



**GrandBridge**  
ENERGY

**MATERIALS AND CONSTRUCTION  
SPECIFICATIONS**

**New Subdivisions**

**(Cambridge, North Dumfries, Brant County and  
Brantford)**

Issued by: Engineering Department

GrandBridge Energy

Effective: October 2023

Approved by: Gurdeep Bansal, P.Eng. *Gurdeep Bansal*

Approval is given in accordance with Ontario Regulation 22/04. There are no undue hazards. It is suitable for the intended application and will be adequately inspected.

October 12, 2023

Dear Specification Book Holder:

Enclosed please find a new Materials and Construction Specifications book (dated October 12, 2023) for new residential subdivisions. This document applies to all new utility power distribution and street lighting system construction in the City of Cambridge, the Township of North Dumfries, County of Brant and the City of Brantford.

The revisions are effective October 2023. Questions and comments are welcome.

It is the responsibility of all developers and contractors to ensure that they are in possession of the most current edition of this document. No substitutions are permitted. All work and materials used are subject to inspection and approval by a GrandBridge Energy (formerly Energy+ Inc. and Brantford Power Inc.) representative.

Yours truly,

**GRANDBRIDGE ENERGY**

Gurdeep Bansal, P.Eng.

Senior Power Distribution Engineer

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# 1 Residential Subdivisions

## 1.1 Purpose

This specification prescribes the general requirements for the installation of an underground electrical distribution within a residential subdivision within the City of Cambridge, the Township of North Dumfries, the County of Brant and the City of Brantford. It also prescribes the general requirements for the installation for the points of supply within a residential subdivision. Please contact the City of Cambridge, Township of North Dumfries, County of Brant and the City of Brantford for their street light system requirements. It is the Developer's and its contractor's responsibility to familiarize themselves with these specifications.

GrandBridge Energy reserves the right to refuse to energize any part of the electrical plant which does not conform to these specifications. GrandBridge Energy assumes no responsibility whatsoever for the cost of repairs, relocating, or delays in energizing the system incurred as a result of disregarding these specifications.

## 1.2 Provincial Statutes and Municipal By-Laws

All work is to be done in accordance with Electrical Safety Authority Ontario Regulation 22/04 – Electrical Distribution Safety.

The latest edition of the Ontario Electrical Safety Code is also applicable where required (ie. street lighting installations). The Developer and its agents are to familiarize themselves with, and abide by, all relevant Provincial Statutes and Municipal By-Laws. Such relevant regulations include in part, the Occupational Health and Safety Act and Regulations for Construction Projects. Also applicable are City of Cambridge, Township of North Dumfries, County of Brant, City of Brantford and Regional Municipality of Waterloo By-Laws including but not limited to regulating entry upon road allowances, and traffic control. Developers must comply with GrandBridge Energy's appropriate clearance requirements to ensure adequate separation to GrandBridge Energy's hydro facilities. Developers must also plant trees in accordance with GrandBridge Energy's clearance requirements.

## 1.3 Scope of Work

GrandBridge Energy, as indicated in the Development Agreement, will give assistance to the Developer by performing several tasks on its behalf. Also, the Developer and its agents shall be responsible for other necessary tasks as specified in this agreement.

Specific task assignments are summarized below.

### 1.3.1 GrandBridge Energy Responsibilities:

- a) The City of Cambridge and the Township of North Dumfries:  
Design of Electrical Plant



The Street Lightning System is the responsibility of the Developer. The Developer must follow the City of Cambridge and the Township of North Dumfries' latest revision of Development and Engineering Standards.

b) The County of Brant and the City of Brantford:

Design of Electrical Plant.

The Street Lightning System is the responsibility of the Developer. The Developer must follow the County of Brant and the City of Brantford's latest revision of Development and Engineering Standards.

- c) Co-ordinate design and approvals with Bell Canada, Rogers Cable T.V., Solo Cable, NetOptiks, Xplornet, Brant Municipal Enterprises, City of Cambridge, Township of North Dumfries, County of Brant, City of Brantford, Regional Municipality of Waterloo, and Enbridge Gas as required.
- d) Supply and install easement marking posts as required.
- e) Supply and install all materials required to complete terminations, both low and high voltage.
- f) Supply and install service cable, from lot line to meter base, including trenching and backfilling.
- g) Inspect, test, and energize all electrical plant.

