

# Conduit construction guide

For the installation of conduit, manholes and splice boxes



An Exelon Company

[BGE.COM](http://BGE.COM)

Before you dig, every dig.  
**MISS UTILITY**

It's the law.  
**811 or 1.800.257.7777**

## **One call to Miss Utility can save time, money and lives.**

Before you pick up any equipment, pick up the phone and call Miss Utility.

Miss Utility will notify all applicable utility companies and see to it that your job site is marked for all underground utility lines. One simple phone call can save you the time and hassle of dealing with job site mistakes and delays. Not to mention decrease liability, prevent damage, reduce injuries and possibly save lives. After all, safety is everyone's job.

**Call Miss Utility, at least 48 hours prior to work, at 811 or 1.800.257.7777.**

## **Dig Safely CHECKLIST**

1. Call Miss Utility at 811 or 1.800.257.7777 at least 48 hours prior to work.
2. Allow the required time for utilities to mark the underground lines.
3. Respect and protect all marks/flags.
4. Excavate with care. Take all reasonable actions to properly protect, support and backfill underground utility lines.
5. Immediately notify the utility if an underground utility line is damaged.
6. If damage creates an emergency, take immediate steps to safeguard life, health and property.

**Please check with your individual jurisdictions with regard to  
waiting times and specific digging guidelines.**

*For more information, contact Miss Utility or check online at **[www.missutility.net](http://www.missutility.net)**.*

# INTRODUCTION

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**The information in this manual provides general guidelines for the installation of conduit, manholes and splice/pull boxes as it relates to BGE gas and electric service.**

These guidelines assist developers, general contractors, builders, architects, engineers, licensed electricians and plumbers in the engineering, planning and construction of commercial, industrial and residential projects.

This addendum provides clear and more consistent guidelines on the requirements for conduit and manhole construction. This publication does not cover all the rules and regulations and is to be used in conjunction with the “Commercial, Industrial and Residential Customer Information Booklet”. For your convenience both booklets are available online at [\*\*bge.com\*\*](http://bge.com)

BGE’s goal is to work with you to install gas and electric service promptly and safely while meeting all construction codes and safety standards. Now and in the future, we’re committed to providing safe and dependable natural gas and electric service.

We hope the information in this manual answers your questions and guides you through the process. If there’s anything we haven’t made clear, please call us at **800.233.1854**

# TABLE OF CONTENTS

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## 1

### GENERAL

Guidelines . . . . .	2
Customer responsibilities . . . . .	3

## 2

### CONDUIT

Specifications for Customer Installation . . . . .	5–7
Standard Duct Bank Arrangement/Installation . . . . .	8
Plastic PVC Duct Spacers General Information . . . . .	9
Road Crossing Specifications . . . . .	10
3-Phase Transformer Pad Dimensions Detail . . . . .	11
1-Phase Transformer Pad Dimensions Detail . . . . .	12
Turning Conduit Into Transformer Pads . . . . .	13

## 3

### SPLICE/PULL BOXES

General Information . . . . .	15
Secondary (600V) Fiberglass Splice/Pull Box . . . . .	16
Installation Instructions for 13 and 34 kV Boxes . . . . .	17
Splice/Pull Box - 13kV (#2- 1/0 cables only) . . . . .	18
Splice/Pull Box - 13kV (#2- 500 cables only) . . . . .	19
Splice/Pull Box - 2-sets 13kV or 1- set 34kV (#2- 750 cables) . . . . .	20–21

## 4

### MANHOLES

General Information . . . . .	23
Installation of Precast Concrete Manholes . . . . .	24
Small Secondary Manhole 1 to 4 Services . . . . .	25–26
Large Secondary Manhole 1 to 7 Services . . . . .	27–28
Precast Concrete Line Manholes . . . . .	29–30
Precast Concrete Slotted End Wall Manhole . . . . .	31–33
Installation Standards . . . . .	34–40
Materials Available from BGE Contractor Supplier . . . . .	41

## 5

### DEFINITIONS AND FREQUENTLY ASKED QUESTIONS

Definitions . . . . .	44
Frequently Asked Questions . . . . .	45

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# GENERAL

## GUIDELINES

**BGE's Underground Cable Systems**

BGE's underground cable systems are divided into three types:

**1. Direct-Buried: (Cables/Gas Pipe installed directly in ground, not installed in any type of duct or sleeve)**

This type of system is typically used in rural or suburban areas where:

- Load density is relatively light; a concentration of cables does not exist.
- Circuits are not routinely added and front lot line installations.
- Dirt digging with occasional paving is expected.
- In these areas, the design principle used is loop feed primary and joint trenching with telephone and gas.
- Sleeving (short duct lengths) may be used in advance of paving where BGE utilities are to be installed at a later date (i.e. road crossings, parking lots, etc.).

**2. Direct-Buried Conduit: (cables/gas pipe installed in PVC or flex polyethylene duct or sleeve that is installed directly in ground)**

This type of system is typically used in rural or suburban areas where special situations exist such as:

- Extensive paved areas with concrete or macadam such as parking lots.
- Secondary distribution through paved, limited access, congested or potentially congested areas, thus preventing easy maintenance digging for repairs or replacement of the installed lines.
- Rocky soil conditions which could damage the cable.

(Note: Typically used in conjunction with splice/pull boxes and not concrete manholes.)

**3. Concrete Encased Conduit: (Cables installed in concrete encased PVC duct)**

This type of system is typically used in urban areas where:

- Load density is significant.
- Concentration of circuits via the same route are planned or expected.
- Additional circuits will be added routinely.
- The concentration of circuits, limited Right-of-ways and an expected high number of circuits leaving distribution or master substations.
- Ducts are stacked on top each other.

(Note: Typically used in conjunction with concrete manholes and not splice/pull boxes.)

(Note: Gas sleeves will not be concrete encased.)

## CUSTOMER RESPONSIBILITIES

### General

The information provided below is an addendum for conduit and manhole construction only. Please refer to the “Commercial & Industrial and Residential Customer Information Booklet” for the comprehensive list of rules, regulations and responsibilities.

The customer is responsible for engineering, designing, permitting, purchasing and constructing all required road crossings, ducts, conduit, splice/pull boxes and manholes according to the standards set forth in this document in order for BGE to provide gas and electric service.

### Customer’s responsibility to perform the following:

#### Pre-Construction Phase

- Submit BGE service application and obtain project number (WMS#).
- Provide loads and voltage class.
- Provide detailed utility site plans.
- Meet with BGE representative to discuss project scope, schedules and next steps.
- Develop detailed conduit and manhole drawings including profiles and duct runs. \*\*
- Submit conduit and manhole drawings to BGE for review. \*\*
- Submit drawings to local municipality and obtain required permitting.
- Sign and return required BGE design drawings and contract.
- Provide payment to BGE for project costs.
- Contact inspector noted on BGE design drawings to schedule pre-construction meeting.

#### Construction Phase

- Notify BGE immediately of any changes to schedule, scope or final design.
- Contact BGE to schedule “Pre-pour Inspection.” \*\*
- Contact BGE to schedule “Pre-backfill Inspection.” \*\*
- Contact BGE to schedule “Mandreling and Stringing Inspection.” \*\*

#### Post Construction Phase

- Satisfy all municipality inspections.
- Call BGE to schedule and release BGE project.

**\*\* When indicated on BGE drawings.**

**Note: Not following specifications and standards in this booklet may cause delays in customer project and additional costs necessary for BGE to complete the job.**



# CONDUIT

## SPECIFICATIONS FOR CUSTOMER INSTALLATION

Note: Conduit from the meter termination point to the secondary side of the transformer is the standard method of installation for most three-phase commercial and industrial secondary services. The direct-buried method is still a method of installation where conduit installation would be impractical. When required by BGE, the customer is responsible for designing and building ducts and conduit systems.

### Direct-Buried Electric Conduit

#### Primary and Secondary Electric Conduit

1. Secondary conduit will be 4" minimum inside dimension I.P.S.
2. Primary conduit size varies, contact BGE representative for actual sizes.
3. BGE shall specify the number, size and configuration of ducts.
4. All direct-buried ducts shall be UL schedule 40.
5. All bends shall be no less than 36" in radius. A total of two (2) 90 degree bends are allowed in the conduit line (i.e., conduit turn up at transformer pad is one (1) 90-degree bend). One (1) additional, wide-radius bend (minimum radius of five feet for this additional bend) will be allowed. If this still will not be sufficient for the conduit design/construction, contact your BGE representative. A hand hole, splice/pull box or manhole may be required.
6. The customer shall pull a mandrel (1/2" smaller in diameter than the conduit and 6" long) through each duct prior to BGE cable installation, followed by a pulling line (1800 lb. minimum tensile strength mule line preferred) which shall remain in each duct.
7. Customers will connect all electric conduit with sealed/glue couplings and terminate their conduit with bell ends and plugs.
8. Electrical ducts should be sloped away from the customer's building whenever possible to reduce the potential for water intrusion into the building as a result of failed or missing duct seals.
9. Required depth of conduit from final grade to top of conduit/conduit bank:
  - 30" for secondary, minimum
  - 36" for primary, minimum
  - 48" maximum
10. Backfill evenly around duct with clean dry earth and mechanically tamp in 12" lifts.
11. Lengths of secondary duct banks shall be minimized to limit pulling distances and electrical losses. Any secondary duct lengths over 100 feet shall be approved by BGE prior to construction.
12. The minimum longitudinal separation between foreign structures and conduit should be as follows:
  - Telephone/Cable Television Conduit—3" of concrete or 12" of earth
  - Gas, Water, Sanitary and Oil Mains—12" of earth
13. Splice/pull boxes or manholes may be required by BGE depending on the specific installation.
14. If electric service is being supplied from a **new** transformer, the customer's duct shall enter the transformer as shown on page titled "Turning Conduit into Transformer Pads" in section two (2) of this booklet.
15. If electric service is being supplied from an **existing** transformer, the customer shall end the secondary duct five feet from the secondary side of the transformer at a location determined by BGE. BGE will continue the duct into the transformer based on field conditions.

## SPECIFICATIONS FOR CUSTOMER INSTALLATION (CONT'D)

## Direct-Buried Gas Sleeves

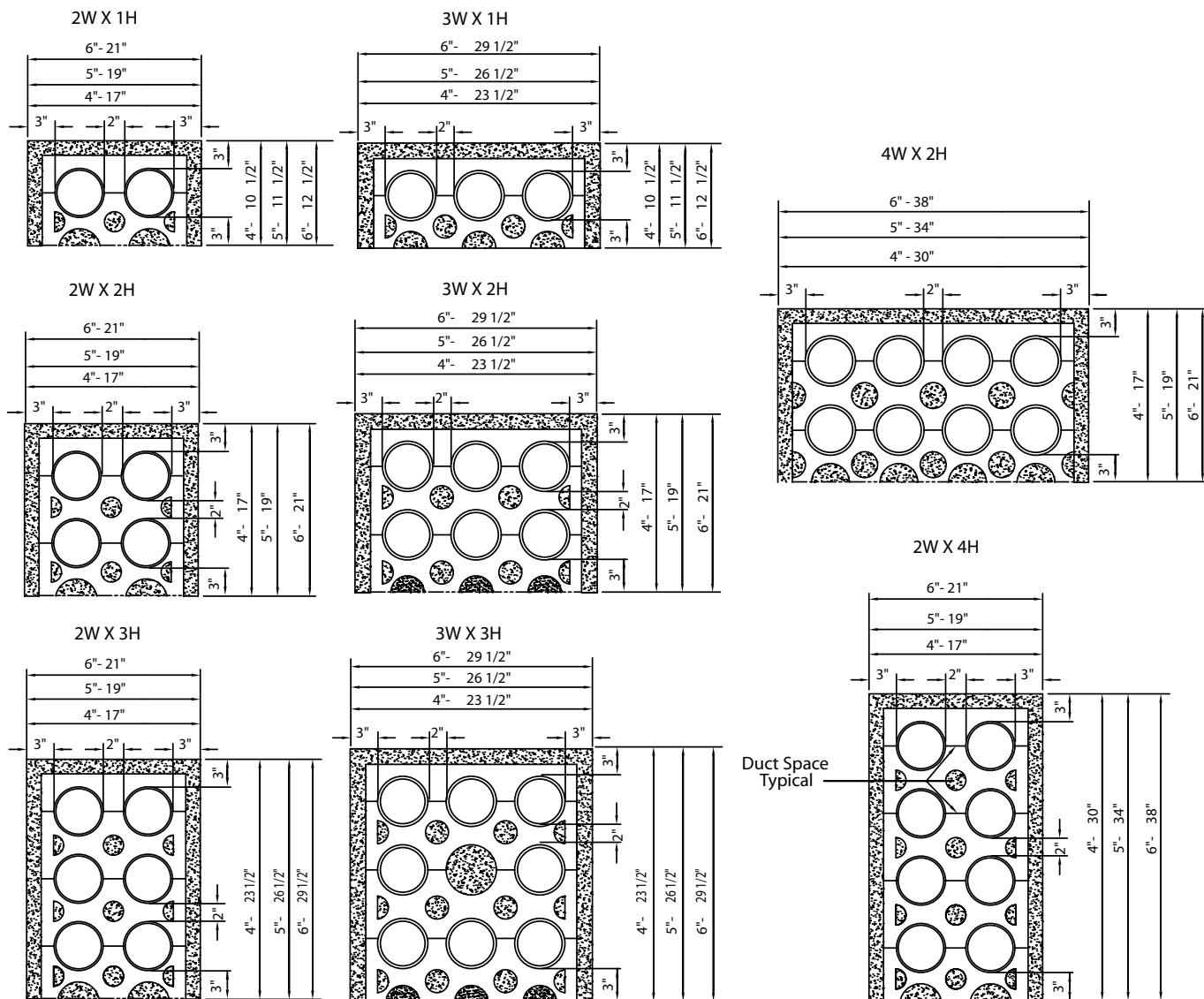
1. PVC UL Schedule 40 conduit (solid wall, not split) may be used as a sleeve installed in advance of paving to facilitate future installation of small size (2" and smaller) gas services where casing is not required. The ends of the sleeve should not be sealed after insertion of the carrier pipe to avoid containment of gas in case of a gas leak. However, the end of the sleeve on a service line nearest the building should be sealed after installation of the carrier pipe and the opposite end of the sleeve left open.
2. Gas services common trenched with electric duct shall be in sleeves.
3. Gas sleeves shall not exceed one 45-degree bend, and must terminate a minimum of 5' from all buildings/ structures. **Note: 90-degree bends are not allowed.**
4. Only one gas service per sleeve is permitted.
5. Gas sleeves will not be concrete encased.
6. Installation of gas piping into any electrical conduit bank is prohibited.
7. Installation of minimum 4" sleeve and underground warning tape unless otherwise specified for natural gas service under paving, or under improved areas as required by BGE or any city or county regulations. (Applicable only for plastic gas service sizes: 1/2" CTS; 3/4" IPS; 1" CTS; 1-1/4" CTS; 1-1/4" IPS and 2" IPS.)
8. Lengths of continuous runs for gas sleeves shall not exceed 300 feet.
9. Mechanical joints on gas services are not allowed inside of sleeves. Open trench space provision must be made to allow BGE room to make these connections.
10. Warning tape is required above all gas sleeves and can be purchased and delivered to your site from BGE's Contractor Supplier (See page 41).
11. PVC sleeves for gas shall be two (2) standard pipe sizes larger than the gas pipe .
12. Vertical separation for gas sleeves when crossing any foreign structure is a minimum of 12".
13. Radial separation between gas sleeves and electric cable or conduit is a minimum of 12".

## SPECIFICATIONS FOR CUSTOMER INSTALLATION (CONT'D)

**Concrete Encased Electric Conduit**

1. Duct banks must be concrete encased if any ducts are stacked vertically (one on top of the other). All 2x2 duct banks and greater must be concrete encased.
2. If ducts are within municipality Right-of-way, it may be required to concrete-encase. Check with local Department of Public Works for specific requirements.
3. BGE shall specify the number, size and configuration of ducts.
4. Schedule 20 PVC must be used for concrete encased ducts.
5. Bends shall be no less than 36" in radius. A total of two (2) 90-degree bends are allowed in the conduit line. If this still will not be sufficient for the conduit design/construction, contact your BGE representative. A manhole, splice/pull box or hand box may be required.
6. Duct spacers that maintain a 2" separation between ducts are required every 6 1/2 - 7'.  
  
Required depth of conduit from final grade to top of conduit/conduit bank (unless otherwise approved by BGE):  
30" for secondary, minimum  
36" for primary, minimum  
48" maximum
7. Only standard 2,500-psi ready-mix concrete with 1/2" pea gravel will be approved for encasement.
8. After concrete cures for 24 hours, backfill around duct bank with clean select soil and mechanically tamp in 8" lifts.
9. The customer shall pull a mandrel (1/2" smaller in diameter than the conduit and 6" long) through each duct prior to BGE cable installation, followed by a pulling line (1800 lb. mule line preferred), which shall remain in each duct.
10. Secondary customer switchgear installations that incorporate metering compartments that are supplied by eight or more ducts, require a pit to be installed under that compartment. The pit shall be 2' deep and measure 1" less than the width and depth of the compartment. Ducts must enter the pit from the bottom, not the sides. Refer to the BGE Gas & Electric Metering Manual under the New Construction Services section available at **bge.com** for more details.
11. If electric service is being supplied from a **new** transformer, the customer's duct shall enter the transformer as shown on page titled "Turning Conduit into Transformer Pads" in section two (2) of this booklet.
12. If electric service is being supplied from an **existing** transformer, the customer shall end the secondary duct five feet from the secondary side of the transformer at a location determined by BGE. BGE will continue the duct into the transformer based on field conditions.

