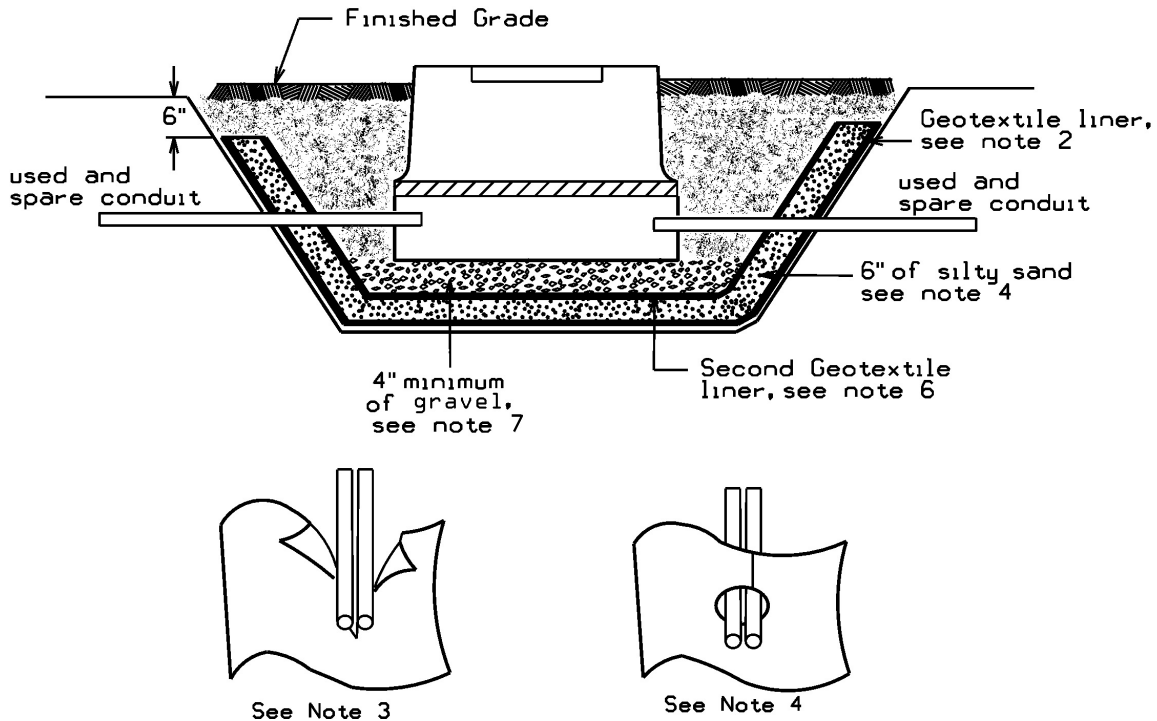


### 18.0-5 Properly Completed Handhole Installations (Final Grade)



## 19.0 Transformer Oil Containment

Figure 19.0-1 Single Phase Oil Containment for Cables in Conduit

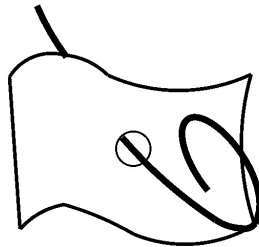
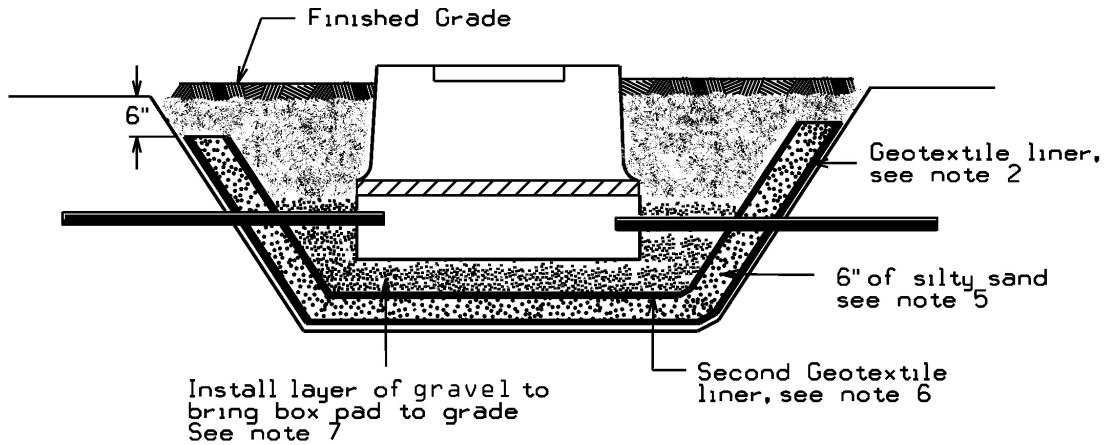


### NOTES:

1. Dig out at least an additional foot on bottom and sides for boxpad area and stub conduits out into the pit.
2. Install geotextile liner in pit along the bottom and sides up to 6" from finished grade.
3. Make vertical cuts in liner to accommodate conduits.
4. Overlap the liner flaps around the conduit and seal both liner seam and in between conduits with expanding foam.
5. Fill in area with 6" of compacted silty sand.
6. Install second layer of geotextile liner by repeating steps 2 and 3.
7. Install 4" minimum of gravel base for boxpad to be at proper grade.
8. Set boxpad and make up conduits into it.
9. Install ground grid, and backfill after company inspection.



Figure 19.0-2 Single Phase Oil Containment for Direct Buried Cables



See Note 3,4

NOTES:

1. Dig out at least an additional foot on bottom and sides for boxpad area and stub conduits out into the pit.
2. Install geotextile liner in pit area to and along the sides to 6" from finished grade.
3. Make small holes in the liner, feed liner through holes into pit.
4. Once cable is pulled, seal the liner around the cable with expanding foam.
5. Fill in area with 6" of compacted silty sand.
6. Install second layer of geotextile liner and cut holes for cables as in note 2.
7. Install layer of gravel for cable routing and base for boxpad to be at proper grade.
8. Set boxpad, train cables into boxpad and fill on top of cables with sand.
9. Install ground grid, and backfill after company inspection.