### 1.3.2 Developer Responsibilities:

- a) Supply required shop drawings via e-mail to GrandBridge Energy for review and approvals. This includes all major material to be installed for the subject development.
- b) Purchase and install primary cables, ground rods, enclosures, underground vaults, ducts, transformers, multiplex junction units, switches, marking discs, meter bases, other equipment, and accessories as per these specifications.
- c) Provide copy of purchase order for transformers to the Engineering Department of GrandBridge Energy at time of order placement.
- d) Arrange for delivery of transformers to site.
- e) Forward transformer certified test results prior to equipment delivery to site and installation.
- f) Forward copies of certified primary and secondary cable test results from manufacturer to GrandBridge Energy prior to cable installation.
- g) Provide shop drawings of all major materials such as switchgear, transformer, primary conductor, vaults etc.

## 1.4 Procedure

For developer installed residential subdivisions, a general procedure has been adopted. This procedure specifies the sequence of events that occurs for new subdivision construction within the boundaries of the City of Cambridge, the County of Brant, the Township of North Dumfries, and the City of Brantford:

- a) Developer submits required drawings to GrandBridge Energy with covering letter indicating electrical loading, development staging, and tentative construction schedule. An on-street parking plan shall be submitted if one is available. For semi-detached or twin lots, developer shall indicate whether driveways are to be located in the centre of the lot or at the sides. For condominium/row housing developments, developer shall number each unit and indicate whether the heating is electric or non-electric.
- b) City of Cambridge and the Township of North Dumfries:  
The governing road authority is to provide GrandBridge Energy with roadway classification as per I.E.S. RP-8-00 guide for the design of Roadway (City of Cambridge, Township of North Dumfries, Region of Waterloo), for example: Road Class and Area Class.

County of Brant:

The Developer must follow the County of Brant's latest revision of Development and Engineering Standards for roadway classification.

- c) City of Cambridge, the Township of North Dumfries, County of Brant and City of Brantford:

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GrandBridge Energy carries out design of electrical distribution only

- d) GrandBridge Energy prepares cost estimates.
- e) GrandBridge Energy forwards drawings and/or notification to the utilities and communication companies operating in GrandBridge Energy's service area.
- f) GrandBridge Energy forwards drawings to City of Cambridge, Township of North Dumfries, County of Brant, City of Brantford and Regional Municipality of Waterloo for approval of location of electrical plant.
- g) GrandBridge Energy forwards drawings to the Developer and/or its engineering firm for comments.
- h) Developer must prepare and submit a Composite Utility Plan – C.U.P., forwards design drawing(s), cost estimates and easement requirements to Developer. The design drawings are to be reviewed by the Developer and its contractor. Any discrepancies or items needing clarification are to be discussed with the GrandBridge Energy Representative responsible for the project. One approved copy of the design drawing(s) must be returned to GrandBridge Energy prior to commencement of construction.

- i) GrandBridge Energy prepares and forwards to Developer three copies of the Development Agreement. Developer may make additional copies if required.
- j) GrandBridge Energy receives signed copies of Development Agreement and required financing from Developer. GrandBridge Energy executes copies of agreement.
- k) Developer requests GrandBridge Energy approval of contractor(s), has site graded to within 150mm (6") of final grade and notifies GrandBridge Energy of tentative construction schedule.
- l) Developer installs electrical plant in accordance with approved drawings bearing the stamp "FOR CONSTRUCTION" with the ESA Certificate of Approval (Design) signed and dated by a Professional Engineer. GrandBridge Energy inspects work in progress. No backfilling or concrete encasement shall take place prior to inspection by the GrandBridge Energy representative.
- m) Developer submits to GrandBridge Energy a grade sheet showing the actual final elevation of the top of all equipment enclosures, proposed landscaping drawings, the proposed finished grade beside all equipment enclosures and the difference between these grades. A drawing showing the as-constructed location of any equipment installed on an easement shall also be submitted. Grades and location shall be checked and confirmed by the Developer's engineering firm immediately after the contractor has installed the enclosure(s). This ensures that any corrections to enclosure elevation can be made prior to placement of ducts and installation of cables.
- n) GrandBridge Energy inspects and approves Electrical Plant for energization. An ESA Record of Inspection and an ESA Certificate shall be signed and dated by a qualified GrandBridge Energy representative prior to energization.
- o) Electrical plant is energized. Guarantee period of one year commences upon issuance of a defect free Final Inspection Report. Letter of Credit may be reduced to 10% of estimated value of installed Electrical Plant upon receipt of:
  - i. A Statutory Declaration stating that all amounts relative to the installation of the Electrical Plant have been paid in full.
  - ii. Evidence, to the satisfaction of GrandBridge Energy, that there are no outstanding claims pursuant to the Construction Lien Act (Ontario).
  - iii. A breakdown of actual costs for the installation of the Electrical Plant.
  - iv. A certificate indicating the location and elevation of equipment enclosures.
- p) The Letter of Credit may be reduced to zero after Notice of Final Acceptance of the Electrical Plant has been issued to the Developer by GrandBridge Energy, after expiration of the Guarantee period and after any deficiencies have been corrected to the satisfaction of the GrandBridge Energy inspector.