## STANDARD DUCT BANK ARRANGEMENT/INSTALLATION



## PLASTIC PVC DUCT SPACERS GENERAL INFORMATION

### General Information

(A) Duct spacers are used to hold PVC ducts in position and maintain a 2" separation between adjacent ducts while pouring concrete.

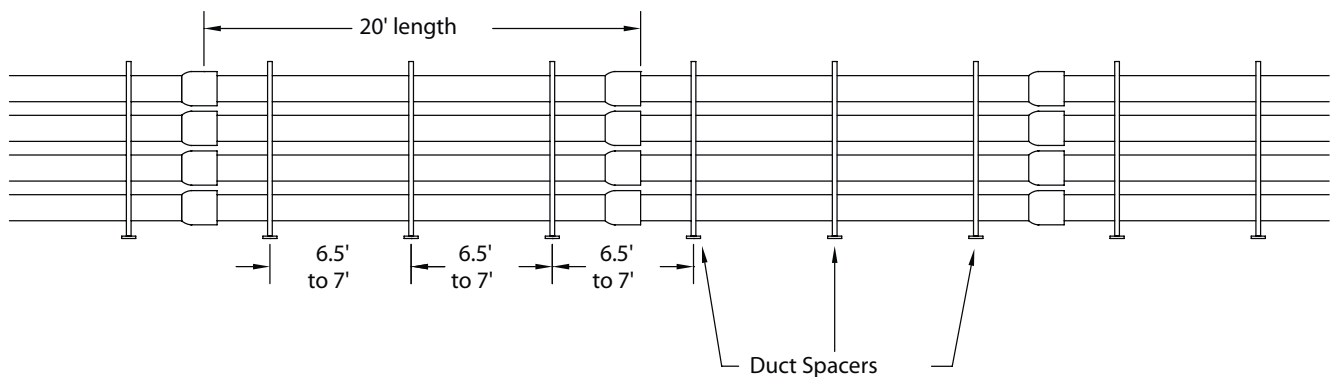
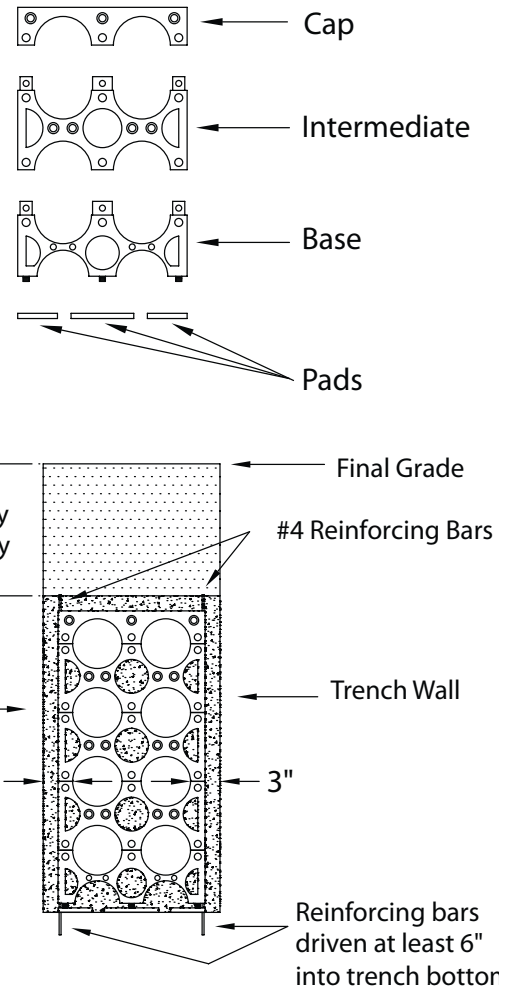
(B) There are 3 basic parts to the duct spacers -- the base, intermediate, and cap. If required, there are also pads/feet that can be used with 5" and 6" spacers for extra support in an unstable trench bottom.

(C) Standard cover for a primary conduit system is 36" and 30" cover for a secondary conduit system. Both of these dimensions are measured from final grade to the top of the concrete envelope of the duct.

(D) Reinforcing bars are used to stabilize the duct and spacers when the concrete is poured. Drive #4 reinforcing bars through the inside edges of the duct spacers and at least 6" into the trench bottom.

(E) The sides of the trench are used as retaining walls when the concrete is poured. The distance from the outer duct diameter to the trench wall should be 3" wide. This in turn gives the required 3" apron around the whole duct bank.

(F) To properly support multiple ducts in a trench, the duct spacers are separated approximately 6-1/2' to 7' apart. Since PVC duct is manufactured in 20' lengths, this means there are three (3) spacers installed within one section of duct.

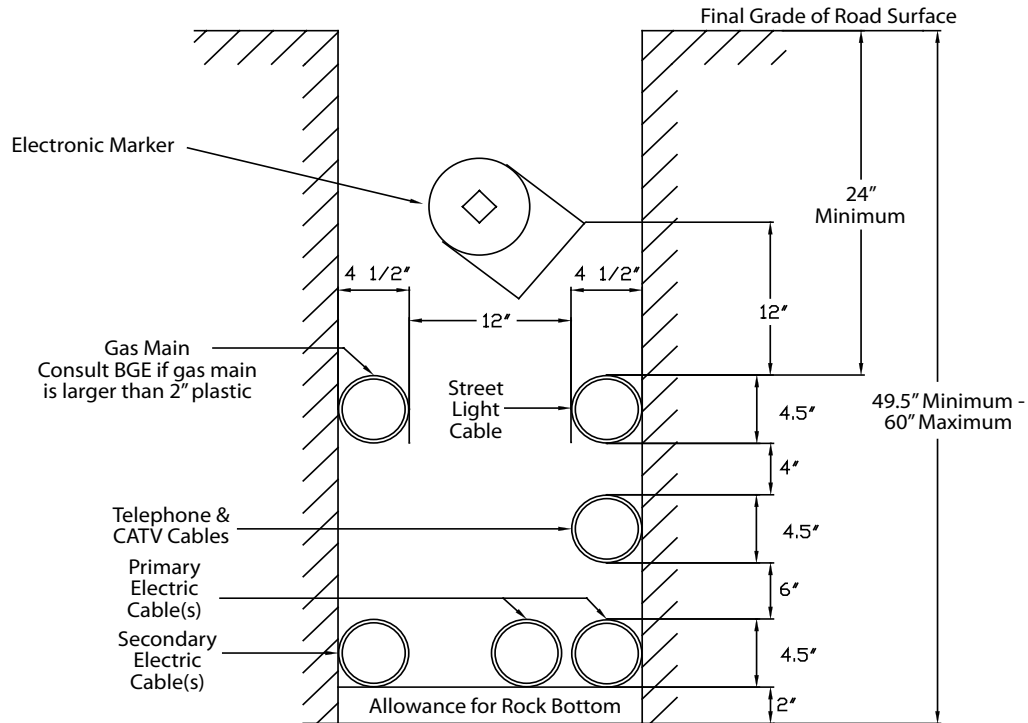


## ROAD CROSSING SPECIFICATIONS

NOTES: • A minimum 12" radial separation must be maintained between gas and any other utility.

• Allow a minimum 6" separation between primary ducts or between primary and secondary ducts.

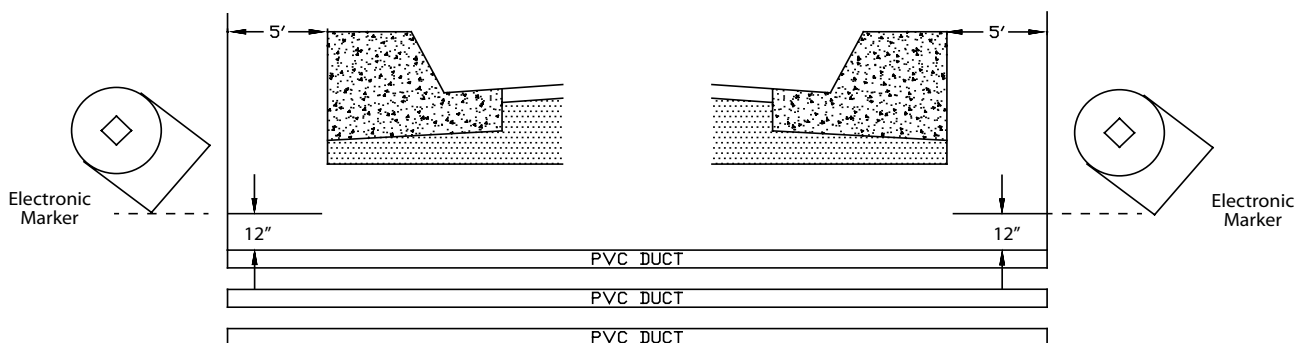
• Place an electronic marker 12" above the end of the PVC duct crossing(s).



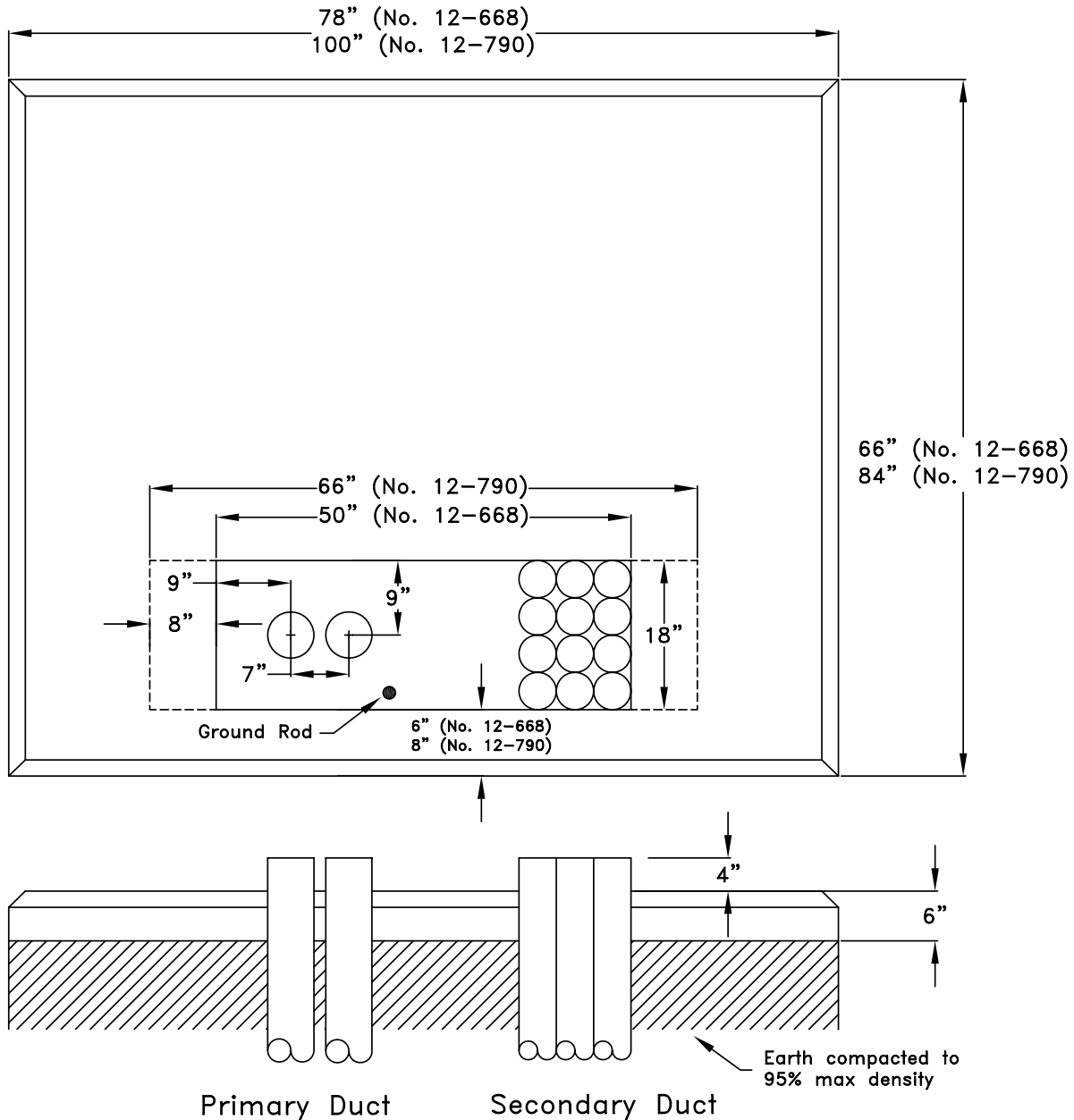
NOTES: • All ducts to be 4" PVC SCH 40 unless otherwise noted. Ducts must extend a minimum 5' beyond proposed paving.

• Place an electronic marker 12" above the end of each PVC duct crossing(s).

• Install a PVC duct plug on the end of each duct crossing(s).



## 3-PHASE TRANSFORMER PAD DIMENSION DETAIL/CONDUIT DETAIL



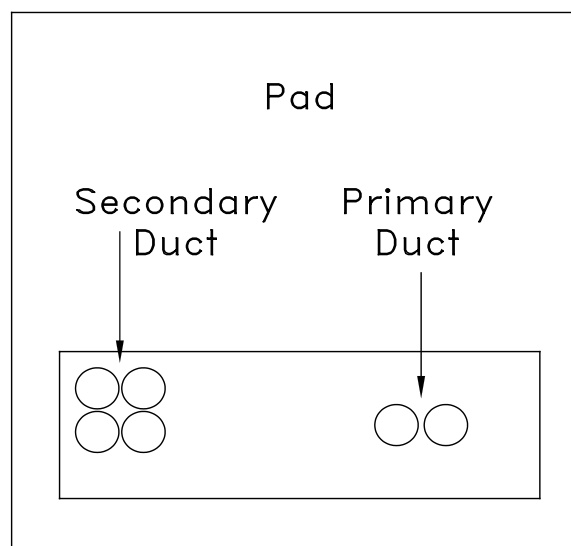
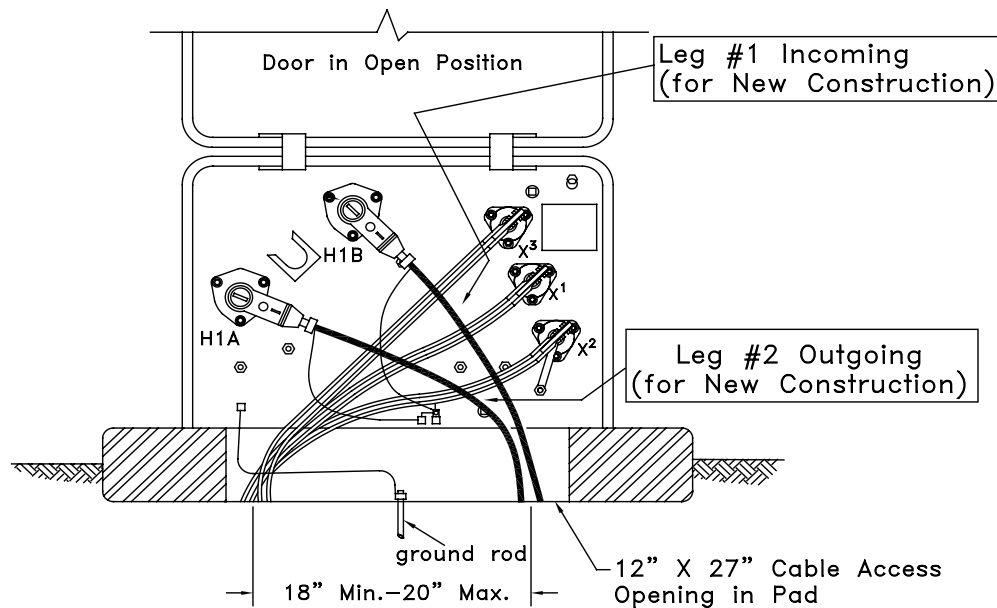
### Note:

- A. The number of secondary 4" conduit shall not exceed 12 total.
- B. Approximate weight of precast pad is 2200 pounds for 500kVA and smaller transformers (No. 12-668) or 4120 pounds for 750kVA and larger (No. 12-790).
- C. Customer to install a 1/2' x 8' copper-clad ground rod as required, avoiding in-coming conduit.
- D. (No. 12-668 & No. 12-790) numbers refer to BGE Material Numbers.
- E. Pad No.12-790 has two knockouts that allow the 50" opening dimension to be increased to a maximum of 66".
- F. If the duct count exceeds nine, the ducts shall be banded together within the transformer pad opening to ensure all ducts remain in their correct spaces within the transformer.
- G. Transformer pads can be purchased and delivered to your site from BGE's Contractor Supplier (See page 41).
- H. If electric service is being supplied from an **existing** transformer, the customer shall end the secondary duct five feet from the secondary side of the transformer at a location determined by BGE. BGE will continue the duct into the transformer based on field conditions.