**Geo-textile Liner**

Generic name is: 16 oz. polypropylene geotextile. Also called filter fabric weighing 16 oz./square yard.

**Brand names / Suppliers are:**

***AME1680 available from***

American Engineering Fabrics (AEF), Inc.  
(Emphasize polypropylene not polyester)  
New Bedford, MA

**1-617-965-0007 / 1-800-770-2666** or from

Vellano Bros. Lancaster, NY  
1-716-684-7222

Several other locations in New York, Massachusetts, Rhode Island and New Hampshire  
**www.vellano.com**

***Synthetic Industries ST 160 available from***

Spartan Mills Inc  
Spartanburg, NC

**1-803-576-2353**

***Carthage Mills FX-160HS***

US Construction Fabrics LLC  
90 Range Road  
Windham, NH 03087

**1-603-898-0532**

## 20.0 Riser Pole

The *Company* shall designate conduit riser locations on the pole. All primary risers shall be Galvanized Steel, this includes the 90 degree sweep. Per NESC all steel risers must be bonded 6" from top and the bond must be at least 8' high from finished grade.

The *Customer* is responsible for providing and installing the bond clamps and the tap. The *Company* will make the bond connection from the riser bond tap to the ground system on the pole. Spare riser sweep shall be bonded also. In New York direct buried applications, riser sweep shall be concrete encased. Approved materials reference is located on Page 39.

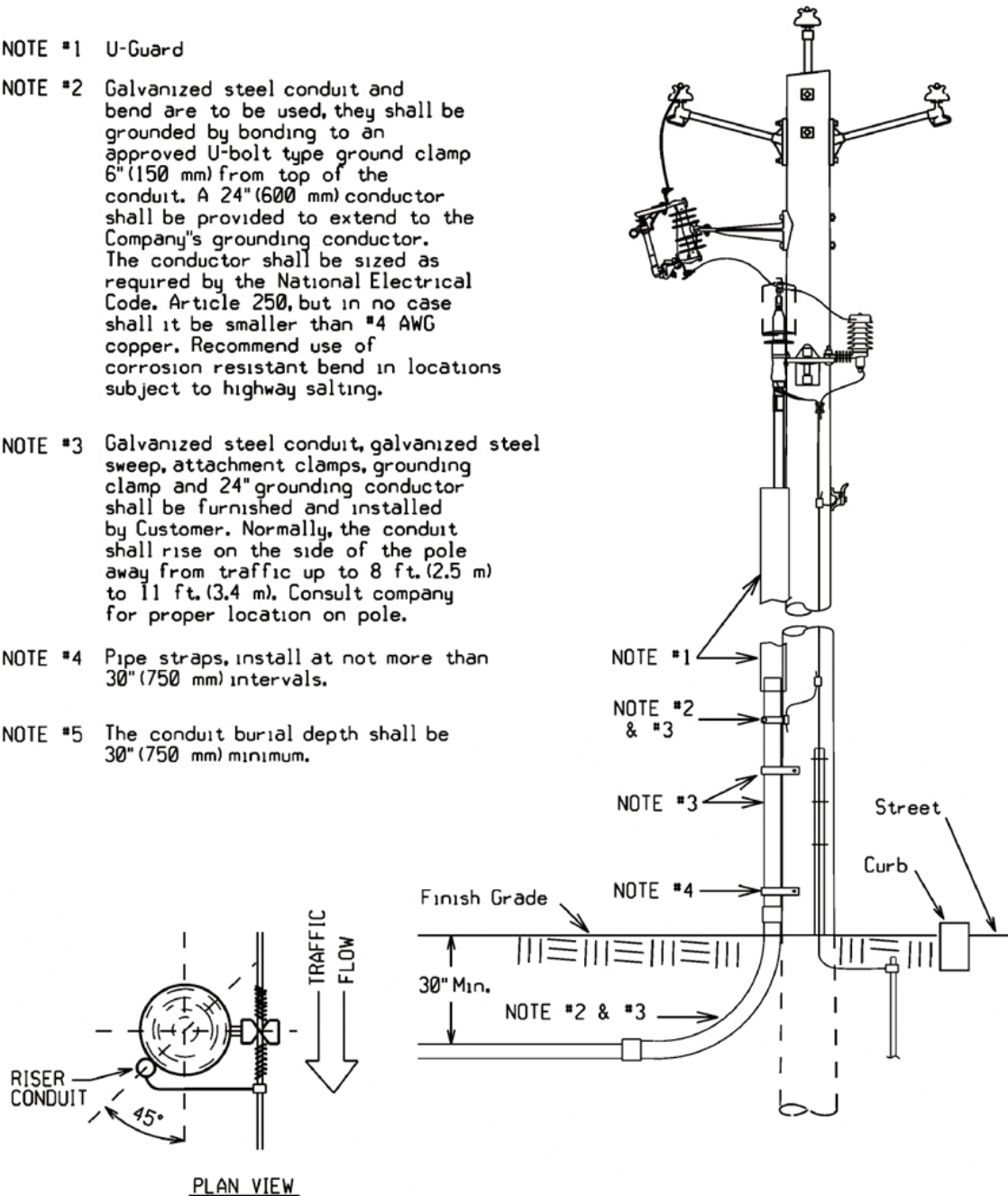
NOTE #1 U-Guard

NOTE #2 Galvanized steel conduit and bend are to be used, they shall be grounded by bonding to an approved U-bolt type ground clamp 6" (150 mm) from top of the conduit. A 24" (600 mm) conductor shall be provided to extend to the Company's grounding conductor. The conductor shall be sized as required by the National Electrical Code, Article 250, but in no case shall it be smaller than #4 AWG copper. Recommend use of corrosion resistant bend in locations subject to highway salting.