## 1.5 Plan of Subdivision

The Developer shall submit to GrandBridge Energy all required drawings in AutoCAD ".DWG" or ".DXF" format via e-mail.

Semi-detached lots shall be identified by underlining the lot number. A north indicator shall be shown near the top right corner. The plan shall be laid out to conform with Drawing **UGS-00A** included in this specification, when possible. Property lines and lot numbers are to be placed on one layer, while sidewalks, curbs, parking areas, underground services with civic and registered lot numbers etc. are to be placed on one or more different layers.

## 1.6 Plan of Multiple Unit Developments

The Developer shall submit to GrandBridge Energy all required drawings in AutoCAD ".DWG" or ".DXF" format via e-mail.

A north indicator shall be shown near the top right corner. The plan shall be laid out to conform with Drawing **UGS-00B** included in this specification, when possible. Property lines, buildings, parking areas, sidewalks, etc. are to be placed on one layer, while underground services, grades, etc. are to be placed on one or more different layers.

## 1.7 Registration Plans

The Developer shall forward to GrandBridge Energy two prints of the Registered Plan of Subdivision and/or two prints of the Reference Plan showing the subdivision.

## 1.8 Civil Engineering Plans

The Developer shall forward to GrandBridge Energy one set of prints of the approved Civil Engineering Plans (including grading plans) and one copy of any subsequent revisions to the approved plans.

## 1.9 Tree Saving Plan

The Developer shall forward to the GrandBridge Energy a copy of the tree saving plan, where required, for the development so that trees being preserved are taken into account in the hydro design.

## 1.10 Ontario Energy Board (OEB) – Connections and Expansions

### 1.10.1 Economic Evaluation Formula

GrandBridge Energy is regulated by the OEB. OEB regulations apply to all subdivision agreements dated November 1, 2000 or later.

Refer to the GrandBridge Energy Economic Evaluation Policy (latest edition) for more information about charges or rebates. This policy is updated regularly to reflect current cost and rate projections.

### 1.10.2 Alternate Bids

Section 3.3 of the Distribution System Code permits a developer to complete work that has normally been completed by the electric utility. (i.e. high voltage and streetlight terminations in new equipment.) Two conditions must be satisfied for the above clause to apply:

- i. The project requires a capital contribution by the Developer – This is a requirement for all new subdivisions.
- ii. The construction work must not involve existing utility plant – This is true for most work carried out in a new subdivision except for connections to existing lines/equipment.

For work meeting the above criteria the developer may choose to use a construction contractor that is approved by GrandBridge Energy. A list of approved and qualified electrical contractors can be obtained from Purchasing Manager at GrandBridge Energy.

If a developer wishes to use a contractor that is not on the approved list, the proposed contractor shall contact the GrandBridge Energy Purchasing Manager who will provide information on the required submittals that must be provided in order to be considered for approval. The developer is encouraged to provide as much time as possible for the pre-approval process.

Where a developer uses an approved contractor for the work noted in this section, the developer shall select, hire, and pay the contractor for this work and assume full responsibility for the quality of this work.

A GrandBridge Energy representative shall inspect and approve all termination work prior to the connection of the new equipment to the existing utility power distribution system. The developer shall pay all costs associated with the additional inspection and approval by the GrandBridge Energy representative.