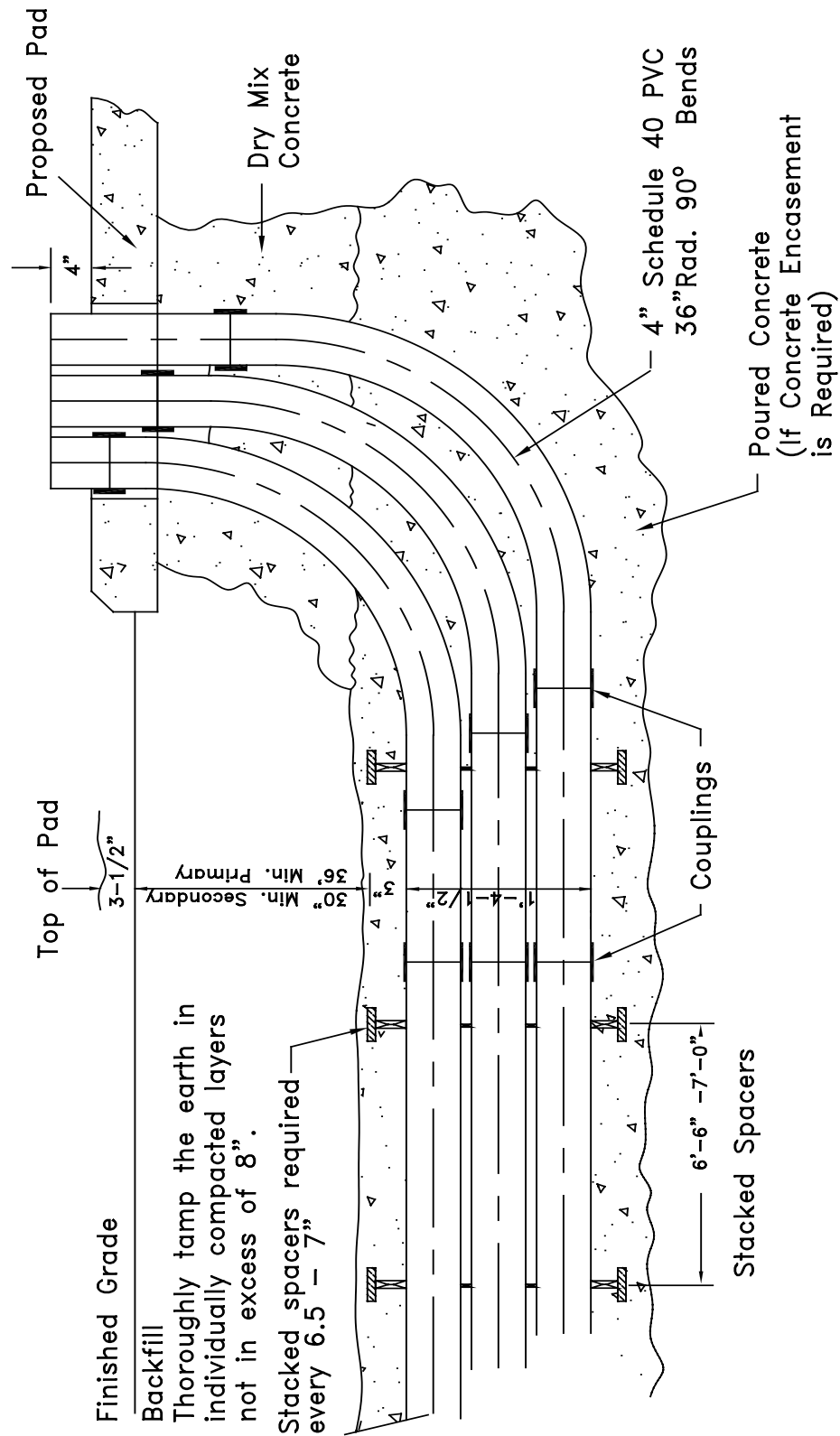
## 1-PHASE TRANSFORMER PAD DIMENSION DETAIL/CONDUIT DETAIL

Typical Single-Phase 13kV  
Low Profile Pad-Mounted Transformer



Note: If electric service is being supplied from an existing transformer, the customer shall end the secondary duct five feet from the secondary side of the transformer at a location determined by BGE. BGE will continue the duct into the transformer based on field conditions.

## TURNING CONDUIT INTO TRANSFORMER PADS



Side View

Note: If electric service is being supplied from an existing transformer, the customer shall end the secondary duct five feet from the secondary side of the transformer at a location determined by BGE. BGE will continue the duct into the transformer based on field conditions.

## **SPLICE/PULL BOXES**

GENERAL INFORMATION

Splice/pull boxes are primarily utilized on 13kV or 34kV direct-buried or directional bored polyethylene flex or PVC duct installations. For economic reasons, splice/pull boxes are not intended to be used for direct- buried or concrete encased duct systems. The intent of a splice/pull box is to provide an enclosure in which to install splices or assist in cable pulling operations when duct runs exceed the reel length of a certain cable, or the duct run exceeds the allowed number of bends. Splice/pull boxes can also be used to break into and extend from existing 13kV or 34kV duct systems to maintain the connectivity of the duct system.

Customers must only install BGE approved splice/pull boxes and should consult with a BGE representative prior to design and installation. When required, customers are responsible for purchasing, engineering, designing and constructing all ducts and splice/pull boxes.

There are various sizes and styles of splice/pull boxes. Depending on the specific situations and applications, there are approved splice/pull boxes for 600V, 13kV or 34kV systems and load bearing and non-load bearing applications.

With the exception of the secondary splice/pull box (12-647) all splice/pull boxes are rated for heavy vehicular traffic in parking lots and driveways. They are designed to safely support the weight of occasional, slow moving traffic. They are not rated for frequent, fast moving traffic in street or highway applications.

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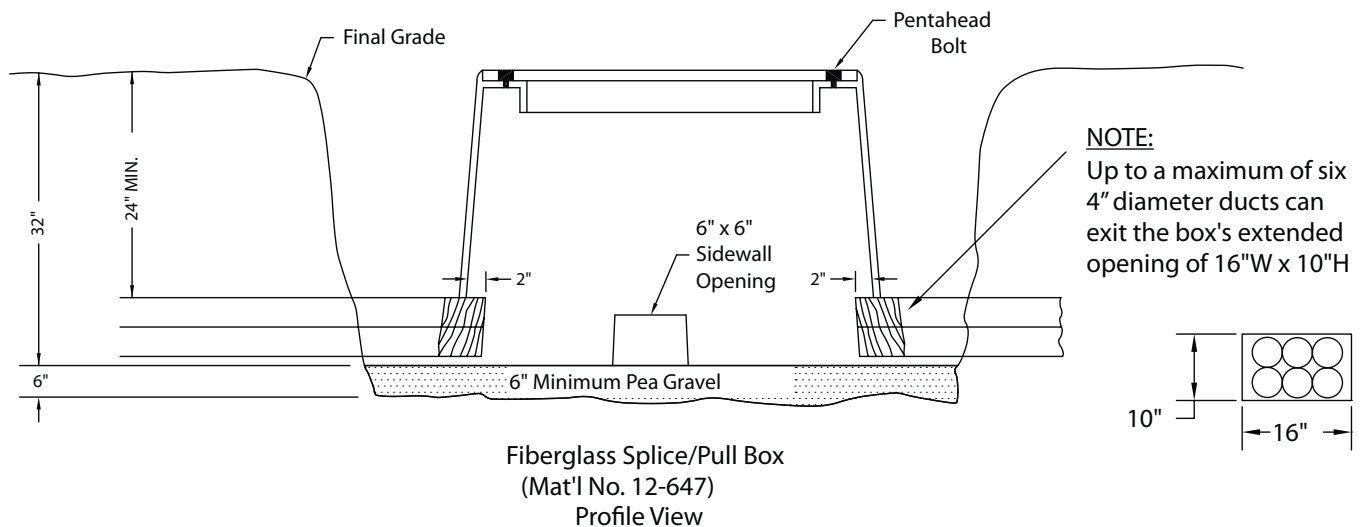
## SECONDARY (600V) FIBERGLASS SPLICE/PULL BOX - PEDESTRIAN (GRASSY) AREAS ONLY – 1 TO 7 SERVICES

**Outside Dimensions: 50"W x 56"L x 32"H, Approx. Weight: 100 lb.**  
**Mat'l No: 12-647**

**Notes:** This fiberglass splice/pull box cannot be used in Baltimore City.  
 For Baltimore City and traffic rated secondary splice/pull boxes see concrete manhole section.

### General Information

1. This fiberglass splice/pull box must be installed only in pedestrian (grassy) areas on level ground. It must not be installed on a hill or slope.
2. Stabilize the bottom of the excavation with 6" of pea gravel. The bottom flange of the splice/pull box must be on a firm level foundation.
3. Position the enclosure in the excavation so that the cover will be flush with final grade. See diagram below.
4. Ducts can only enter and exit the splice/pull box at opposite ends from each other. When necessary, the existing 6"x6" openings in the end walls can be enlarged to accommodate multiple ducts (maximum opening 16"W x 10"H). This enlarged opening will allow up to six 4" diameter ducts (3W x 2H configuration) to enter or exit this box. However, only a maximum of eight ducts can be joined to this splice/pull box at any time, one for the secondary main and up to seven for service cables.
5. Install the ducts no more than 2" into the splice/pull box. Use aerosol foam sealer or duct sealing compound around the ducts on the outside of the splice/pull box to seal openings.
6. Place a block of wood over side wall openings without ducts, on the outside, to prevent backfill from entering the confines of the splice/pull box.
7. Once the box and duct are installed, the cover should be securely fastened to the enclosure during backfill compaction. This action will prevent any distortion of the sidewalls while the box is being backfilled.
8. Backfill evenly around the splice/pull box with clean, dry earth and mechanically tamp in 8" layers.



## INSTALLATION INSTRUCTIONS FOR 13 AND 34 kV BOXES

1. Locate within 30' of a truck accessible paved surface.
2. Install in an area that will be easy to locate and easy to access.
3. Do not install on slopes or in areas that will become overgrown with vegetation.
4. Do not install in swales or areas that are prone to flooding.
5. Install a minimum 6" of pea gravel at the bottom of the excavation for water drainage.
6. Install so that the top of the box is level and at final grade. If pavement is to be placed around the enclosure, leave enough of the sidewalls exposed to account for paving.
7. Slope the final grade away from the enclosure to match the surrounding grade.
8. Insert the duct into the factory installed duct terminators in the end or side walls, or cut out a circular hole to accept either the 4" or 6" duct. Do not cut this hole too large because the opening has to be moisture sealed.
9. Insert duct a minimum of 1" and a maximum of 2" inside the box.
10. Seal around the outside of the duct and terminators using aerosol foam sealer or duct sealing compound to prevent debris from entering into the box.
11. Securely fasten cover to box before backfilling to prevent distortion of the sidewalls.
12. Backfill evenly around the splice box with clean, dry earth and mechanically tamp in 8" layers.

## NOTES

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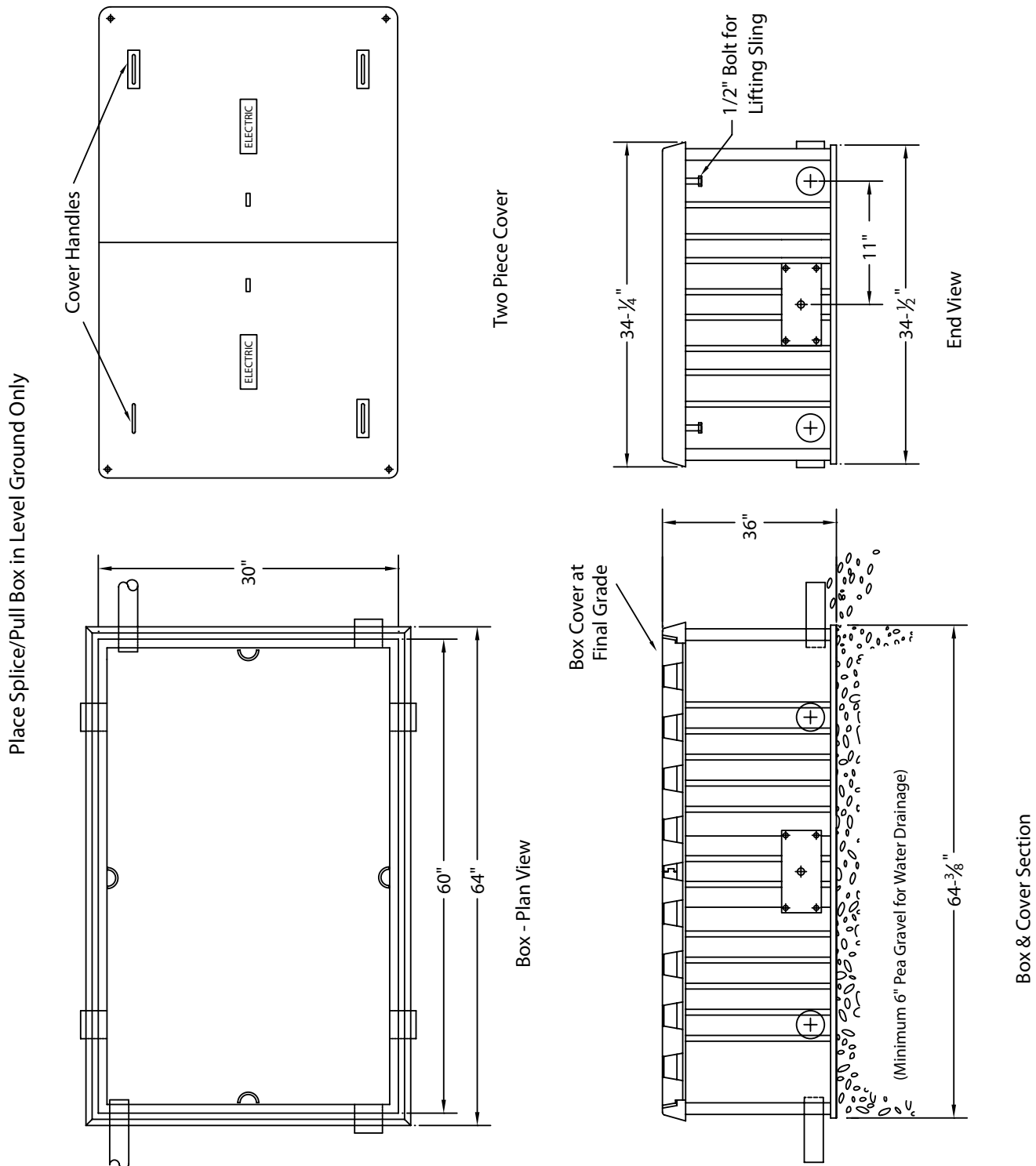
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## SPLICE/PULL BOX - 13kV (#2- 1/0 CABLES ONLY)

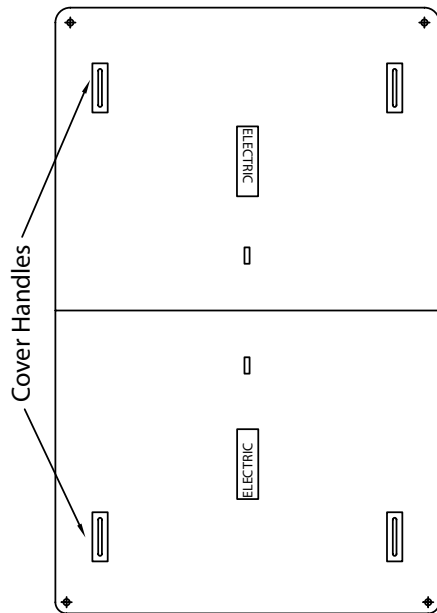
Outside Dimensions: 35"W x 64"L x 36"H, Approx. Weight: 531 lb.  
Mat'l No: 12-F63