NOTE #3 Galvanized steel conduit, galvanized steel sweep, attachment clamps, grounding clamp and 24" grounding conductor shall be furnished and installed by Customer. Normally, the conduit shall rise on the side of the pole away from traffic up to 8 ft. (2.5 m) to 11 ft. (3.4 m). Consult company for proper location on pole.

NOTE #4 Pipe straps, install at not more than 30" (750 mm) intervals.

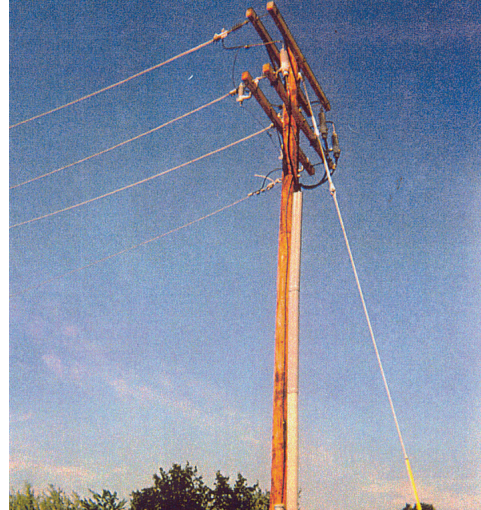
NOTE #5 The conduit burial depth shall be 30" (750 mm) minimum.



## Properly Installed Primary Risers



**Riser Pole Bonding**  
Rigid Galvanized Steel. Bond higher than 8' and at least 6" from top.



**Completed Riser Pole**  
The Company will specify on which quarter of the pole the riser shall be installed, away from traffic.

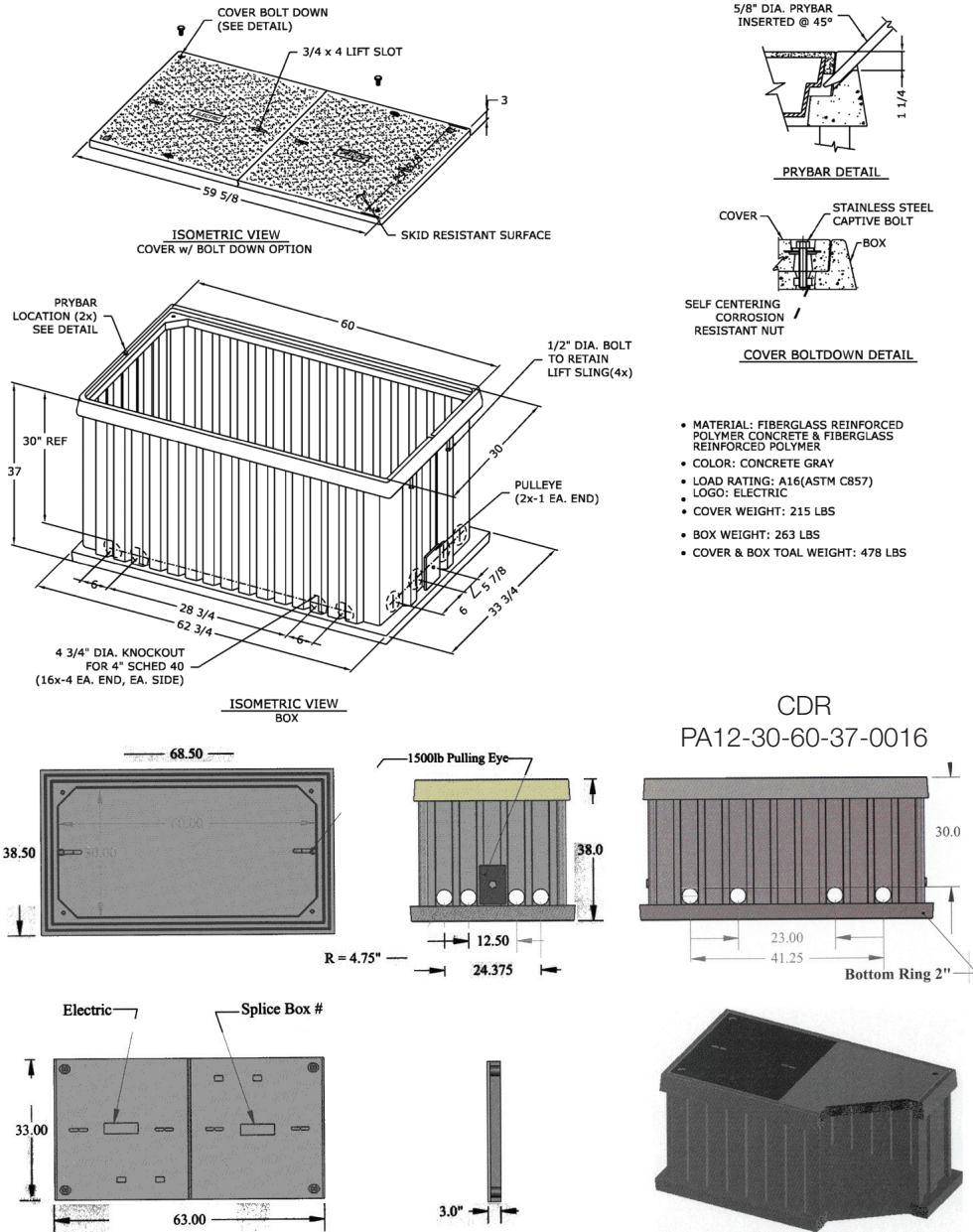


**Spare Riser Sweep**  
Spare sweep shall be bonded to down ground and capped at riser pole.



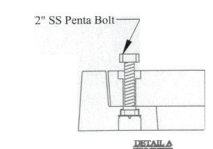
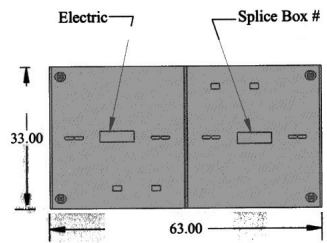
### 21.0 Primary Cable Pull/Splice Box

This primary conduit equipment may be specified in the design for installation in sidewalks or grass plot areas where duct length or design requires extra pulling locations or splices. The splice box is H20 rated and shall be installed in locations not frequently traveled over by vehicles. Pull/splice boxes are supplied and installed by the *Customer*.