## 1.11 Electrical Safety Authority (ESA) Streetlighting System

### Compliance Requirements

In accordance with ESA Bulletin 30-9-1 dated April 2002, all streetlighting systems designed or tendered after January 1, 2003 shall meet the requirements of the Electrical Safety Code.

Installation requirements are provided in standard drawings SLS 003 and SLS 004 for all GrandBridge Energy service territory. Please contact the City of Cambridge, the Township of North Dumfries, County of Brant and the City of Brantford for their street light system requirements.

For all new installations, a permit shall be obtained by the Developer or its Contractor and all associated fees shall be paid.

Details on the new processes, regulations, applications and fees can be found at:  
<https://esasafe.com/>

Concrete street light pole drawings provide for service entrance switch mounting requirements and larger handholes to accommodate individual light fusing.

Consult the GrandBridge Energy Engineering Department for further information.

## 2 Material Specifications

### 2.1 Underground Cable

#### 2.1.1 Primary Underground Cable

Primary underground cable shall be specified according to CAN/CSA standard C68.5, latest edition. Cable test reports are required and must be submitted to GrandBridge Energy Design Technologist for review. The C68.5 standard can be briefly described as follows:

- i. 1000 kcmil, 750 kcmil, 500 kcmil, or 1/0 AWG 28kV compact stranded aluminum central conductor concentric neutral.
- ii. approved strand-fill compound.
- iii. extruded semiconducting thermosetting conductor shield.
- iv. extruded thermosetting tree-retardant cross-linked polyethylene (TRXLPE) insulation.
- v. extruded semiconducting thermosetting insulation shield.
- vi. copper wire 100% concentric neutral.
- vii. linear low density polyethylene encapsulating (LLDPE) jacket.

Dimensions for compact aluminum cables shall be as per Table 2.1.1-1:

**TABLE 2.1.1-1: COMPACT ALUMINUM CABLE DIMENSIONS**

<b>Cable Class</b>	<b>Size</b>	<b>Over Insulation (mils)</b>	<b>Over SC Shield (mils)</b>	<b>Overall (mils)</b>	<b>Concentric Neutral</b>
28kV	1/0 AWG	910 – 955	984 – 1025	1179 – 1304	16 x 14 AWG
28kV	500 kcmil	1350 – 1410	1430 – 1530	1802 – 1818	16 x 12 AWG
28kV	750 kcmil	1480 – 1575	1614 – 1649	1924 – 1974	24 x 12 AWG
28kV	1000 kcmil	1681 – 1741	1810 – 1845	2120 – 2170	30 x 12 AWG

#### 2.1.2 Secondary Underground Cable (test results required)

Secondary underground cable shall be specified as per Canadian Electrical Association Specification WCWG-04 (02/93) (or latest revision) USC75 or USC90 and CSA 22.2 including any other requirements as described in this section.

The CEA specification can be briefly described as:

- i. 3/0 AWG Aluminum Triplex or 250kcmil Aluminum Triplex (Three single cables twisted together Black, White, Red with reduced neutral)
- ii. Polyethylene or Cross-linked Polyethylene (XLPE) insulation
- iii. P.V.C. Jacketed (-40°C)
- iv. 18 or 19 strand (3/0) - 35 to 37 strand (250mcm)

Cable Identification on Stamped Metal Plate to include:

- i. Date
- ii. Length in Metres
- iii. Manufacturer
- iv. Insulation Type

Cable test reports are required and must be submitted to GrandBridge Energy Design Technologist for review.

### 2.1.3 Street Light Cable

For City of Cambridge, the Township of North Dumfries, Brant County and City of Brantford service areas, the Developer should reference the latest revision of Development and Engineering Standards. Issued by the municipalities.

### 2.1.4 Grounding Wire

Specification:

2/0 AWG bare copper  
Soft drawn  
19 strand

### 2.1.5 Approved Manufacturers

Approved manufacturers for cables include the following:

- i. Alcan Wire & Cable
- ii. Nexans
- iii. Prysmian Cable/General Cable
- iv. Southwire

## 2.2 Single-Phase Transformers

Transformers shall be constructed as per Grid Smart City Specifications, or latest revision. Grid Smart City latest specifications supersedes this document where conflicting information exists. Transformers shall be low profile, deadfront, padmounted with "Equipment Green" finish. Transformers shall be delivered directly to site. Developer must reach out to GrandBridge Energy Design Technologist for the latest copy of the Transformer Specification.