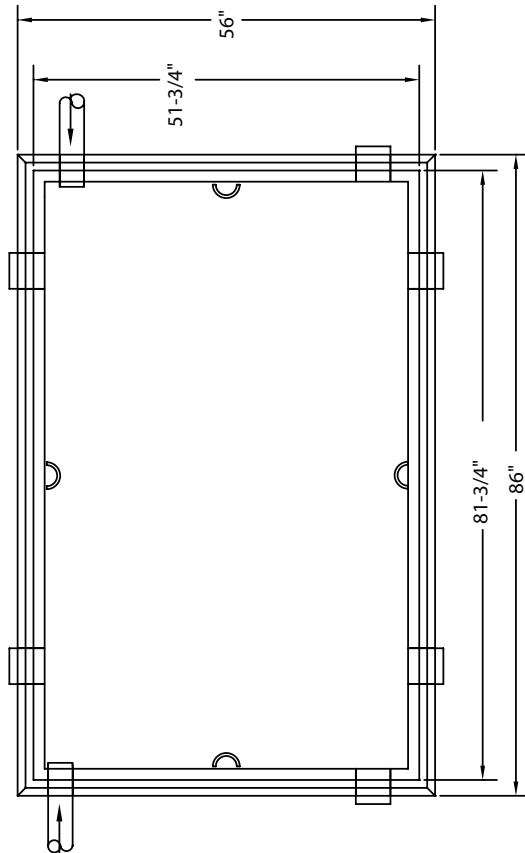
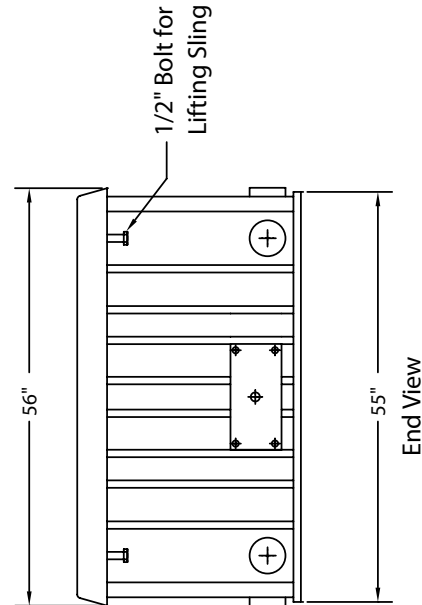
## SPLICE/PULL BOX - 13kV (#2- 500 ONLY) CABLES

Outside Dimensions: 56"W x 86"L x 36"H, Approx. Weight: 894 lb.  
Mat'L No: 12-E23

Place Splice/Pull Box in Level Ground Only

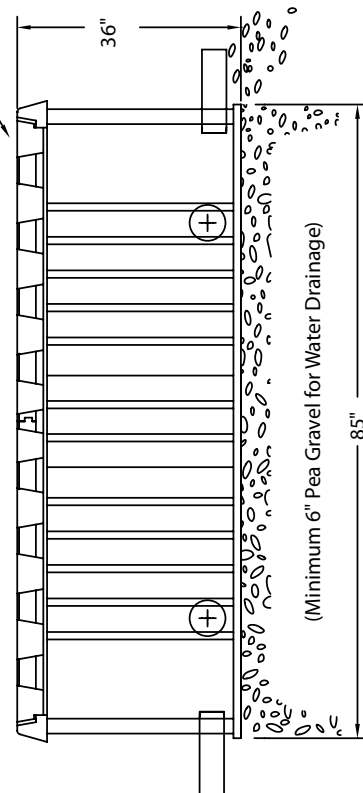


Two Piece Cover



Box - Plan View

Box Cover at Final Grade



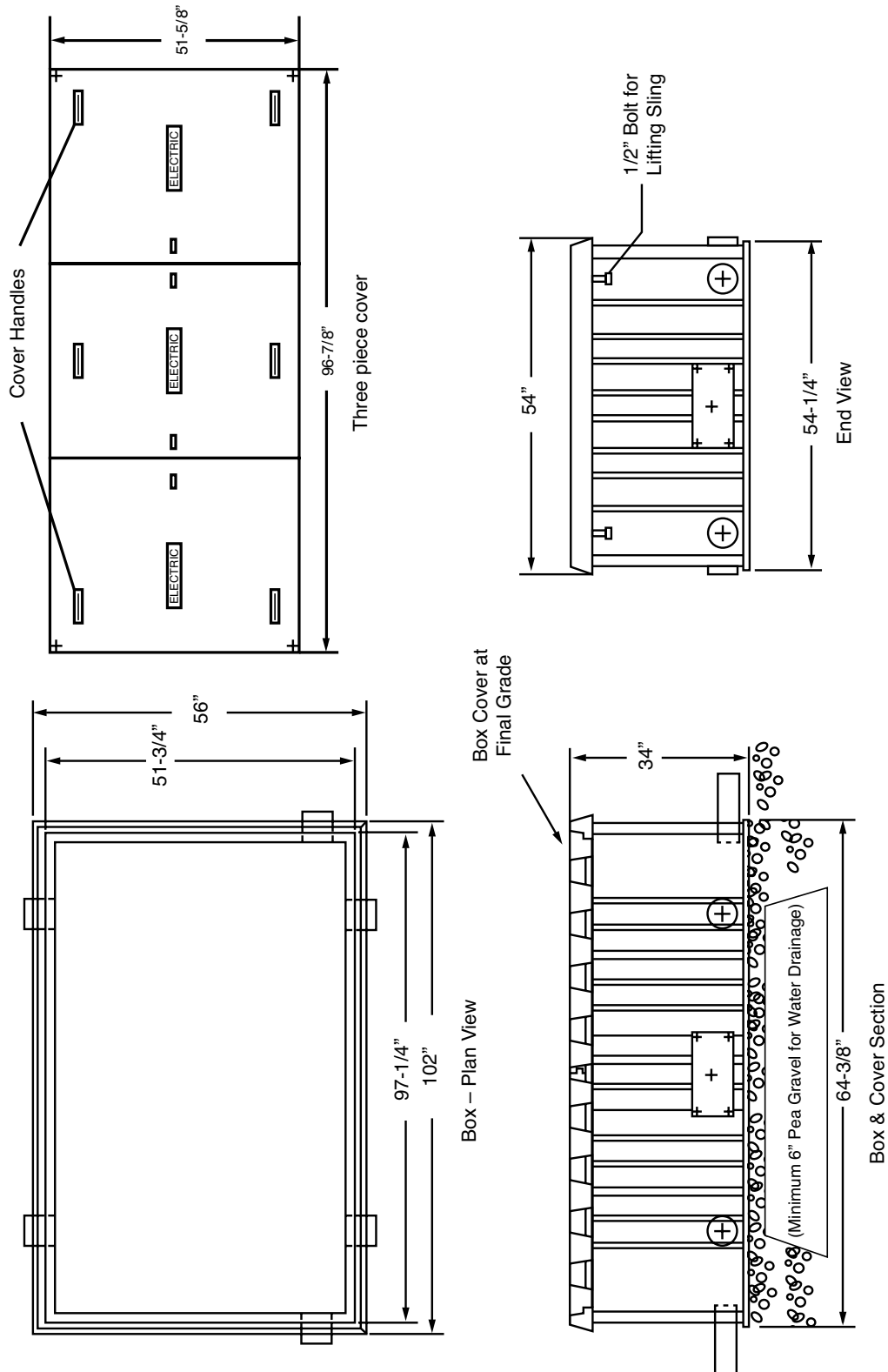
Box & Cover Section



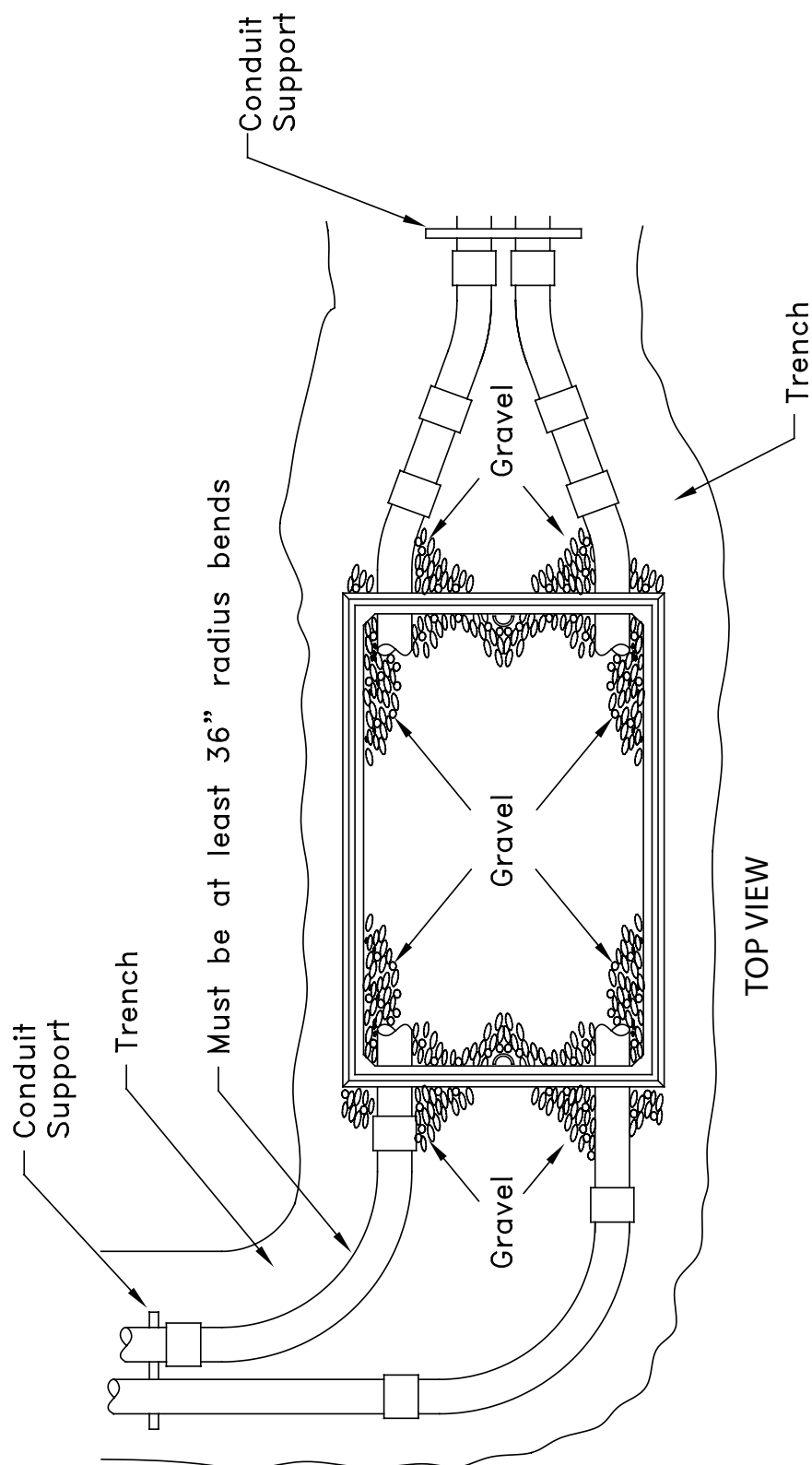
## SPLICE/PULL BOX - 2-SETS 13kV OR 1- SET 34 kV (#2- 750 CABLES)

Outside Dimensions: 56"W x 102"L x 34"H, Approx. Weight: 1322 lb.  
Mat'L No: 12-E24

PLACE SPLICE/PULL BOX IN LEVEL GROUND ONLY



## SPLICE/PULL BOX - 2-SETS 13kV OR 1- SET 34kV (#2- 750 CABLES) (CONT'D)



### Notes:

- A. Top of splice box should match finished grade. Box does not have to be perfectly level.
- B. This splice box is not for roadway use.

# MANHOLES

## GENERAL INFORMATION

Precast concrete manholes are primarily utilized on 600V, 13kV or 34kV concrete encased conduit systems that require a heavy vehicular traffic rating. The intent of a manhole is to provide a housing in which to install splices or assist in cable pulling operations when duct runs exceed the reel length of a certain cable, or the duct run exceeds the allowed number of bends. Manholes can also be used to break into and extend from existing 13kV or 34kV conduit systems to maintain the connectivity of the system.

Manholes are typically used in urban areas where:

- The concentration of circuits, limited Right-of-way and municipality requirements necessitate the conduit system be in roadways and alleys.
- Load density is significant.
- Concentration of circuits via the same route are planned or expected.
- Additional circuits will be added routinely.

**(Note: Manholes are typically used in conjunction with concrete encased ducts and not direct-buried PVC)**

When required, customers are responsible for engineering, designing, permitting, purchasing, and constructing all ducts and manholes. Customers must purchase manholes from a BGE approved manufacturer. Consult with a BGE representative prior to design and installation for approved list of manufacturers.

**Manholes are the most expensive item per foot in conduit construction, so design project to keep the number of manholes to a minimum.**

## Special Customer Requirements for Manhole Installations

**Customers are required to perform the following for manhole and conduit installations:**

- Develop detailed conduit and manhole drawings including profiles and duct runs. \*\*
- Submit conduit and manhole drawings to BGE for review. \*\*
- Submit drawings to local municipality and obtain required permitting.
- Contact inspector noted on BGE design drawings to schedule pre-construction meeting.
- Contact BGE to schedule "Pre-pour Inspection". \*\*
- Contact BGE to schedule "Pre-backfill Inspection". \*\*
- Contact BGE to schedule "Mandreling and Stringing Inspection". \*\*
- Notify BGE immediately of any changes to schedule, scope or final design.

**\*\* When indicated on BGE drawings.**

## INSTALLATION OF PRECAST CONCRETE MANHOLES

The following instructions are to be utilized to install all Precast Concrete Manholes unless otherwise noted. This Section Includes:

- Standard Manholes Sizes
- Installation Standards
- Duct Terminations
- Clearances
- Depth (Cover)

### Sizes

There are various sizes and styles of BGE approved Precast Concrete Manholes. Depending on the specific situations and applications, manhole types are usually determined by the voltage of the circuits and the proposed number of ducts entering the manhole. Generally your BGE representative will determine the size and type of manhole for your project.

### Installation Standards

1. Determine as accurately as possible surface and subsurface obstructions to assure proper installation of manholes and the proper installation, alignment and interception of ducts.
2. Stabilize the bottom of the manhole excavation with 8 " of pea gravel.
3. The excavation bottom shall be dry and level to within 1 " side-to-side and end to end.
4. Position manholes in the excavation so that the rooftop is 1' minimum – 5' maximum below final grade. If the manhole has to be installed at a greater than 5' depth, contact the BGE representative for authorization.
5. Backfill evenly around the manhole with clean, dry earth or sand. Mechanically tamp in 12 " layers.
6. Install 36 frame and cover. Check with local authority for proper cover if the manhole is installed in municipality right of way. On private property a frame and cover can be purchased and delivered to your site from BGE's Contractor Supplier (See page 41) .
7. Place black mastic sealant strips (provided from manufacturer) in the groove on the top of the wall prior to installing top to provide a water tight installation.

### Location

1. The preferred manhole location is installed adjacent to, but not in, truck-accessible, H-20 rated roadways to provide access for personnel and construction equipment for the installation and maintenance of manholes, equipment and cables.
2. Second choice, locate manhole to one side of the road (in one traffic lane) and avoid gutter area with manhole cover.
3. Third choice, consider only when necessary. Locate manhole to one side of road (one traffic lane) and avoid gutter area with manhole cover.
4. Locating a manhole in a street intersection is the least desirable alternative because of accessibility and the impact to traffic and underground obstructions.
5. Avoid wet locations, swale areas and low points.

### Clearances

1. A minimum of 15' overhead clearance is required for the installation and maintenance of existing and proposed manholes.
2. Maintain 2' minimum horizontal clearance from edge of curb or paving to manhole.
3. Maintain 2' minimum clearance from property line.
4. Minimum horizontal clearance from adjacent buildings is determined by maintaining a one foot horizontal separation for every foot the manhole floor extends below the basement floor elevation.
5. Minimum horizontal clearance from underground obstructions such as retaining walls, pole, foundations is determined by maintaining a one foot horizontal separation for every foot the manhole floor extends below the obstruction.
6. When clearances must be reduced, contact the responsible agency or local authority to negotiate an agreement.

## SMALL SECONDARY (<600V) MANHOLE 1 TO 4 SERVICES

### General Information

1. This manhole can be used in any vehicular traffic area including but not limited to streets, roadways, alleyways, driveways, parking lots and sidewalks.
2. Because of the confined space inside this manhole, only one to four services can be spliced to the secondary main inside this smaller manhole. (For five to seven services, the larger 6'W x 8'L x 7'H manhole must be used).
3. This 4' x 4' x 4' (inside dimension) manhole must be located on a level area. Do not install it on a hill or slope.
4. Stabilize bottom of excavation with 8" of pea gravel. The bottom shall be dry and level to within 1" side to side.
5. Position the manhole in excavation so that the roof slab is a minimum of 8" below finished grade and the cover ends up at final grade.
6. Place black mastic strips (provided with the unit) in groove on top of the wall. Position the 6" concrete roof slab in the groove and compress to provide a watertight installation. See diagram on opposite page.
7. Install 36" frame and cover. Check with local authority for proper cover if the manhole is installed in municipality right of way. On private property a frame and cover can be purchased and delivered to your site from BGE's Contractor Supplier (See page 41).
8. The concrete encased ducts must enter and exit the manhole at opposite ends.
9. Position the ends of the ducts so they are flush with the inside wall.
10. The ducts must enter/exit the manhole 21" from the exterior sided wall and 12" from exterior bottom.
11. A maximum of five ducts can be connected to this manhole at any time, one duct for the secondary main and up to four ducts for the service cables.
12. Backfill evenly around the manhole with clean dry earth and mechanically tamp in 12" layers.