- MATERIAL: FIBERGLASS REINFORCED POLYMER CONCRETE & FIBERGLASS REINFORCED POLYMER
- COLOR: CONCRETE GRAY
- LOAD RATING: A16(ASTM C857)
- LOGO: ELECTRIC
- COVER WEIGHT: 215 LBS
- BOX WEIGHT: 263 LBS
- COVER & BOX TOAL WEIGHT: 478 LBS

CDR  
PA12-30-60-37-0016



**PROPRIETARY AND CONFIDENTIAL**  
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF HIGHLINE PRODUCTS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF HIGHLINE PRODUCTS IS PROHIBITED.

UNLESS OTHERWISE SPECIFIED:  
DIMENSIONS ARE IN INCHES  
TOLERANCES:  
FRACTIONALS:           BEND ±  
ANGULAR: MATCH       ±  
TWO PLACE DECIMAL   ±  
THREE PLACE DECIMAL ±  
INTERPRET GEOMETRIC TOLERANCING PER:  
MATERIAL: Polymer & Fiberglass  
FINISH:  
DO NOT SCALE DRAWING  
3

NAME DATE  
CC  
SK 05.30.08

<b>HIGHLINE PRODUCTS</b>	
TITLE: Composite Vault Assembly Model CVA306038 S=10,000lb Rating H=20,000lb Rating	
SIZE DWG. NO. <b>A</b> CVA306038HEIK	REV <b>A</b>
SCALE: NTS/WEIGHT: 764lbs   SHEET 1 OF	



### Properly Installed Primary Pullbox



## 22.0 Trench Requirements

Final grades shall be established, the surface rough graded within 6" of finished grade, and roadway and property boundaries shall be staked or marked by the *Customer* before any trenching is started.

The *Customer* shall adhere to the construction plan and specifications regarding trench locations, trench depth, and concrete encasement. Any deviation shall be subject to approval by the *Company*.

The *Company* shall be notified in advance of the backfilling of any electric facility. The *Company* reserves the right to require re-excavation of the conduits and foundations if the *Customer* fails to have inspection done or backfills before inspection.

For special circumstances that call for concrete encasement, such as crossing a culvert or stream, trenches shall not be backfilled until concrete has set (for at least two hours) and after approval by authorized *Company* personnel. All backfill shall be sand or gravel containing stones less than 1" in any dimension. Backfilling shall not take place over any open-ended (unplugged) conduits. *Company* approved red "Warning" tape shall be installed directly above the *Company's* cable eight to 12 inches below finished grade. Laying the warning tape directly on the cable, concrete or conduit is not acceptable. Certain installations in the public way may require flowable fill instead in place of normal backfill.

### 22.1 Trench Depth New York/New England Concrete Encased Conduit

Burial depths for electrical conduit shall be maintained not less than 30" from the top of the concrete encasement to grade during all phases of construction. The trench bottom shall be solid, undisturbed earth. Earth showing signs of peat, cinders, rubble, or any conditions not suitable for a stable foundation shall be reported to the *Company* for recommendation. Small pockets of unsuitable soil shall be replaced with compacted gravel (maximum 2" stone). At riser pole, end concrete encasement just before riser sweep.

### 22.2 Trench Depth Conduit Direct Buried New York (under certain circumstances agreeable with the Company)

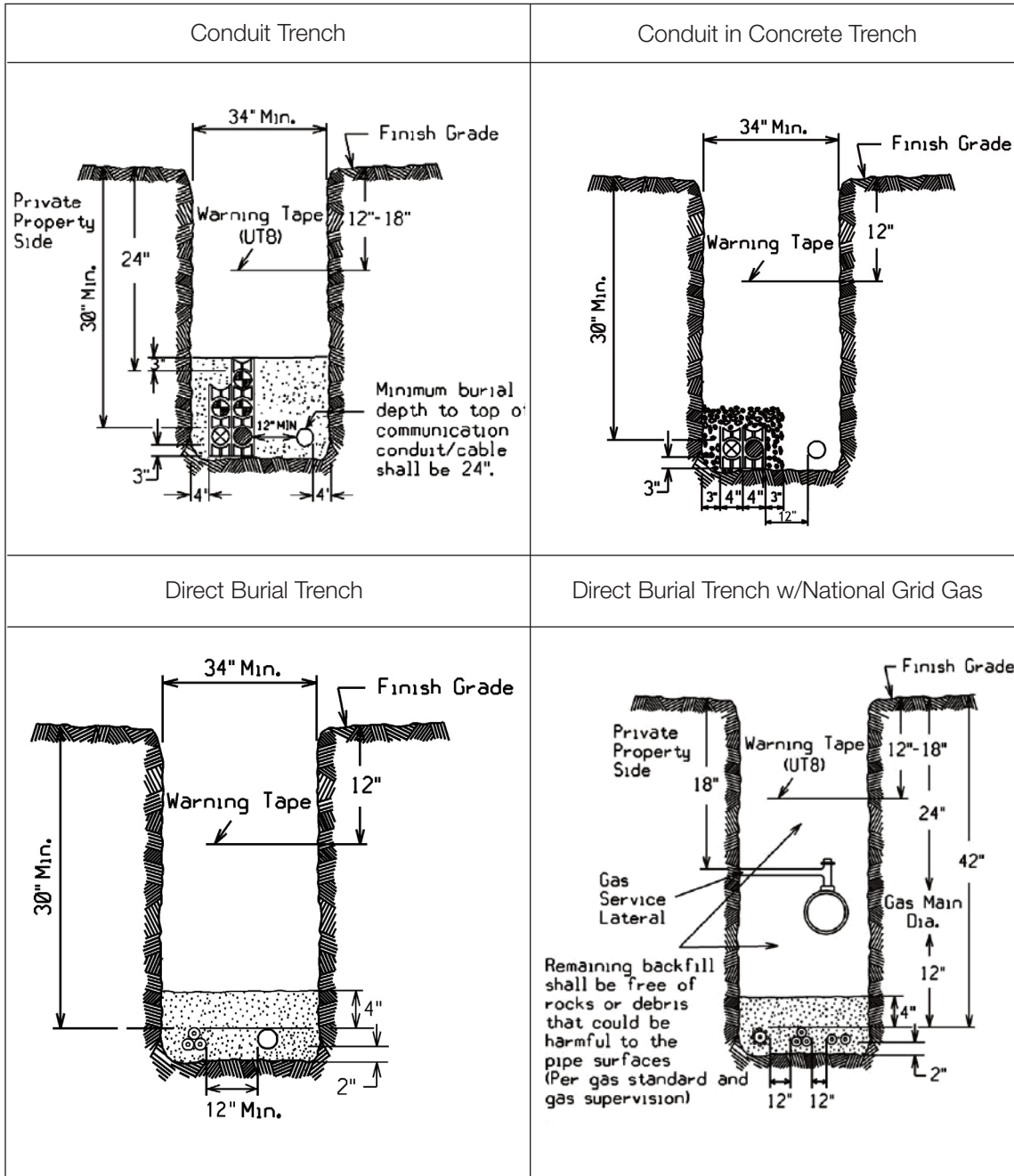
Burial depths for electrical conduit shall be maintained not less than 30" from the top of the conduit to grade during all phases of construction. The trench bottom shall be solid, undisturbed earth. Earth showing signs of peat, cinders, rubble, or any conditions not suitable for a stable foundation shall be reported to the *Company* for recommendation. Small pockets of unsuitable soil shall be replaced with compacted gravel (maximum 2" stone).