### 2.2.1 High Voltage

Transformers shall be supplied complete with two high voltage cavity bushing wells and a feed through bus rated at 200 A.

### 2.2.2 Fusing

Transformers shall be supplied complete with RTE Bay-O-Net Fuse Assembly and in series with RTE ELSP.

### 2.2.3 Low Voltage

Transformers shall be supplied complete with a seven-hole low voltage bar terminal.

### 2.2.4 Certified Test Reports

Two copies of the certified test results shall be forwarded to the engineering Design Technologist at the Cambridge or Brantford office, respectively, with the transformer shipment dates. Transformers will not be released for installation until certified test results, including the actual measured losses and impedances, corrected to 85°C are received for each transformer. Testing for verification may be carried out by GrandBridge Energy.

### 2.2.5 Maximum Transformer Losses

Transformer Losses shall be equal or less than those maximum values given in the latest version of the CSA Standard C802.1/DOE, "Minimum efficiency values for liquid-filled distribution transformers."

### 2.2.6 Transformers For Use on a 4.8KV Ground 'Y' System

Specify: GrandBridge Energy Specification, as per Grid Smart City, or latest revision

Complete unit to be manufactured for use on 8,320/4,800V Grounded 'Y' System.

### 2.2.7 Transformers For Use on 16KV Ground 'Y' System

Specify:

GrandBridge Energy Specification, as per Grid Smart City, or latest revision.

Complete unit to be manufactured for use on 27,600/16,000 V Grounded 'Y' System.

### 2.2.8 Approved Manufacturers

The following are approved manufacturers of mini pad transformers for new subdivisions:



- i. Carte Electric Ltd.
- ii. Canadian Electrical Services
- iii. Cam Tran Co. Ltd.

## 2.3 Padmount Switchgear

### 2.3.1 Three-Phase Padmounted Switching Units

Three Phase Switching units, as specified by GrandBridge Energy, shall be purchased and installed by the Developer. Switching units shall be shipped directly to site.

Approved Supplier:

- i. ABB (Elastimold) Model: ESD324-TTLL-6622-CS1578

### 2.3.2 Fault Indicator – Single phase Primary Dip

GrandBridge Energy will supply and install the following fault indicator.

HORSTMANN

Model: Navigator LM HV

## 2.4 Street Lighting

For City of Cambridge, the Township of North Dumfries, Brant County and Brantford, the Developer should reference the latest revision of Development and Engineering Standards.

NOTE: GrandBridge Energy no longer support street light design and installation services in the City of Cambridge and Township of North Dumfries, effective April 2024. For more details, please contact the GrandBridge Energy Engineering team.

### 2.4.1 Poles

For pole, please contact the City of Cambridge, the Township of North Dumfries, County of Brant and City of Brantford for more information.

### 2.4.2 Tapered Elliptical Mast Arm

Please contact the City of Cambridge, the Township of North Dumfries, County of Brant and City of Brantford for more information.

### 2.4.3 Luminaires

- i. For LED luminaires, please contact the City of Cambridge the Township of North Dumfries, County of Brant and City of Brantford for more information.

#### 2.4.4 Luminaire Lamps

- i. For luminaire lamps, please contact the City of Cambridge the Township of North Dumfries, County of Brant and City of Brantford for more information..

#### 2.4.5 Luminaire Wiring - for Cobra Head Luminaire

- i. For Luminaire wiring, please contact the City of Cambridge the Township of North Dumfries, County of Brant and City of Brantford for more information.

#### 2.4.6 Luminaire Control - Photocell

- i. For Luminaire control, please contact the City of Cambridge the Township of North Dumfries, County of Brant and City of Brantford for more information.

#### 2.4.7 ESA Requirements – Street Lighting Materials Note

In accordance with bulletins issued by the ESA all streetlighting installations shall comply with the latest Ontario Electrical Safety Code. Underground material and installation requirements are provided in drawings SLS-003 and SLS-004.

### 2.5 Meter Bases

#### 2.5.1 Single Family Units

- i. Single Phase 3 wire 240/120V Rated 200A

Specify: The approved meter base shall be as per the latest GrandBridge Energy Metering Specifications (Dated June 01, 2023 or newer). The specification can be found on the GrandBridge Energy website.