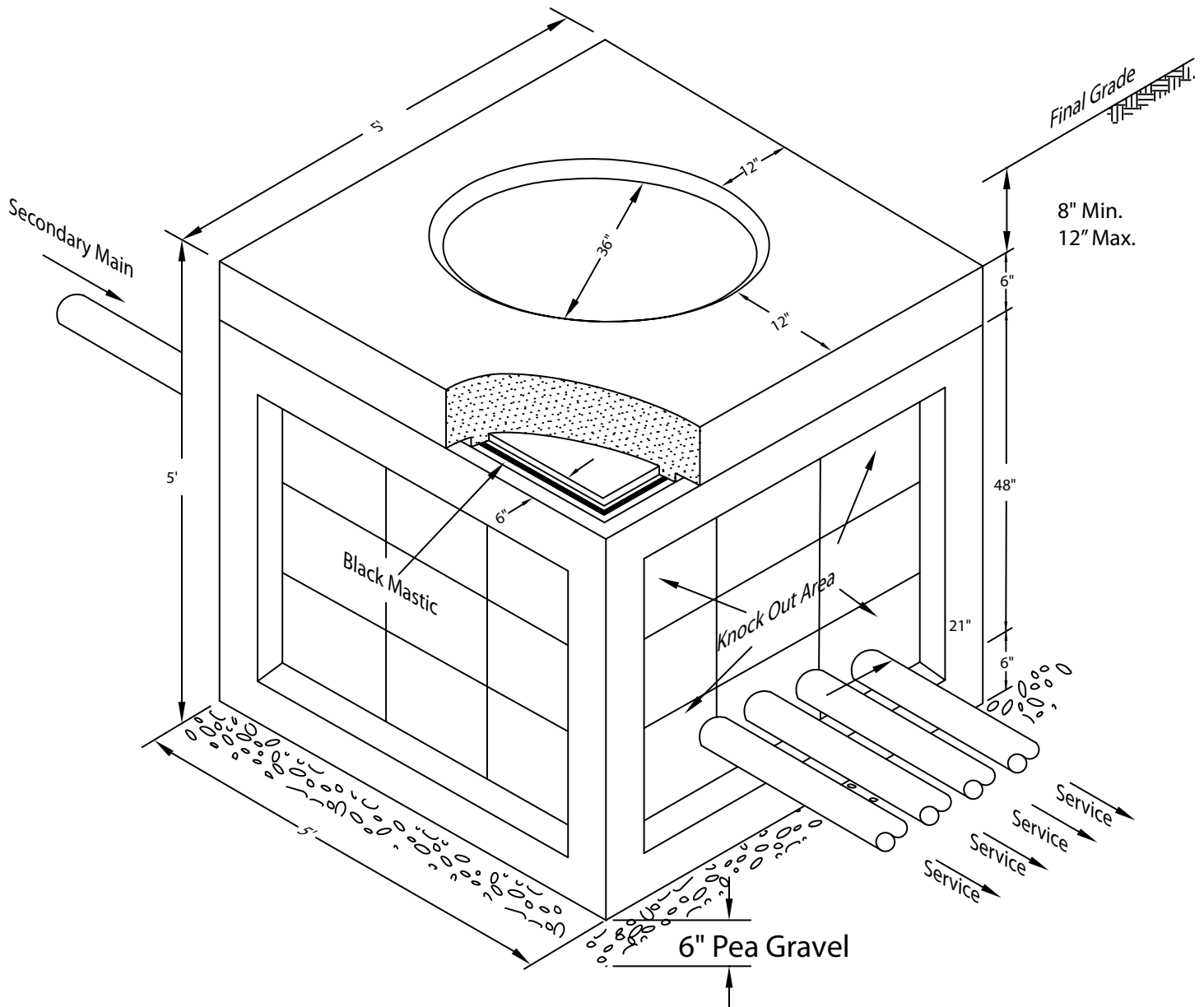
**This concrete manhole can be purchased from A.C. Miller Concrete Products Spring City, PA 19475, Phone 800.229.2922.**

## SMALL SECONDARY MANHOLE 1 TO 4 SERVICES (CONT'D)

**Manhole Inside Dimensions = 4'W x 4'L x 4'H**

**Outside Dimensions: 5'W x 5'L x 5'H**

**Approx. Weight: Roof 1680 lb., Base 6560 lb.**



**Note:**

The concrete encased ducts should enter the manhole 21" from the outside wall where the secondary bus connectors are located. (See diagram above). No more than five ducts shall be connected to this concrete box. One duct is used to install the secondary main. Up to four more ducts can be used for service cables.

## LARGE SECONDARY (<600V) MANHOLE 1 TO 7 SERVICES

### General Information/Installation instructions

1. Before installing manhole, you must ensure that the exterior top of the manhole is positioned 12" minimum and 5' maximum below final grade. If the manhole is to be installed at a greater depth, contact your BGE representative for approval.
2. This manhole can be used in any vehicular traffic area including but not limited to streets, roadways, alleyways, driveways, parking lots and sidewalks.
3. Because of the confined space inside this manhole, only one to seven services can be spliced to the secondary main inside this manhole.
4. This 6' x 8' x 7' (inside dimension) manhole must be located on a level area. Do not install it on a hill or slope.
5. Stabilize bottom of excavation with 8" of pea gravel. The bottom shall be dry and level to within 1" side to side.
6. Position the manhole in excavation so that the roof slab is a minimum of 12" below finished grade and the cover ends up at final grade.
7. Install the bottom half of the manhole in the excavation. Place black mastic strips (provided with the unit) in groove on top of the wall. Install top half on top of the bottom half and compress to provide a watertight installation.
8. Install 36" frame and cover. Check with local authority for proper cover if the manhole is installed in municipality right of way. On private property a frame and cover can be purchased and delivered to your site from BGE's Contractor Supplier (See page 41).
9. On each end wall of the manhole there are a total of 10-4" end wall duct terminations," six in the bottom half and four in the top half. These terminators are built into the manhole and allow for easier installation of the 4" PVC ducts into the manhole.
10. Install one duct for the secondary main and up to seven ducts for services.
11. Always install ducts in the bottom half of manhole first and leave spare openings in the top half for the future.
12. Backfill evenly around the manhole with clean dry earth. Mechanically tamp in 12" layers.

**This concrete manhole can be purchased from A.C. Miller Concrete Products Spring City, PA 19475, phone: 800.229.2922.**



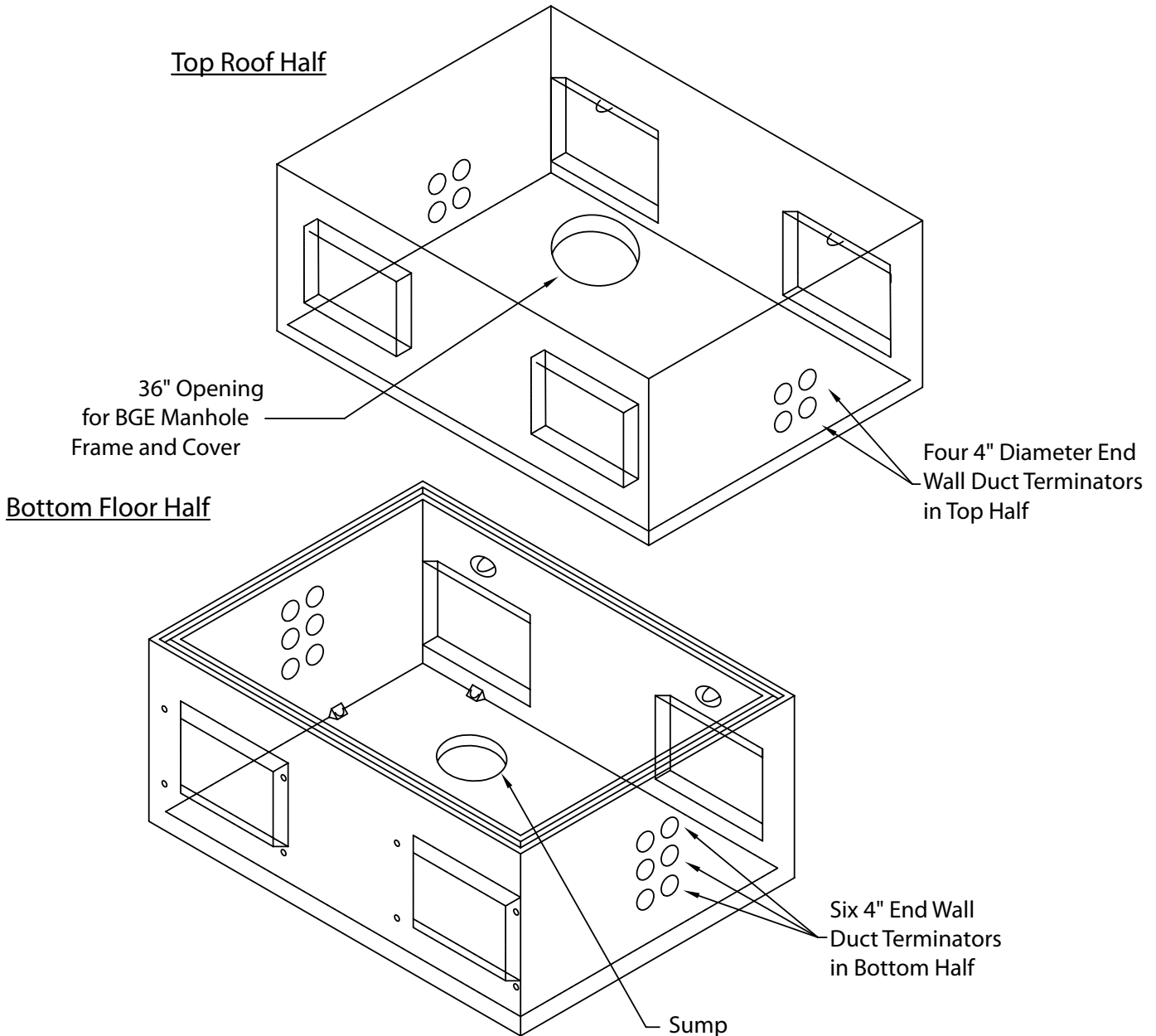
## LARGE SECONDARY MANHOLE 1 TO 7 SERVICES (CONT'D)

**Outside Dimensions: 7'W x 9'L x 8'H**

**Manhole Outside Dimensions: 7'W x 9'L x 8'H**

**Manhole Inside Dimensions: 6'W x 8'L x 7'H**

**Approx Weight: Top 9200 lb., Bottom 9600 lb.**



## PRECAST CONCRETE LINE MANHOLE 6'W X 12'L X 7'H

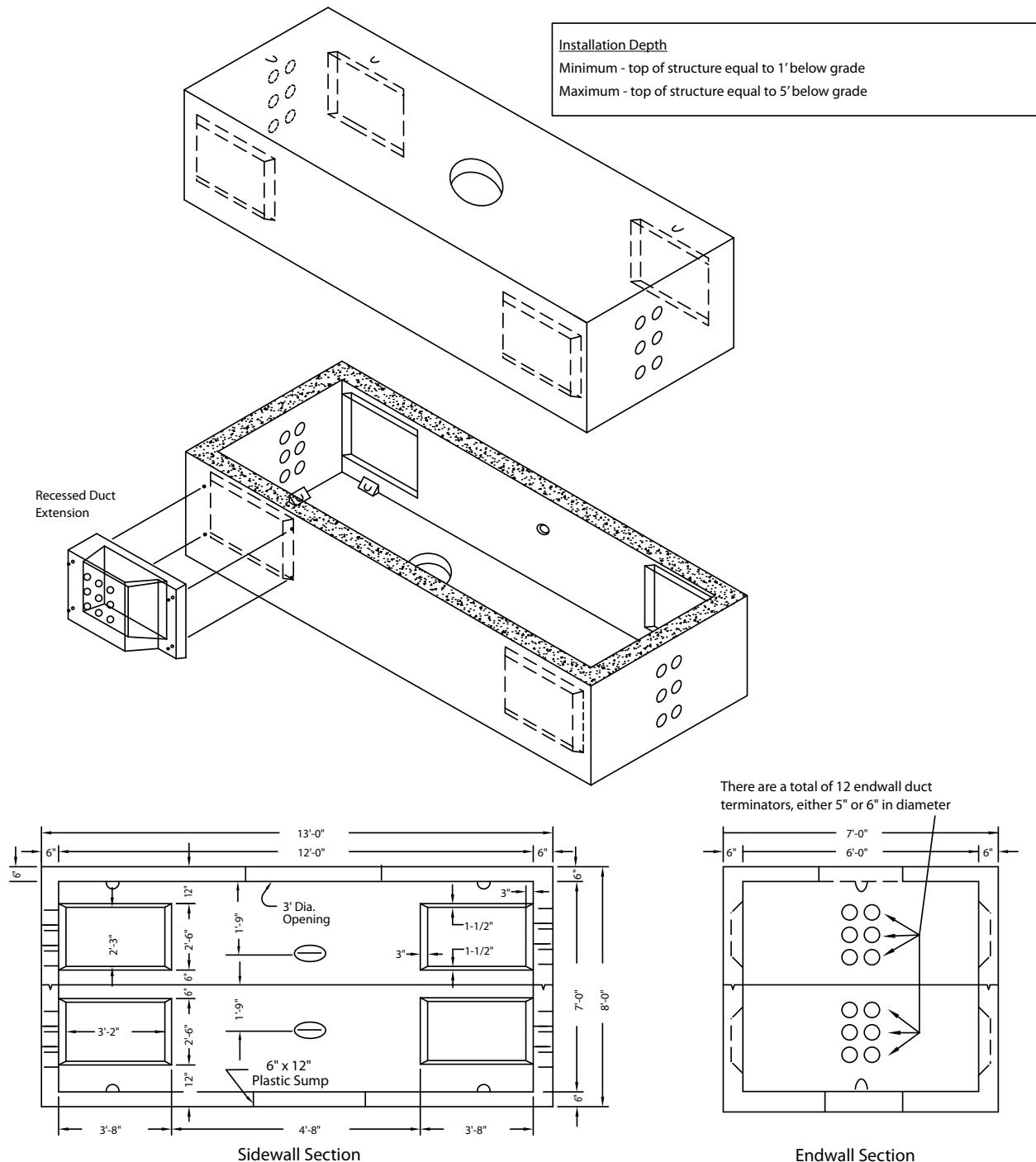
**Outside Dimensions: 7'W x 13'L x 8'H**

**Inside Dimensions: 6'W x 12'L x 7'H**

**Approx. Weight: Top 15,120 lb., Bottom 16,480 lb.**

**Maximum 12 Endwall Ducts**

This concrete manhole can be purchased from A.C. Miller Concrete Products Spring City, PA 19475, Phone 800.229.2922.



## PRECAST CONCRETE LINE MANHOLE 6'W x 12'L x 9'H

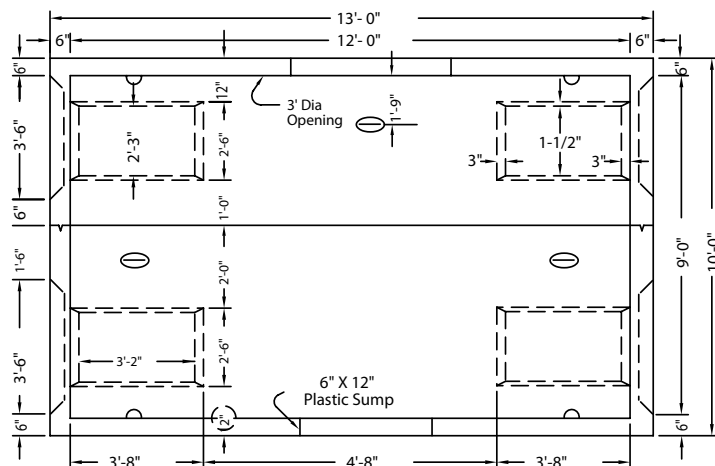
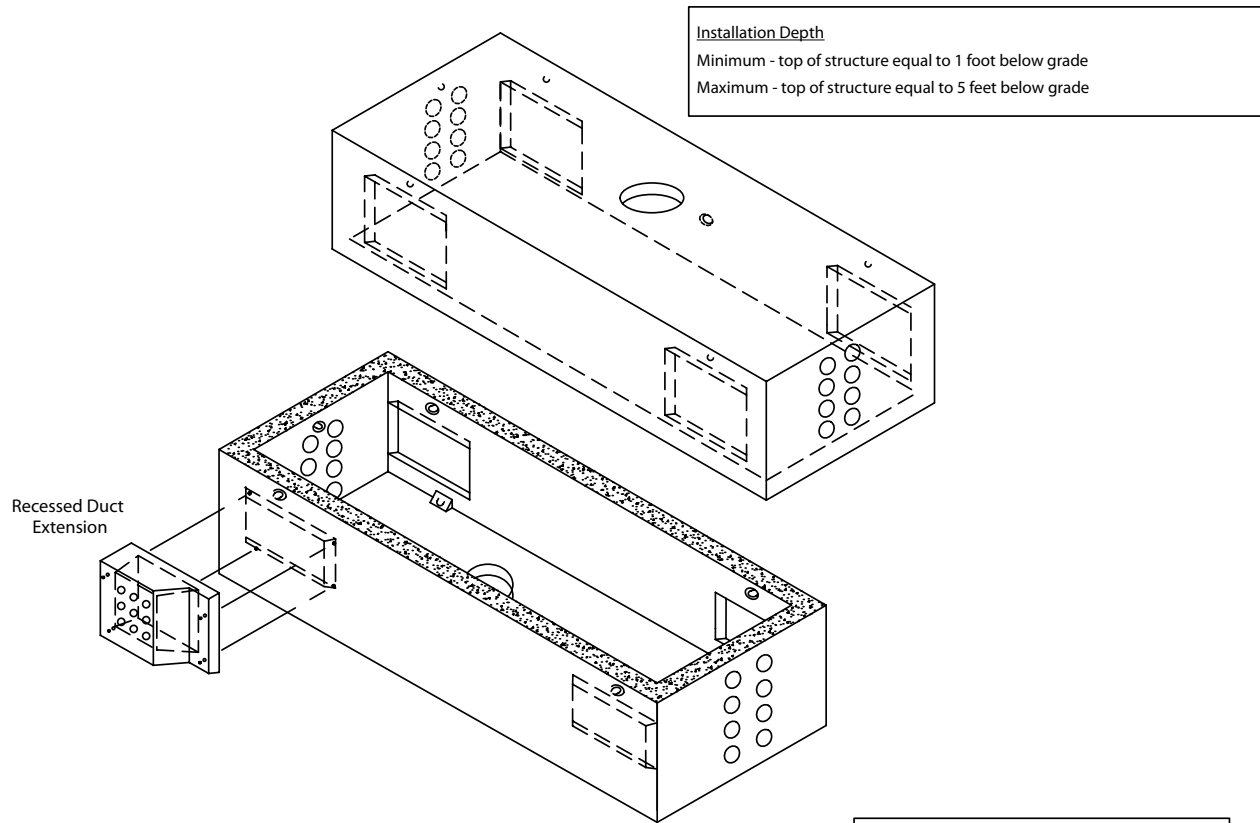
**Outside Dimensions: 7'W x 13'L x 10'H**