### 22.3 Trench Depth Direct Buried New York and Nantucket

Burial depths for electrical cable shall be maintained not less than 30" to grade during all phases of construction. The trench bottom shall be solid, undisturbed earth. Earth showing signs of peat, cinders, rubble or any conditions not suitable for a stable foundation shall be reported to the *Company* for recommendation. Small pockets of unsuitable soil shall be replaced with compacted gravel (maximum 2" stone). Then 2" minimum of sand shall be the base to lay the cable on top of with another 4" minimum of sand to cover cable.

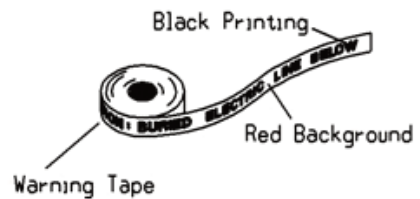


Figure 22.0-1 Typical Trenches



**LEGEND**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li> Base Spacer</li> <li> Intermediate Spacer</li> <li> Secondary Electric Duct</li> <li> Primary Electric Duct</li> <li> Communication Duct or Cable</li> <li> Spare Duct</li> </ul> | <ul style="list-style-type: none"> <li> Nat. Grid Electric Primary Cable</li> <li> Nat. Grid Electric secondary and/or Street Light Cable</li> <li> Communication Cable</li> <li> Sand or Rock-Free Sandy Loam (Clay shall not be acceptable. Site material may be reused if sand or rock free sandy loam.)</li> </ul> |
|---|--|





## 23.0 Conduit Requirements

### New England:

The *Customer* shall be responsible for all trenching, excavation, backfilling, and installation of the primary duct system. The *Customer* is also responsible to supply and install any necessary pullboxes. Concrete encasement shall be provided and installed by the *Customer* as specified by the *Company* when required.

### New York:

New York primarily employs direct buried cable installations. For applications deemed necessary by the *Company* to install conduit, the *Company* shall be responsible for all trenching, excavation, backfilling and installation of the primary duct system. The *Company* is also responsible to supply and install any necessary pullboxes. Exceptions to this are road crossings, culvert crossings, or any cable run requiring concrete encasement. In these situations trenching excavation, backfilling and installation responsibilities will revert back to the *Customer*. Also, in the event of one of these exceptional circumstances, the *Customer* shall adhere to trench inspection guidelines highlighted on Page 11. Once all civil work is deemed satisfactory by the *Company*, the *Company* shall install cable.

## 23.1 Pulling Tape

All conduits shall have a pulling tape, also known as "Mule Tape." This tape is to be rated for 2,500 lbs. of tensile strength. Manufacturers of this tape are listed on Page 41.

## 23.2 New England and when applicable in New York:

The *Customer* shall ascertain the requirements of the specific municipality in which the development is located. For example, some municipalities may require that the *Customer* employ a licensed electrician to direct the installation of all conduit intended for electric facilities.

Temporary mechanical protection over buried conduit and encasements is recommended to prevent crushing or damage during construction, and is the *Customer's* responsibility.

All road crossings shall, when practical, be perpendicular to the sidelines of the road.

The minimum conduit size shall be 4" for three phase and 3" for single phase cable installations. All sweeps at foundations and risers shall have a minimum radius of 36 inches. The riser sweep shall be galvanized steel. The *Customer* shall install conduit plugs in all unused conduits and pulling tape. At the riser pole, the galvanized rigid steel sweeps and the PVC/steel adaptors shall not be concrete encased (In contrast, New York Direct buried applications require the sweeps to be encased). The *Customer* shall be responsible to install rigid galvanized steel straight conduit up the pole high enough to meet NESC code referenced on the riser pole requirements on Page 25, including conduit ground straps, up the riser pole (unless directed otherwise by the *Company*). The *Company* will specify on which quarter of the pole the riser shall be installed, usually away from oncoming traffic.

Except as noted on construction prints, curves and bends in conduit shall be gradual, and the radius of curvature shall not be less than 40 feet. All curves shall be formed with five-degree couplings. The minimum length between single, five-degree couplings is 42".

Conduit grade shall be such as to cause all ducts to drain toward one or both equipment foundations or pullboxes. Minimum pitch shall be three inches per 100 feet.