All meter base face plates must be self supporting and securely clamped as per ESA after installation.

- ii. Single Phase 3 wire 240/120V Rated 400A

Specify: The approved meter base shall be as per the latest GrandBridge Energy Metering Specifications (Dated June 01, 2023 or newer). The specification can be found on the GrandBridge Energy website.

400A Meter bases must be equipped with an automatic circuit isolation device and shall be wired for a 4-Jaw socket configuration.

#### 2.5.2 Multiple Family Units

Single phase 3 wire 240/120V rated 200 amp per position, 200 amp 600V max. main lugs. Two position meter sockets shall be used for two housing units. Three position meter sockets shall be used for two housing units and a general service for lighting.

Specify: The approved meter base shall be as per the latest GrandBridge Energy Metering Specifications (Dated June 01, 2023 or newer). The specification can be found on the GrandBridge Energy website.

All meter base face plates must be self supporting and securely clamped as per ESA after installation.

## 2.6 Civil Materials

### 2.6.1 Screened Bedding Sand

Specify: Screened Bedding Sand, screened to remove all particles with an overall dimension of ¼" or greater.

### 2.6.2 Granular "A"

Specify: Ontario Provincial Standard Specification 1010 Aggregates (latest edition).

### 2.6.3 Concrete

City of Cambridge/Township of North Dumfries/Regional Municipality of Waterloo/County of Brant / City of Brantford Roads

Design strength 20 MPa (2900psi), 10mm (3/8") Peastone, 80mm (3") Slump. Winter handling when required.

### 2.6.4 20mm (3/4") Clear Stone

Clear Stone, free of contaminants, maximum aggregate size 20mm (3/4").

## 2.7 Accessories

### 2.7.1 Precast Concrete Single Phase Transformer Vault

Specify: Approved manufacturers: Acton Precast or Brooklin Concrete Products

Vault specification shall be as per drawing UGS-004.

### 2.7.2 Precast Concrete Underground Pulling Vault

Specify: Approved manufacturers: Acton Precast or Brooklin Concrete Products

Vault specification shall be as per standard drawing UGS-005.

NOTE: If a larger vault is required, GrandBridge Energy will provide details. Supply all required shop drawings via e-mail to GrandBridge Energy Design Technologist for review and approval.

### 2.7.3 Precast Concrete Switching Unit Enclosure

#### i. Three Phase Switching Unit Enclosure

Specify: Approved manufacturers: Acton Precast or Brooklin Concrete Products

Vault specification shall be as per standard drawing UGS-008.

#### ii. Single Phase Switching Unit Enclosure

**This requirement became obsolete, effective October 2023. For more details, please contact the GrandBridge Energy Engineering team..**

**Contact GrandBridge Energy Engineering team for more details.**

## 2.7.4 Grounding Materials/Riser Pole Materials

### i. Ground Rod

Installation details as per UGS-010

Specify: Ground Rod 20mm x 3m (3/4" x 10') Copper Clad

### ii. Ground Rod Clamp

Specify: Ground Rod Clamp

Shear-Lok Copper Tap Grounding Connector Cat. No. 80408-6 (AMP)

## 2.7.5 Underground Duct

Specify as per C.S.A. C22.2 #211.1 (latest revision) or DB2 - (IPEX, Royal Pipe)

Installation details as per UGS-013, UGS-014 and UGS-014-A, UGS-014-B

## 2.7.6 Electronic Marking Disc

Specify: "APC" 1251 EMS Full Range Power Marker (3M)

## 2.7.7 Cable Caps (Vinyl)

Specify: MM Plastic Mfg. Co. Inc. Vinyl Caps - Diameters as per Table 2.7.7-1:

**TABLE 2.7.7-1: CABLE CAP DIAMETERS**

<b>Cable Size</b>	<b>Cap Diameter (inches)</b>
#6 AWG	0.343
3/0 AWG	0.625
250 kcmil	0.875
1/0 AWG	1.375
500 kcmil	1.875
750 kcmil	2.188
1000 kcmil	2.500

## 2.7.8 Electrical Coating

Specify: ScotchKote (3M) – temperature rating up to **121°C**

## 2.7.9 Duct Sealant

Specify: Dux #1 or Dux #5 (Commander Electrical Materials)

or

DS1 or DS 5 (Panduit)

### 2.7.10 Underground Warning Tape

150mm (6") wide polyethylene red warning tape with the message "Caution - Electric Line Buried Below".