**Inside Dimensions: 6'W x 12'L x 9'H**

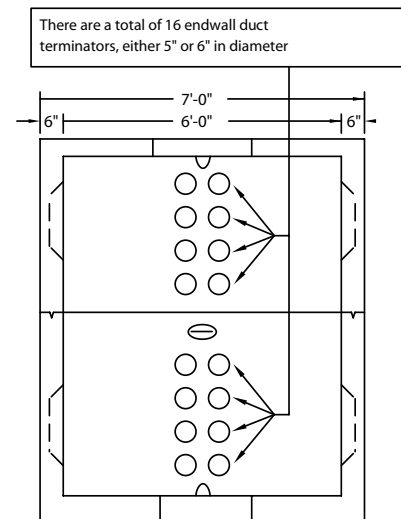
**Approx. Weight: Top 19,120 lb., Bottom 21,920 lb.**

**Maximum 16 Endwall Ducts**

This concrete manhole can be purchased from A.C. Miller Concrete Products Spring City, PA 19475, Phone 800.229.2922.



Sidewall Section



There are a total of 16 endwall duct terminators, either 5" or 6" in diameter

Endwall Section

## PRECAST CONCRETE SLOTTED END WALL MANHOLE

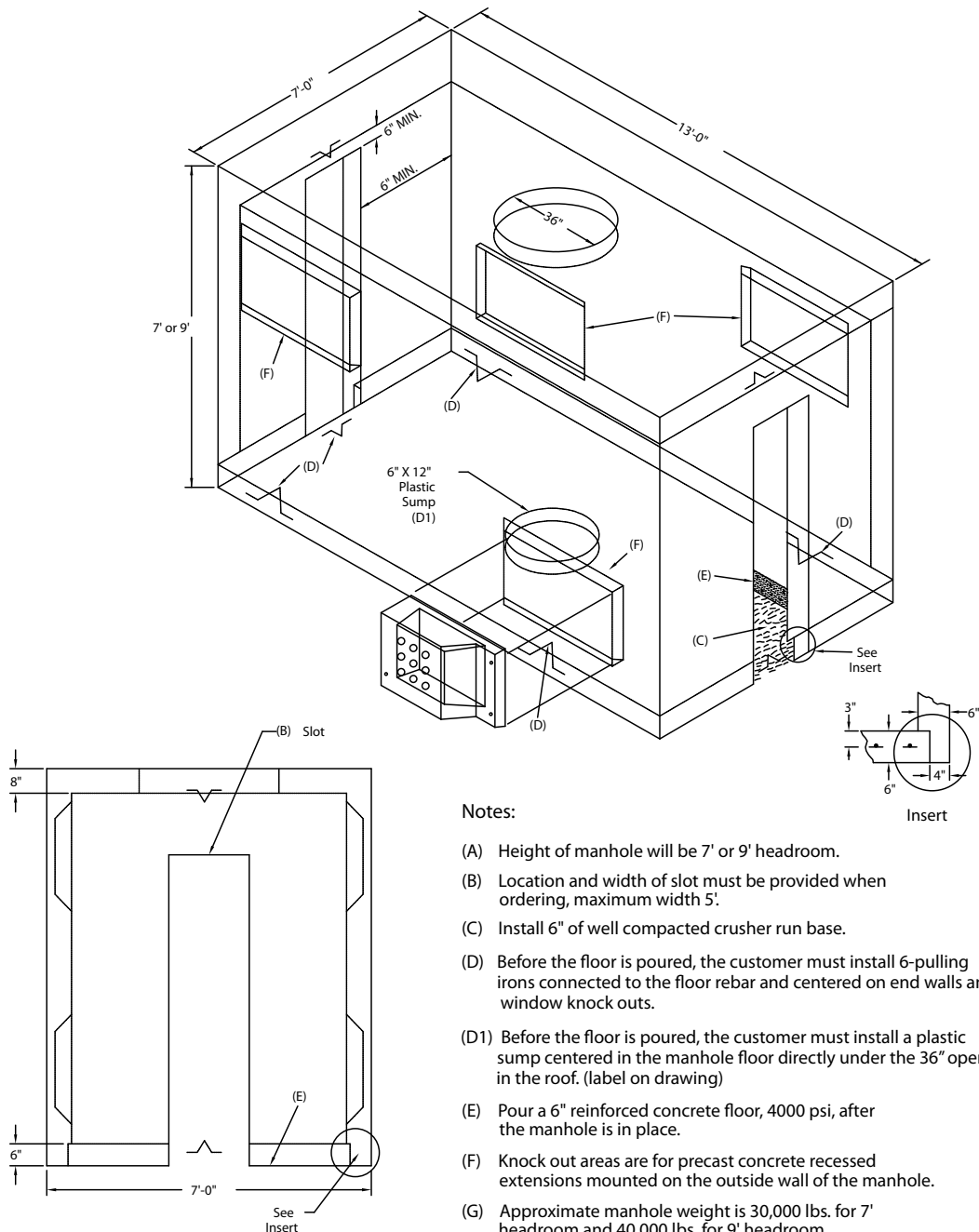
**Outside Dimension: 7'W x 13'L x (8'H or 10'H)**

**Inside Dimensions: 6'W x 12'L x (7'H or 9'H)**

**Approx. Weight: 30,000 lb. (7'H), 40,000 lb. (9'H)**

**Purpose: For use when intercepting existing conduit**

This concrete manhole can be purchased from A.C. Miller Concrete Products Spring City, PA 19475, Phone 800.229.2922.



### Notes:

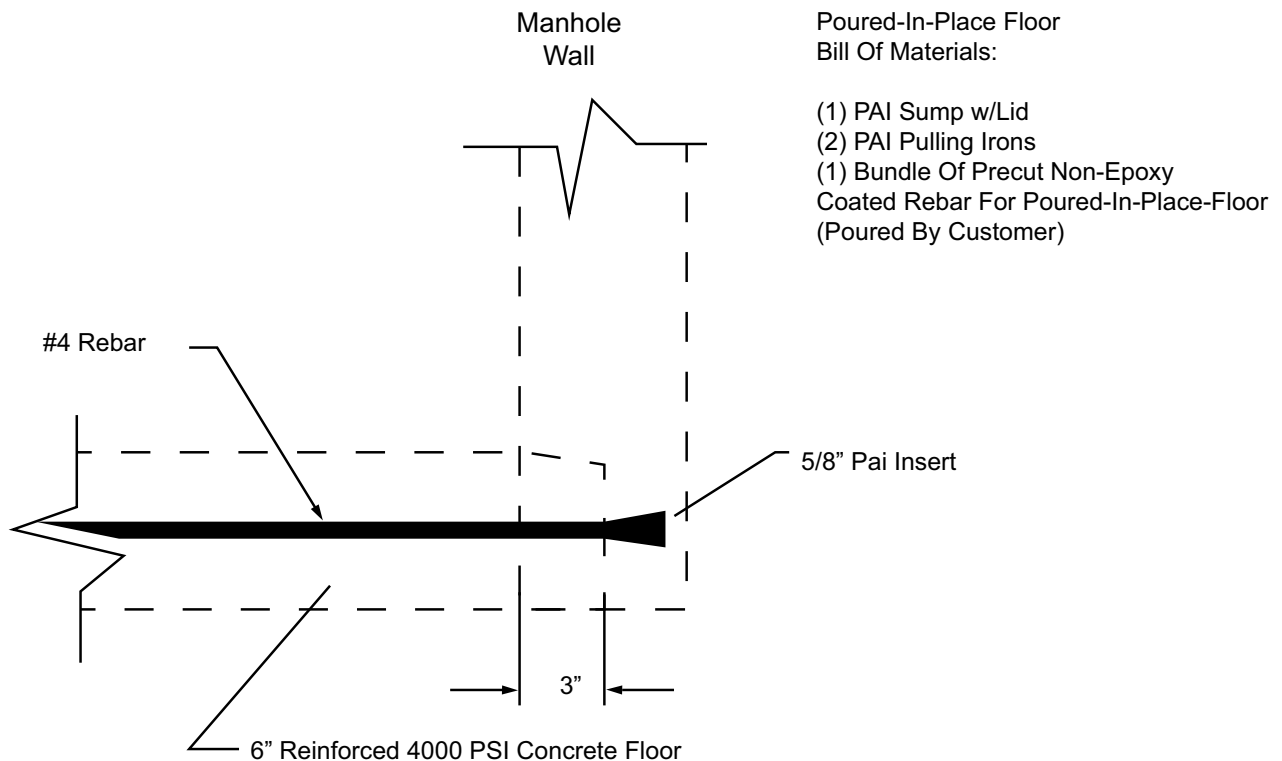
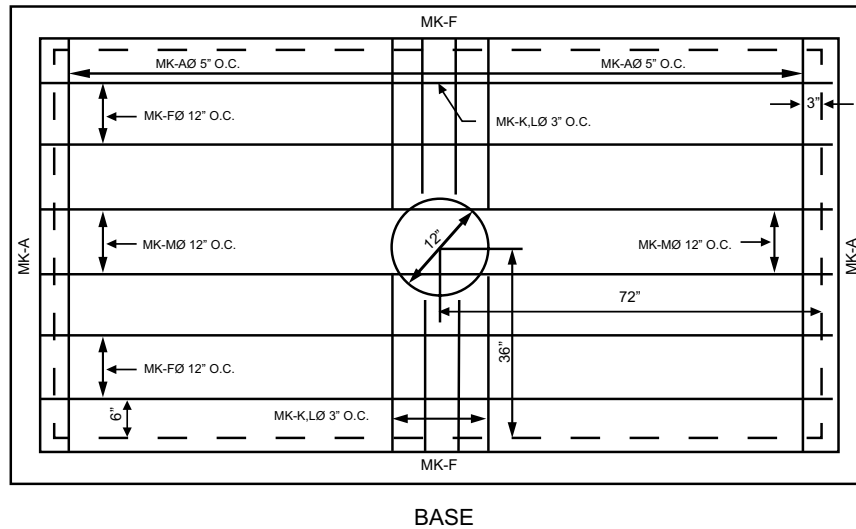
- (A) Height of manhole will be 7' or 9' headroom.
- (B) Location and width of slot must be provided when ordering, maximum width 5'.
- (C) Install 6" of well compacted crusher run base.
- (D) Before the floor is poured, the customer must install 6-pulling irons connected to the floor rebar and centered on end walls and window knock outs.
- (D1) Before the floor is poured, the customer must install a plastic sump centered in the manhole floor directly under the 36" opening in the roof. (label on drawing)
- (E) Pour a 6" reinforced concrete floor, 4000 psi, after the manhole is in place.
- (F) Knock out areas are for precast concrete recessed extensions mounted on the outside wall of the manhole.
- (G) Approximate manhole weight is 30,000 lbs. for 7' headroom and 40,000 lbs. for 9' headroom
- (H) Crane required for installation.
- (J) When steel plates are used, do not remove them for 7 days after the floor is poured.

## PRECAST CONCRETE SLOTTED END WALL MANHOLE (CONT'D)

### Poured Concrete Floor Reinforcing Bar Detail

Precut Rebar and PAI Inserts can be purchased from  
A.C. Miller Concrete Products, Spring City, PA 19475, phone: 800.229.2922.

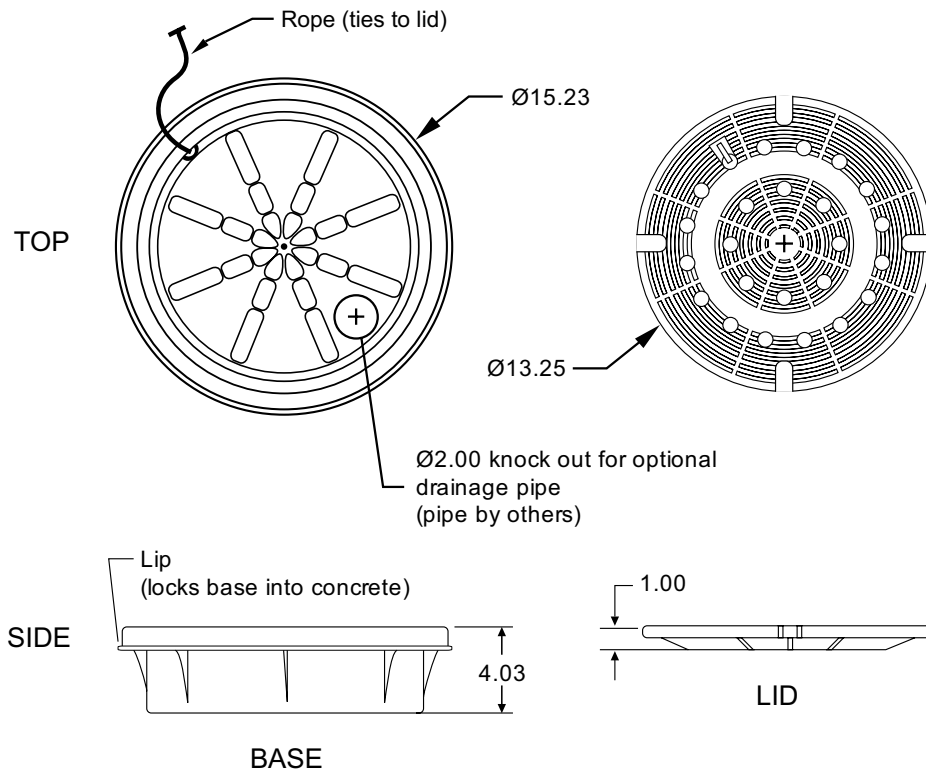
Note: Poured floor shall conform to ACI standard 318-71



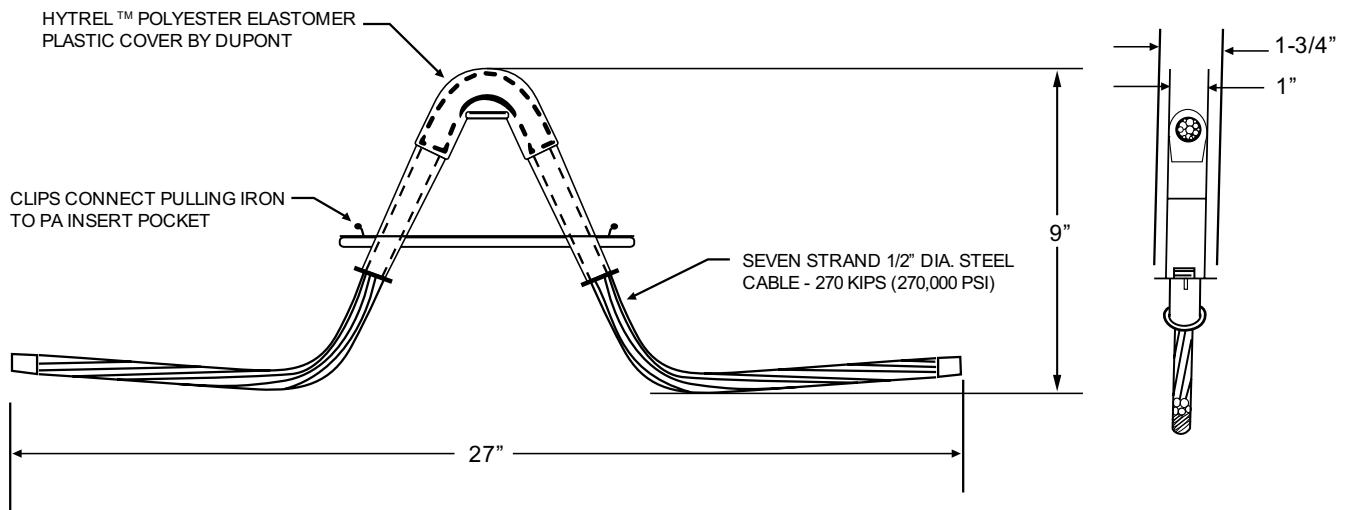
## PRECAST CONCRETE SLOTTED END WALL MANHOLE (CONT'D)

### Plastic Sump

Plastic Sump and Pulling Irons can be purchased from  
A.C. Miller Concrete Products, Spring City, PA 19475, phone: 800.229.29227.