The *Customer* shall insure that clearances are met and maintained, and that they are inspected by the *Company*. Unless local jurisdictions require greater clearances, the minimum clearances shall be as follows:

**23.3 Communication Systems** – *Company* conduit shall not be directly above or below communication conduit, except when crossing below communication conduit at approximately right angles. *Company* conduit and communication conduit shall be separated by a minimum of 3" of concrete encasement.

**23.4 Non-Company Water, Gas and Sewer** – *Company* conduit shall not be directly above or below any of these foreign utilities, except when crossing above these utilities at approximately right angles. Where the paths of these foreign utilities cross under *Company* conduits at approximately right angles, the minimum separation is 12". A minimum separation of 24" shall be maintained between parallel placement of any of these utilities and electrical conduit.

A six-inch clearance shall be between conduit envelopes and major subsurface pipes (e.g. drainage pipes).

The *Customer* shall rod and mandrel all primary conduits to insure their integrity before the *Company* shall attempt to pull any primary cable. The *Customer* shall furnish and install an approved synthetic, 2,500 pound test tape in each primary conduit run including risers. Pulling tape installation and rodding the duct shall be witnessed by the *Company*.

*Company-owned duct shall not share a concrete encasement with foreign utilities (e.g. do not place communication or private electrical duct in the same concrete encasement as Company duct).*

At those locations where manholes or above ground switchgear are required, additional specifications will be provided by the *Company*.

## **24.0 Metering**

Refer to the *Company's* Specification for Electrical Installations book for the type of installation. Division of work and material will be performed with the approval and authorization of the *Company's* Metering Services department.

## 25.0 Easement Applications (New England and New York forms)

### NEW ENGLAND EASEMENT APPLICATION FORM

FOR NATIONAL GRID'S USE ONLY	
<b>Application for Easements (check one):</b> <input type="checkbox"/> OH (jointly owned or solely owned) <input type="checkbox"/> UG <input type="checkbox"/> Electric <input type="checkbox"/> Padmount transformer only <input type="checkbox"/> URD <input type="checkbox"/> Gas	
<b>Work Request Number</b> _____	
Utility Engineer's Name: _____ Telephone Number: _____	

Please complete **ALL** of the sections below so that we may prepare an easement for your signature. Do not leave any sections unanswered. If a section does not apply to you simply put "n/a" on that line. Incorrect or incomplete information will delay service installation.

Property Owner(s): \_\_\_\_\_

**Property Owner Mailing Address**

**Property Address of Easement**  
(if different from mailing address)

Address: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

City: \_\_\_\_\_

State & County \_\_\_\_\_

State & County \_\_\_\_\_

Zip \_\_\_\_\_

Zip \_\_\_\_\_

Customer Contact Person: \_\_\_\_\_

Daytime Phone(s): \_\_\_\_\_

Re: Subdivision Title: \_\_\_\_\_

1. Provide us with a **RECORDED** copy of the present owner's deed, Book \_\_\_\_\_ Page \_\_\_\_\_

a) If multiple deeds make up the whole parcel, please include all deeds.

b) If the Property Owner is a b1) CORPORATION, b2) TRUST, b3) PARTNERSHIP, or b4) LIMITED LIABILITY COMPANY, provide the following which is applicable:

b1) President Name: \_\_\_\_\_ Treasurer Name: \_\_\_\_\_  
*See Footnote<sup>1</sup> Below*

**Or**

Vice President: \_\_\_\_\_ Asst. Treasurer: \_\_\_\_\_

<sup>1</sup> If neither "Name Combinations" is available, the person(s) signing the easement must have a Corporate vote authorizing them to sign on behalf of the Corporation.



**NEW YORK EASEMENT APPLICATION FORM**  
Application For Utility Electric/Gas Distribution Easement

<b>This Portion to be Completed by National Grid Representative</b>	
<b>Application Date Received:</b> _____	
<b>Type of Easement:</b> <input type="checkbox"/> OH (jointly owned or solely owned) <input type="checkbox"/> UG Electric <input type="checkbox"/> Gas <input type="checkbox"/> Padmount transformer only <input type="checkbox"/> URD	
<b>National Grid Representative</b> _____	<b>Telephone</b> _____

**Requestor of Service**

Please complete **ALL** of the sections below so that we may prepare an easement for your signature. Do not leave any sections unanswered. If a section does not apply to you, simply put "n/a" on that line. (Incorrect or incomplete information will delay service installation.)

Property Owner(s): \_\_\_\_\_

**Property Owner Mailing Address**

**Property Address of Easement**  
(if different from mailing address)

Address: \_\_\_\_\_  
 City/Town: \_\_\_\_\_  
 State: \_\_\_\_\_  
 Zip Code: \_\_\_\_\_  
 Telephone: \_\_\_\_\_

Address: \_\_\_\_\_  
 City/Town: \_\_\_\_\_  
 State & Country: \_\_\_\_\_  
 Zip Code: \_\_\_\_\_  
 Name of Subdivision: \_\_\_\_\_  
 Telephone: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Daytime telephone(s): \_\_\_\_\_

1. Provide us with a **RECORDED** copy of the present owner's deed (and survey) if available. If multiple deeds make up whole parcel, please include all deeds.

**Book:** \_\_\_\_\_ **Page:** \_\_\_\_\_

2. Tax map number of property where service is to be installed (SBL): \_\_\_\_\_

3. Recording reference to approved subdivision plan:

**Plan Book:** \_\_\_\_\_ **Plan:** \_\_\_\_\_ **Date:** \_\_\_\_\_

4. If the property owner is a (a) CORPORATION, (b) TRUST, (c) PARTNERSHIP, or (d) LIMITED LIABILITY COMPANY, provide the following which is applicable:

**(a) CORPORATION NAME:** \_\_\_\_\_

President: \_\_\_\_\_ Treasurer: \_\_\_\_\_

Vice President: \_\_\_\_\_ Assit. Treasurer: \_\_\_\_\_

(If none of the Officers listed above are available, the person(s) signing the easement must have a corporate vote authorizing them to sign on behalf of the Corporation.)

**(b) TRUST NAME:** \_\_\_\_\_

Number of Trustees: \_\_\_\_\_ Names: \_\_\_\_\_

**(c) PARTNERSHIP NAME:** \_\_\_\_\_

Number of Partners: \_\_\_\_\_ Name(s): \_\_\_\_\_

**(d) LIMITED LIABILITY COMPANY (LLC) NAME:** \_\_\_\_\_

Authorization to sign – Name(s): \_\_\_\_\_

*Note: As a public utility, National Grid is required to provide electric/gas service; however, you, the customer, are required to provide National Grid with all the easement rights necessary to install your electric/gas service, including any easement rights which must be acquired from others.*

**Please return or fax this document and the requested information to:**

{National Grid Representative}

{Company name}

{Location: Street name}

{Location: City/Town, State, Zip Code}

{Fax number}

**26.0 Approved Material – Underground Residential Installations**

National Grid Item ID	Item Description	Manufacturer 1 Part Number	Manufacturer 2 Part Number	Manufacturer 3 Part Number
-----------------------	------------------	----------------------------	----------------------------	----------------------------

**Conduit – Straight**

2010404	Conduit, 4", PVC	Carlton: 48815	IPEX: 8741	Cantex: A79EA42
2011024	Conduit, Galvanized, 4"	By Description		
5692158	Conduit, 3", PVC	Carlton: 48815	IPEX: 08731	AMERICAN PIPE TC7215752
5692107	Conduit, Galvanized, 3"	BAYNEJONES 300R		

**Conduit – Blends**

5690446	Bend, Galvanized, 4" 36"	BaynesJones 400R9036	Conditmfg TUB490D36RGA LEL	
5690493	Bend, PVC Sch 40, 4", 90 Degree, 36" Rad.	Carlton: UA9FNB	Cantex: 5233842	
5690436	Bend, Galvanized, 3" 36"	BaynesJones 400R9036	Conditmfg TUB490D36RGA LEL	
5690419	Bend, PVC DB, 3", 90 Degree, 36" Rad.	Carlton: PF9FL	Cantex: 5123872	Certisaft 59734

**Spacers**

5646963	Spacer, 4", Base	GS Industries: 186-1	IPEX: 29573	
5646960	Spacer, 4", Inter.	GS Industries: 185-1	IPEX: 29557	
5646958	Spacer, 3", Base	GS Industries: 157-1	IPEX: 29569	
5646956	Spacer, 3", Inter.	GS Industries: 156-1	IPEX: 29553	

National Grid Item ID	Item Description	Manufacturer 1 Part Number	Manufacturer 2 Part Number	Manufacturer 3 Part Number
-----------------------	------------------	----------------------------	----------------------------	----------------------------

**Conduit Accessories**

5641210	Riser Strap, 4"	Electrical Materials: 50-4 USHD	BaynesJones MINRLAC HD-296	
5641205	Riser Strap, 3"	Electrical Materials: 50-3 USHD	BaynesJones MINRLAC HD-294	
7011830	Lag Screw, 1/4" x 2"	Elect. Materials: 106 or 106M	Joslyn J26486.1	PLH LSNW-142
3503074	Pipe Grd. Connector, 4" and 5"	T & B: (O)3905-BU	Burndy GAR3905-BU	
3503075	Pipe Grd. Connector, 2.5" and 3.5"	T & B: (O)3904-BU	Burndy: GAR3904-BU	
2010424	Duct Plug, 4" DB	Carlton: P258NT	GAR3905-BU	
5645682	Duct Plug, 3" DB	CANTEX : 5315260	CARLON: P258L	CERTIFSAFT: 59653
2011254	Duct Plug Galvanized 4"	Crousehind PLG105		
9201659	Duct Plug Galvanized 3"			
2010434	Adapter, Female, PVC-Steel, 4"	Carlton: E942N	Cantex: 5140052	Scepter FA55
2010433	Adapter, Female, PVC-Steel, 3"	Carlton: E942N	OZGEDNEY: PLG-300C	
5693359	Coupling, 5 Degree, Bell-Spigot, 4"	Carlton: E244N	Cantex: 6151452	Certisaft 59544
5693356	Coupling, 5 Degree, Bell-Spigot, 3"	Cantex: 6151450	Carlton: E244L	
2010444	Coupling, 5 Degree, Bell-Bell, 4"	Ameripipe: FT518	Carlton E2440NF	Scepter 7604360040



National Grid Item ID	Item Description	Manufacturer 1 Part Number	Manufacturer 2 Part Number	Manufacturer 3 Part Number
5100696	Coupling, 5 Degree, Bell-Bell, 3"	Ameripipe: NS141	Carlton 6151458	
2010454	Straight Coupling, 4", EB/DB	Carlton: E240N	Cantex: 6151450	
2010453	Straight Coupling, 3", EB/DB	Cantex: 6151450	CARLON : E2544L	

#### Grounding Accessories

961285	Grounding Bushing, 4" and 5"	Burndy GAR3905-BU	T&B: (0)3905-BU	
3500313	Grounding Rod 5/8' x 8' Solid Copperweld	Galvin 6258	ERITECH 615880	Joslyn: J8338
4015032	#2 AWG, 7 strand, soft drawn	South Wire - By description		
3503328	Ground Rod Clamp	Burndy: GRC58	Blackburn: JAB58H	Electromotion EM58DBW
5960412	"C" Connector, 2/0 – 2/0	Burndy: YC26C26TN		

#### Primary Pullbox Secondary Handoles

5640808	Primary Pull/Splice Box	CDRSYSTEM: PA12-3060-37	Highline: CVA306038HEIK	
5643082	Handhole (NE, for conduit)	Highline: PA10- 1730-30-0319	Highline: CHA173030SE1-NG	NORDICFIB: GS-37-23-30-NEPS
5430126	Handhole (Nantucket, square conduit)	CDRSYSTEM: CCE- 0101PA10-1730-30	BAYNEJONES: PA10-1730-24	
0810695	Handhole 13"x22.5 (direct buried NY)	PENCELL: PE-20HD-2X	CARSON: 1324- 153HGE20AVO	Highline: 1324-15 P2P
0810696	2" extension ring for item #0810696	Carson: 1324PR-100		
5643077	Handhole 17x30 (direct buried NY)	Pencell: PE-30-HDX-GREEN	CARSON: 1730-DP2P	Fargo: B-138AG

National Grid Item ID	Item Description	Manufacturer 1 Part Number	Manufacturer 2 Part Number	Manufacturer 3 Part Number
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**Other Materials**

	Secondary Connections	Burndy	Richards	
	Pulling Tape	Arnco: DLWP25	Condux: 08096303	Neptco: WP2500P

## 27.0 Job Checklists

### URD CONDUIT INSPECTION CHECKLIST

Do not back fill BEFORE conduit system inspection and approval by the Company have been obtained. Every item below must be inspected and checked off by the Company representative. Any item found unacceptable must be initialed and rectified by Customer by next inspection.