### Pulling Irons



## INSTALLATION STANDARDS

### General

- The standard 6' x 12' x 7' line manhole is adequate when the number of ducts terminating in a single wall does not exceed twelve (12). For terminating in excess of twelve (12) ducts but not more than sixteen (16), the manhole headroom should be increased to 9'.
- Center all duct terminations in the endwalls.
- The manhole end walls are the preferred locations for duct terminations.
- New duct terminations should be located so as not to interfere with existing ducts and cable. This situation is most critical when new ducts are to be located near existing ducts on the same or an immediately adjacent wall. Fig. 1 illustrates the installation of new ducts so cables installed in them will occupy Zone 2 and not interfere with cables installed in existing ducts placed in Zones 1 and 3.
- Two (2) or less terminations in the side wall of the line manhole do not require recessed extension boxes.

The selected location of the ducts and the formation, including dimensions from adjacent walls and roof, is critical. The following factors should be considered when selecting the exact duct location. (Fig. 2)

- Maintain an 8" minimum clearance from inside adjacent walls and roof.
- Maintain 2" separation between ducts.
- Keep terminations high in manhole wall, if possible.
- Avoid conflict with existing ducts by placing new terminations at different elevation.
- Assure wall space is available in manhole for racking cables installed in proposed ducts.
- Duct terminations should never be located in center of standard manhole sidewalls.

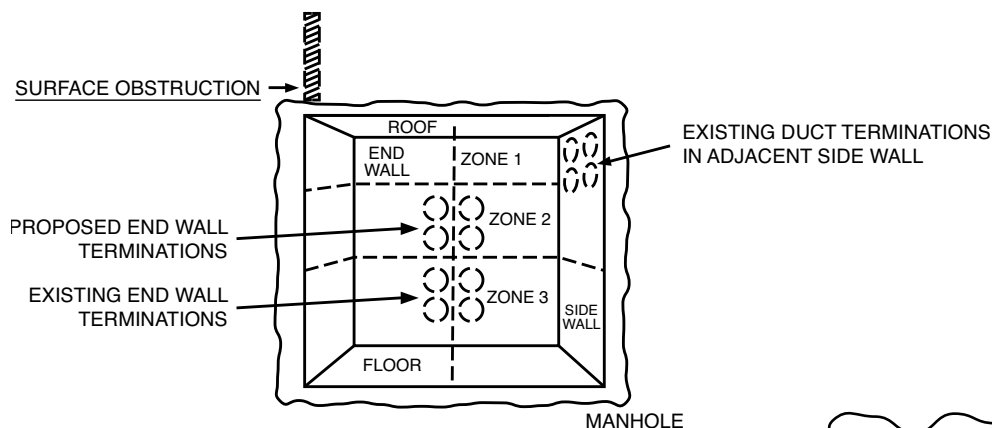


FIG. 1

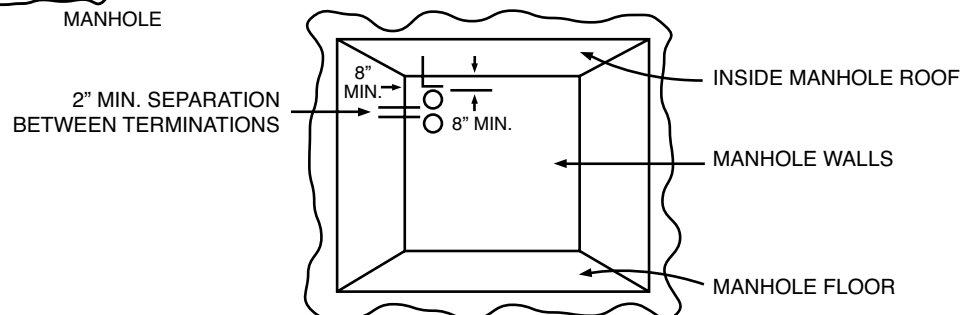
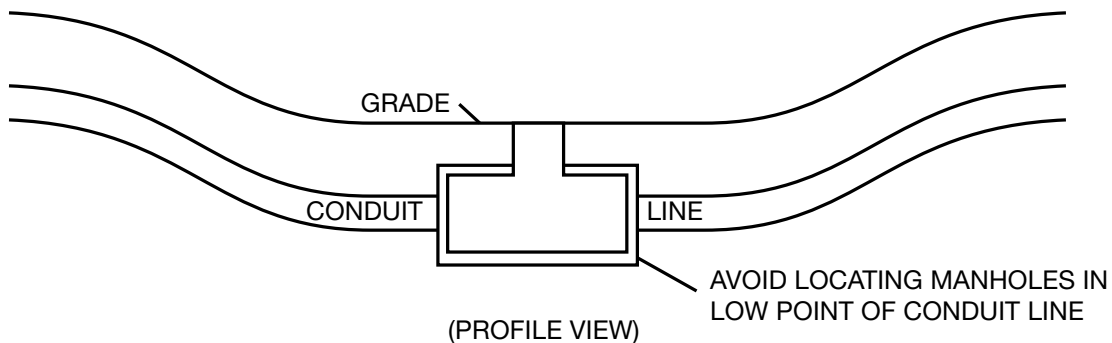
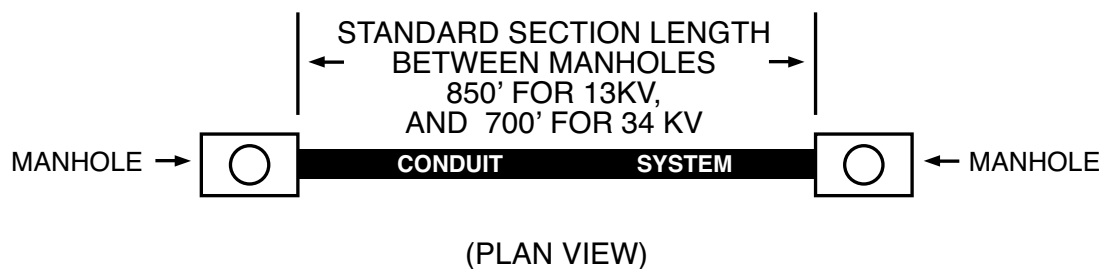


FIG. 2

## INSTALLATION STANDARDS (CONT'D)

### Special Lengths

1. Standard distance between manholes must not exceed 850' for 13kV cables and 700' for 34kV cables.
2. If conduit design/construction requires spacing to be longer than maximum lengths, contact BGE's Electric Distribution Engineering and Standards Unit.

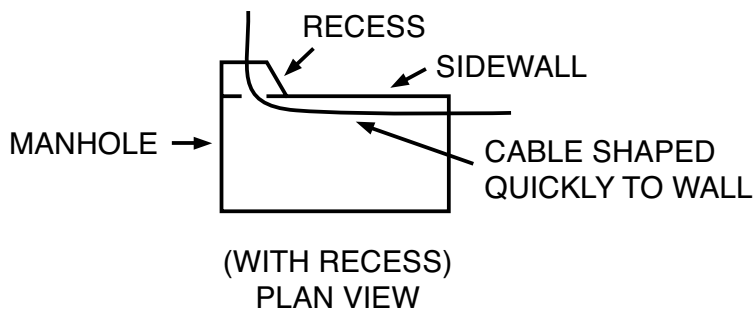




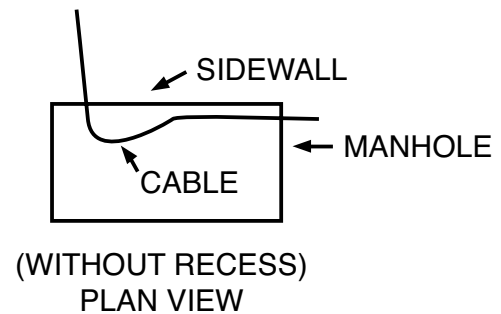
## INSTALLATION STANDARDS (CONT'D)

### Sidewall Terminations – Three (3) or More Ducts

- When three (3) or more ducts are terminated in a manhole sidewall, they are to be recessed. This recessing provides additional sidewall space for splicing the cable by permitting it to be shaped quickly to the wall to which ducts are entering. (Figs. 3 and 4).
- Methods used to install a recess differ for precast and poured-in-place manholes.



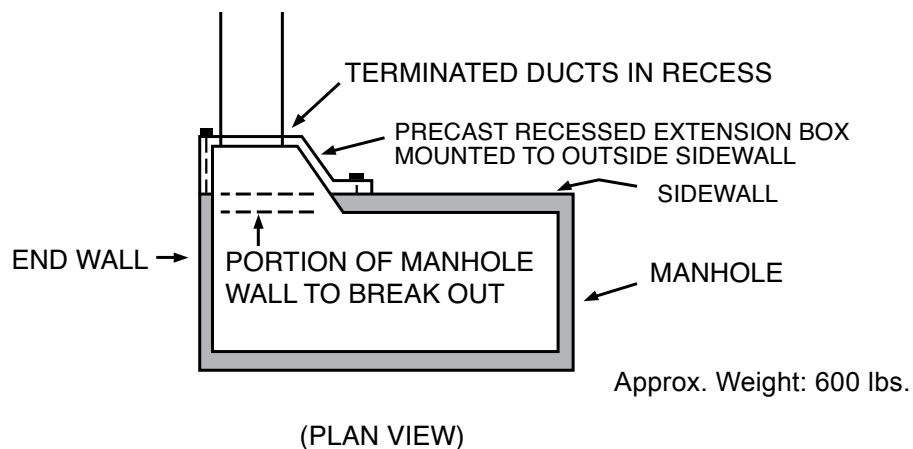
**FIG. 3**



**FIG. 4**

### Precast Manholes – New and Existing (Fig. 5)

- A standard precast manhole provides inserts so a “precast recessed extension box” can be attached to the sidewall at the designated knockout locations. These boxes are to be installed only when required.



**FIG. 5**

## INSTALLATION STANDARDS (CONT'D)

### Existing Manholes Sidewall Terminations (cont'd)

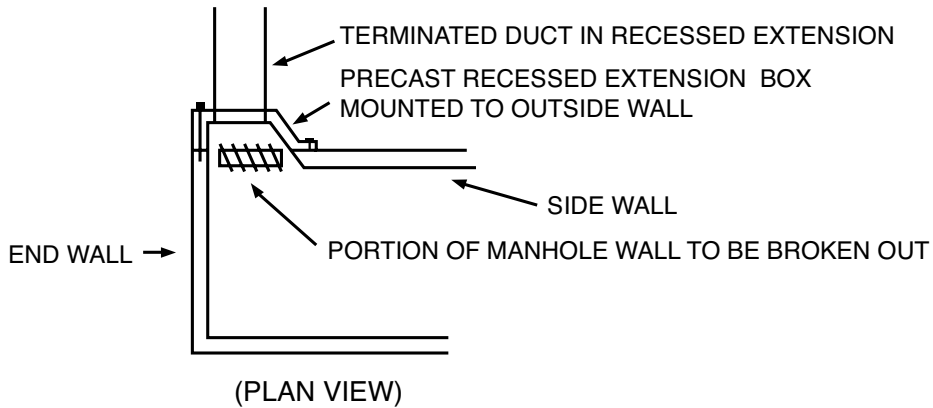


FIG. 6

#### Precast Recessed Extension Box Data (Figs. 7 and 8)

There are nine (9) openings in a precast recessed extension box providing the ability to terminate 6 ducts in a wide x 3 high or 3 wide x 2 high formation. The maximum number of ducts that can be terminated is eight (8). When 8 ducts are terminated, they will be in a non-standard 3 wide x 3 high formation not using the center position.

The recessed box and dimensions do not change when a 9' headroom manhole is used.

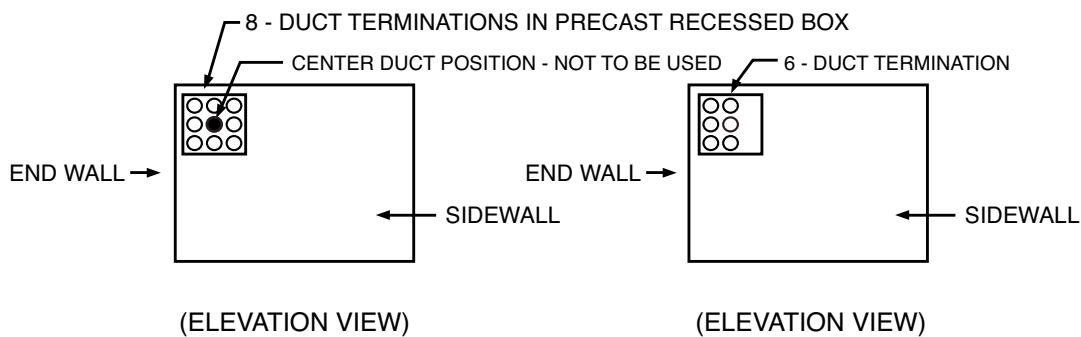


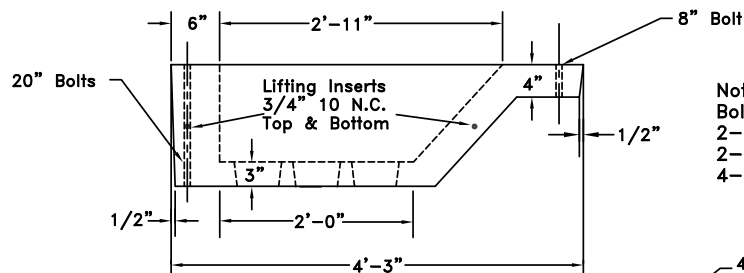
FIG. 7

FIG. 8

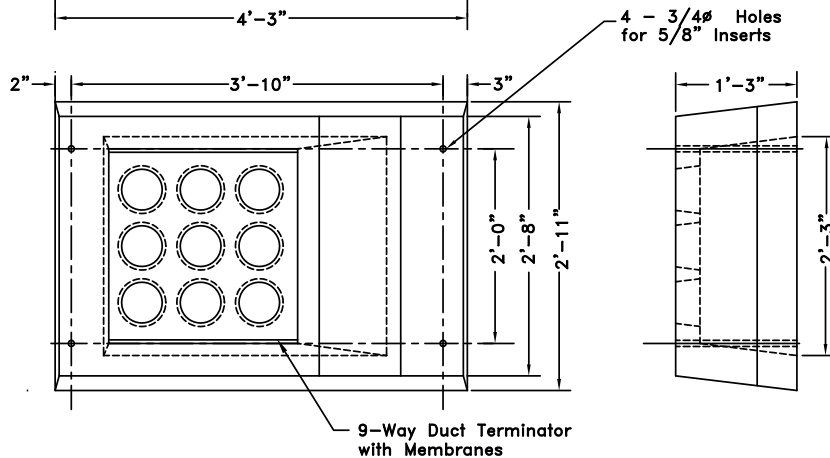
## INSTALLATION STANDARDS (CONT'D)

### Recessed Extensions for Precast Manholes

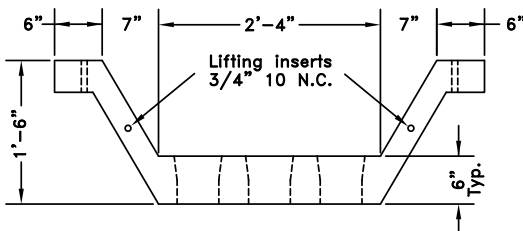
Recessed extensions can be purchased from  
A. C. Miller Concrete Products, Spring City, PA,  
phone: 800.229.2922



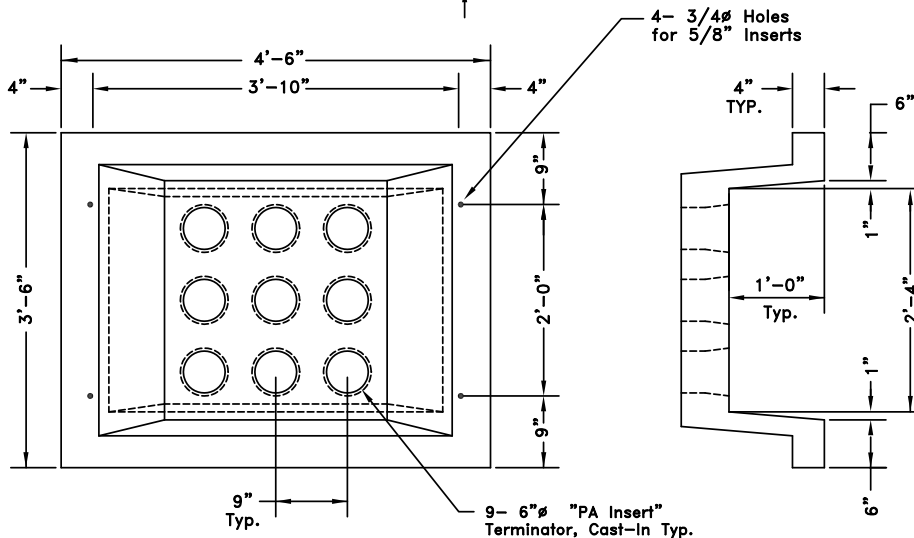
**Note:**  
**Bolt Assembly**  
2- 5/8" x 8" Machine bolts (Mat'l No. 66-262)  
2- 5/8" x 20" All thread bolts (Mat'l No. 11-052)  
4- 1-3/4" Dia. round flat washers (Mat'l No. 11-603)



5" PVC



**Note:**  
**Bolt Assembly**  
4- 5/8" x 8" Machine bolts (Mat'l No. 66-262)  
4- 1-3/4" Dia. round flat washers (Mat'l No. 11-603)

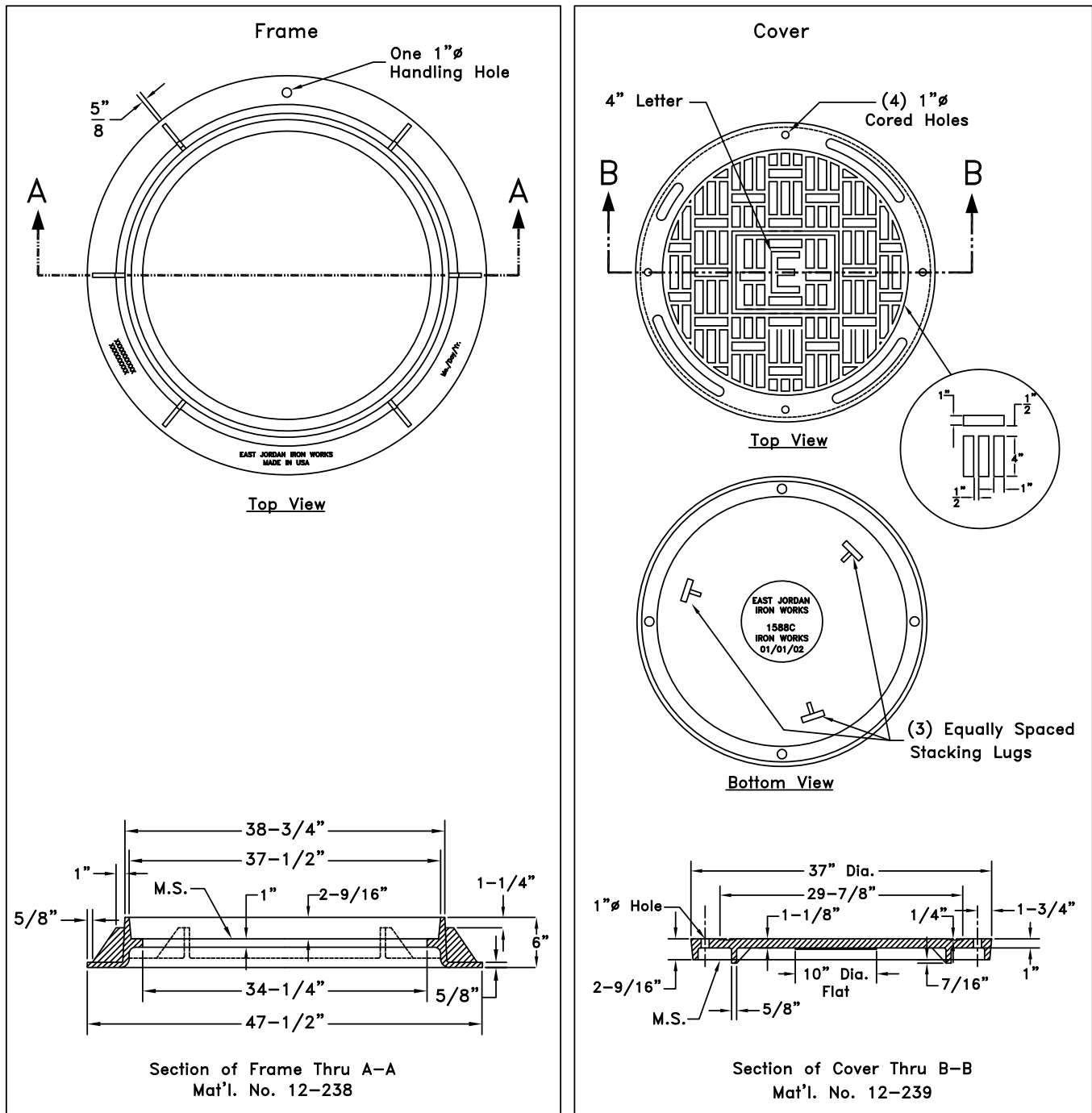


6" PVC

## INSTALLATION STANDARDS (CONT'D)

### Standard Manhole Frame and Cover

This manhole frame and cover can be purchased and delivered to your site from BGE's Contractor Supplier (See page 41). Check with local municipality for proper cover if manhole is located in public right of way.

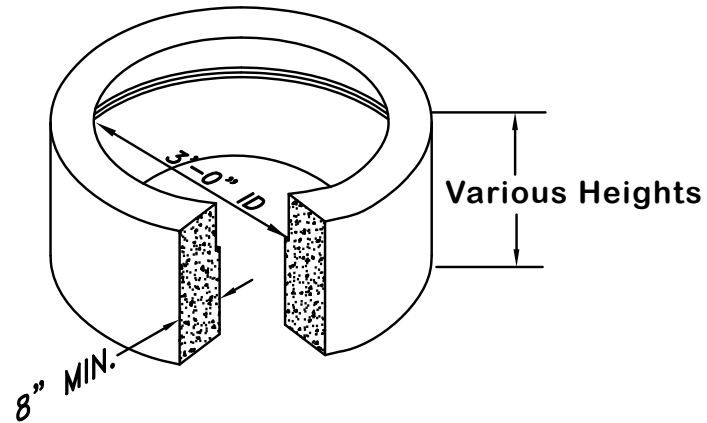


- Notes:
1. Average weight of cover is 320 pounds.
  2. Average weight of frame is 265 pounds.
  3. Frame and cover shall be designed to AASHTO HS20-40 loading and shall be fabricated using ASTM A-48 Class 30 iron.

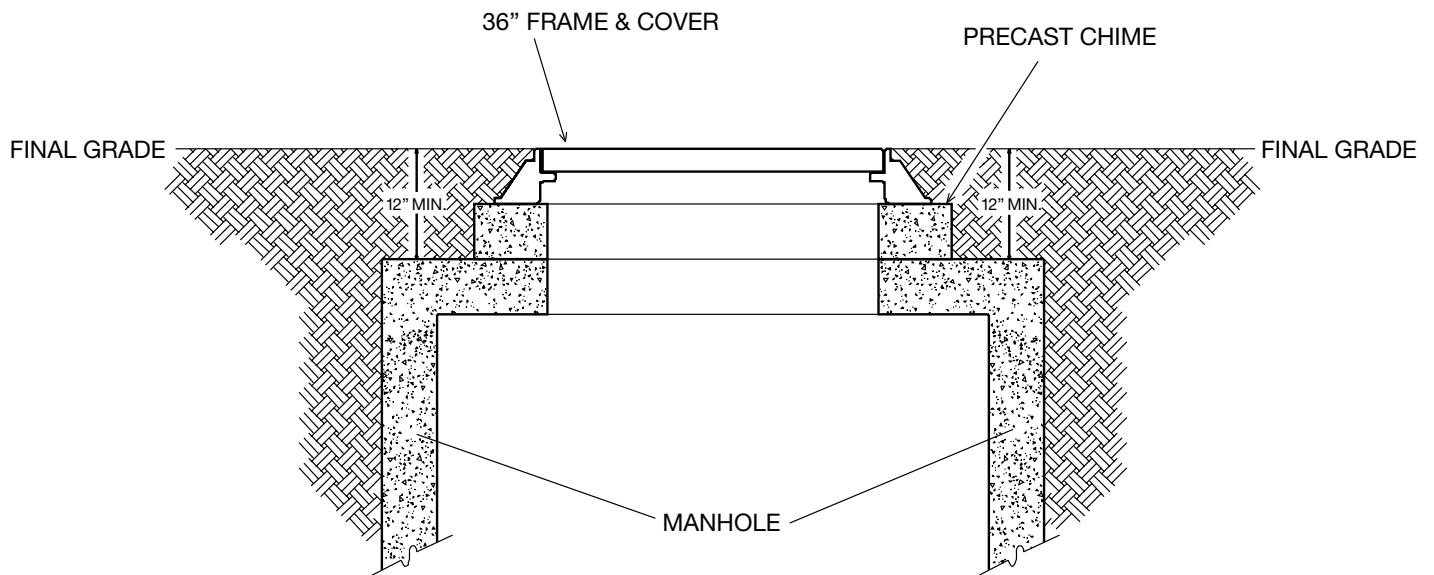
## INSTALLATION STANDARDS (CONT'D)

### Precast Manhole Cover Extension

See A. C. Miller Precast Manholes for Purchasing Information



Various Heights = 3, 6, 9, 12, 15 or 18"



## MATERIALS AVAILABLE FROM BGE CONTRACTOR SUPPLIER

In order to make materials available and as easy as possible for you to obtain, the following materials are available for purchase through BGE's Contractor supplier:

- Pad, Precast, Concrete 78 In. X 66 In.
- Pad, Precast, Concrete 100 In. X 84 In.
- Guard, Pipe 4 Inchs Std Galvanized
- Guard, Removable Pipe Assembly
- Tape, Marking, 3 In. Wide X 1000 Ft.
- Cover, Manhole, 36 Inch
- Frame, 6" Deep, Roadway, Used With 36" Dia. Cover
- Box, Splice, 15 KV
- Box, Splice, 35 KV
- Box, Splicing, 600 V, 16"W X 22"L X 30"D
- Enclosure, Below Grade 600 V, 12"W X 12"L X 17"D
- Enclosure, Below Grade 600 V, 20"w X 30"L X 16"D
- Rod Ground
- Box, Splice 15kv 30" X 60" X 36" Deep
- Pad Plastic Flat 42"x42"x4"
- Pad Box 15kv For Pme Air Swgear
- Gas Marking Tape

These materials are available by contacting:

**Choctaw-Kaul Distribution Company**

**302-292-2660**

**edonaghy@choctawkaul.com**

Direct on site delivery.

Variety of payment options are available.

All costs are fully disclosed and are subject to change without notice.

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# **DEFINITIONS & FREQUENTLY ASKED QUESTIONS**



## DEFINITIONS

*Following are definitions for various terms used in this manual and their source or sources where appropriate. Where no reference is provided, the definition given is that which is applicable to BGE's practices.*

**BGE** - Baltimore Gas & Electric Company or an employee properly qualified to represent Baltimore Gas & Electric Company.

**C & I** - Commercial & Industrial.

**Concrete Encased Duct Bank** - Structure consisting of duct(s) spaced at predetermined distance from each other and encased in concrete.

**Conduit** - A structure containing one or more ducts.

**Conduit System** - Any combination of duct, conduit, manholes, handholes, and vaults joined to form an integrated whole.

**Customer** - Any present or prospective user of BGE's gas or electric service, or any person or entity representing him, such as the architect, engineer, electrical contractor, land developer, builder, etc.

**Directional Bore** - commonly called horizontal directional drilling, is a steerable trenchless method of installing underground pipes, conduit and cables in a shallow arc along a prescribed bore path by using a surface launched drilling rig.

**Direct-Buried** - Cables/Gas Pipe installed directly in ground, not installed in any type of duct.

**Dry Mix Concrete** – One part concrete to two parts gravel that when mixed with four parts water will provide a "Concrete 1-2-4 mix."

**Duct** - A single enclosed raceway for conductors or cable.

**Duct Coupling** - A plastic fitting used to join together two non-belled duct ends.

**Duct Terminator** - A plastic fitting used to terminate one or more ducts in a manhole or splice/pull box wall.

**Mandrel** - A device pulled through a duct to ensure the duct has not collapsed, and is clear of debris and usable for cable installation.

**Manhole** - An underground concrete enclosure to provide housing in which to install cable splices or assist in cable pulling operations.

**Preliminary Routing Sketch** - An engineering plan showing BGE's proposed route of construction, and transformer and meter locations as drawn on the customer's site/utility plan.

**Residential Service** - Gas and/or electric service supplied exclusively for domestic purposes in individually metered dwelling units, where permanent residency is established, including the separately metered non-commercial use facilities of a residential customer (e.g., garages, water pumps, etc.).

**Secondary Service** - Service metered at nominal voltages of 600 volts or less.

**Secondary Mains** - Mains metered at nominal voltages of 600 volts or less.

**Splice/pull box** - A subsurface enclosure that is used for the purpose of installing, or maintaining underground cables and splices.

**Staked Spacer** – A plastic spacer used to hold PVC ducts in position and maintain a 2" separation between adjacent ducts while pouring concrete to encase ducts.

**Sump** - A pit at the lowest point of a manhole floor into which water is drained in order to be pumped out.

**Temporary/Construction Service** - A service intended to be used for a limited period, such as for construction, exhibit, or carnival purposes. The temporary facility will be removed at the completion of its use. This may also be referred to as Doubtful Permanency Service.

**Transformer** - Equipment that converts primary voltage to a lower secondary voltage.

**Underground Distribution** - A distribution system where the cables and pipes are buried with or without enclosing ducts. Transformers, switches and other equipment are normally above ground, or enclosed in vaults or other enclosures.

**URD (Underground Residential Distribution)** - An underground distribution system, primarily supplying single-phase, three wire service laterals to residential dwelling units. Most cables are buried. Transformers and primary switches are contained in above ground pad-mounted enclosures

**WMS Job Number** - An identification number assigned to each job in the BGE Work Management System.

## FREQUENTLY ASKED QUESTIONS

### 1. Who is responsible for designing and building the conduit, splice/pull boxes and manholes?

- The customer is responsible for engineering, designing, permitting, purchasing and constructing all road crossings, ducts, conduit, splice/pull boxes and manholes according to the standards set forth in this document.

### 2. When will BGE require construction, conduit profiles and manhole detail drawings (blow downs)?

- At a minimum, BGE will require a detailed site plan for each project. Depending on the complexity of the project, your BGE representative may require you to provide detailed drawings, including plan views, conduit profiles and manhole blow downs.

### 3. What size ducts, splice/pull boxes, manholes are required and how many do I need?

- BGE will determine the size and number of ducts, splice/pull boxes or manholes and communicate this information to the customer on a BGE Final Design Plan. Check with the local municipality when installing this material in a public Right-of-way for additional requirements.

### 4. What is the minimum cover of duct or conduit?

- Required minimum cover from final grade to top of duct or conduit bank:
- 30 " for secondary (<600V)
- 36 " for primary (>600V)

Note: 48 " maximum depth for top of all duct or conduit unless authorized by BGE representative.

### 5. What is the minimum cover of a manhole?

- Required minimum cover for manholes from final grade to external top of manhole:
- 12 " minimum, 60 " maximum (Excludes 5'x5'x5' secondary manholes).

Note: If requirements call to install manhole below 5' maximum, contact BGE representative for authorization.

### 6. Do the ducts need to be stacked or can they be installed side by side?

- The preferred method to install four or more parallel ducts is to stack and concrete encase the duct run.

Note: If requirements such as economics and underground obstructions require ducts to be installed side by side, contact BGE representative for authorization.

### 7. Do I need to have my work inspected by BGE?

- All concrete encased duct and manhole installations will have the following BGE inspections:
- Pre-construction
- Pre-pour
- Pre-backfill
- Mandreling and Stringing
- Check with local municipalities for additional requirements
- \* All direct-buried duct, road crossings and splice/pull boxes will have a BGE pre-site inspection.

### 8. Where do I purchase splice/pull boxes and manholes?

- Splice boxes can be purchased from BGE's Contractor Supplier (See page 41).
- Manholes can be purchased from BGE approved vendor

### 9. When do I need to concrete encase my ducts?

- Duct banks must be concrete encased if any ducts are stacked vertically (one on top of the other). All 2x2 duct banks and greater must be concrete encased.
- If ducts are within municipality Right-of-way, it may be required to concrete-encase. Check with local Department of Public Works for specific requirements.

### 10. Where do I stop the duct if the transformer or pole has not been set?

- Customer is to stop duct 5' from pole, seal ends of duct and mark location with electronic marker or wooden 2"x 6" stake labeled "BGE".

### 11. Is there a means to track my project on the internet?

- Yes...using your BGE WMS or reference number go to "BGE.com" and search:
- "Customer Service"
- "Construction Remodeling"
- "Check Your Job Status"

### 12. Who do I contact for conduit questions?

- With questions about conduit and manhole construction refer to this booklet or call your BGE project representative. If you have questions about any of our BGE New Business Services, please contact us on: **800.233.1854**.

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