**N\* Y\***

#### PRE-TRENCH

- Final Grade established
- Surface rough graded
- Roadways staked

#### TRENCH

- Minimum 30" depth from finishing grade to top of primary conduit
- Minimum 24" depth from finishing grade to top of secondary conduit
- Minimum 12" separation between Electric conduits and Telecommunications conduits
- Min, 24" separation between Electric conduits and water, sewer or gas if placing parallel
- Minimum 12" separation between Electric conduits and water, sewer or gas if placing perpendicular
- Conduit plugs installed
- Plastic spacers properly installed no more than every 8' and at every junction point
- 4" screened backfill (with less than 1" stones) on-site for backfilling entire trench, (inspector may witness backfilling)
- Warning tape installed 12" below finish grade and directly above electrical conduit system
- All curves properly formed with five degree couplings
- No parallel utilities directly above electrical system

#### Secondary Handhole

- 4" crushed stone under handhole
- Handhole covers installed and properly secured with pentahead bolts
- Top surface flush with final grade
- Conduit plugs installed from the outside in all unused conduit knockouts
- No more than 3" of extended PVC into handhole

#### Transformer Foundation

- 4" of crushed stone under transformer foundation
- Top surface 4" above final grade
- No more than 3" extended PVC through foundation
- Pulling eyes properly installed in front and back of box pad (ring part on the inside)
- Conduit plugs installed from the outside in all unused conduit knockouts
- Two ground rods installed at opposite corners of foundation – exposed for inspection
- Ground grid buried 12" below finish grade and placed 12" away from edge of boxpad
- Loop ground grid around and into foundation through two sides of foundation
- Correct orientation to road and lot lines
- All non-Company owned pedestals are a minimum of 2' away from all sides

#### Pullbox

- 4" or crushed stone under pullbox foundation
- Pullbox covers installed and properly secured with pentahead bolts
- Top surface flush with final grade
- No more than 3" extended PVC into pullbox
- Conduit plugs installed from the outside in all unused conduit knockouts
- All non-Company owned pedestals are a minimum of 2' away from all sides

#### RISER POLE

- 90° bend and 10' straight riser pipe galvanized steel conduit. (3" for single Phase, 4" for three phase)
- Steel-PVC adapter and steel sweep shall not be encased in concrete
- Ground clamp installed with tap
- Install 2500 lb. Pulling Tape in all conduit after rodding with mandrell

\*NOTE Y – Acceptable N – Deficient

## URD DIRECT BURIED INSPECTION CHECKLIST

Do not back fill BEFORE direct buried cable system inspection and approval by the Company have been obtained. Every item below must be inspected and checked off by the Company representative. Any item found unacceptable must be initialed and rectified by Customer by next inspection.

**N\* Y\***

### PRE-TRENCH

- Final Grade established
- Surface rough graded
- Roadways staked

### TRENCH

- Minimum 30" depth from finishing grade to top of cable during all phases of construction
- Minimum 24" depth from finishing grade to top of secondary cable
- Electric infrastructure on "road" side in all multi-utility trench installations
- All road crossings perpendicular
- 2" minimum of sand in base of trench
- All trench spoils shall be stored on field side of exposed trench

### PRE-BACKFILL (After cable is installed)

- 4" of sand minimum on top of cable
- Minimum 12" separation between Electric cable and Telecommunications cable/conduits
- Minimum 24" separation between Electric cables and water, sewer or gas if placing parallel
- Minimum 12" separation between Electric cables and water, sewer or gas if placing perpendicular
- Sand or screened backfill (with less than 1" stones) on-site for backfilling entire trench, (inspector may witness backfilling)
- Warning tape installed 12" below finish grade and directly above electrical system
- No parallel foreign utilities directly above electrical system

### Transformer Foundation

- 4" of crushed stone under transformer foundation
- Top surface 4" above final grade
- Two ground rods installed at opposite corners of foundation – exposed for inspection
- Ground grid buried 12" below finish grade and placed 12" away from edge of boxpad
- Loop ground grid around and into foundation thru 2 sides of foundation
- Correct orientation to road and lot lines

### RISER POLE

- 90° bend and 10' straight riser pipe galvanized steel conduit. (3" for single Phase, 4" for three phase)
- Steel-PVC adapter and steel sweep shall not be encased in concrete
- Ground clamp installed with tap
- Install 2500 lb. Pulling Tape in all conduit after rodding with mandrell

*\*NOTE Y – Acceptable N – Deficient*

## 28.0 Revision History

<b>Version</b>	<b>Date</b>	<b>Description of Revision</b>
1.0	07/19/10	New document superseding all previous versions of ESB 759.

National Grid is an international energy delivery company. In the U.S., National Grid delivers electricity to approximately 3.3 million customers in Massachusetts, New Hampshire, New York and Rhode Island, and manages the electricity network on Long Island under an agreement with the Long Island Power Authority (LIPA). It is the largest distributor of natural gas in the northeastern U.S., serving approximately 3.4 million customers in Massachusetts, New Hampshire, New York and Rhode Island. National Grid also owns over 4,000 megawatts of contracted electricity generation that provides power to over one million LIPA customers.

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