Installation details as per UGS-013

Specify: 210ELE (Revere-Seton Inc.)

or

1000 RT6 (Blackburn)

or

91296 (Brady)

or

Underground Warning Tape (J-2)

or

100R6 (Allen Systems)

### 2.7.11 Cable Pulling Lubricant

Cable pulling lubricant used to reduce friction during cable pulling.

Specify: Aqua-Gel II (Ideal Industries Inc.)

or

WL Wire Pulling Lubricant (3M)

## 3 Construction Specifications – Underground

### 3.1 Layout

The Developer shall be responsible for survey layout with respect to electrical plant location. Location shall be governed by the standard drawings included in this specification. GrandBridge Energy may approve changes in location during installation if the standard location is in conflict with other facilities.

All driveways must be located a minimum of **1.5m** away from hydro poles, guy wires, padmount transformers, padmount switches, vaults, etc.

### 3.2 Utility Locates

The Developer shall be responsible for obtaining existing utility locates prior to excavating for electrical plant. For underground locates, contact GrandBridge Energy and Ontario One Call at 1-800-400-2255.

Please remember that not all buried infrastructure owners are members of Ontario One Call. You are responsible for notifying other companies that may have buried infrastructure in your work area and are not members of Ontario One Call. You are not clear to excavate until all Ontario One Call members have either located their infrastructure in your work area or advised you to proceed.

### 3.3 Equipment Enclosures and Vaults

#### 3.3.1 Installation of Transformer Enclosure

Enclosure installation shall conform with standard drawing No. UGS-009.

#### 3.3.2 Installation of Underground Vault

Vault installation shall conform with standard drawing No. UGS-010.

#### 3.3.3 Installation of Switching Unit Enclosure

Enclosure installation shall conform with standard drawing No. UGS-012 for three phase switches..

### 3.4 Installation of Concrete Encased Road Crossings

#### 3.4.1 Excavation

Sufficient material shall be excavated to allow for placement of duct structures and 0.9m (3') depth of cover as per standard drawing no. UGS-013, UGS-014, UGS-014A, and UGS-014B. The trench bottom shall be undisturbed and reasonably level with a 2% slope from centre to curb.

#### 3.4.2 Placement of Ducts

Duct banks shall be constructed as per standard drawing No. UGS-014. Ducts are to be placed on spacers at 3m (10') intervals and tied with plastic stove or banding to prevent floating. GrandBridge Energy may approve change in duct bank configuration if required. Ducts installed to riser poles are to be placed on the side of the pole away from traffic flow.

All duct connections shall be solvent welded (glued) as per duct manufacturer's recommendations.

#### 3.4.3 Concrete Encasement of Duct Structures

Duct banks shall be encased in a 100mm (4") concrete envelope on top and sides and 50mm (2") underneath, as per standard drawing No. UGS-013 and standard drawing No. UGS-014. Concrete shall have a design strength of 20 MPa (2900psi), 10mm (3/8") peastone, 80mm (3") slump and winter handling when required. Concrete shall be vibrated to ensure uniform encasement.

**All road crossings shall be reinforced with non prestressed 15mm (5/8") deformed steel reinforcing bars. Grade 400 and conforming with CSA C30.18 or latest version. Reinforcing bars shall be installed continuously, minimum 300mm overlap and tied, as per standard drawing No. UGS-014A or UGS-014B.**

### 3.4.4 Backfilling of Concrete Encased Duct Structures on Travelled Roadways

Roads Under the Jurisdiction of the City of Cambridge, the Township of North Dumfries, the Regional Municipality of Waterloo, the County of Brant, or the City of Brantford

Granular "A" backfill material compacted to 100% proctor density shall be used on travelled roadways. The material shall meet the requirements of Ontario provincial standard specification 501, dated November 2014, or latest revision. 150mm (6") wide red polyethylene warning tape(s) with the message, "Caution - Electric Line Buried Below", placed 450mm (18") below finished grade shall be installed continuously along the length of all road crossings.

## 3.5 Installation of Cables and Ducts

### 3.5.1 Excavation

Trenching for ducts shall typically be 1334mm (52.5") in depth. Trench width shall be 762mm (30") to allow adequate separation of cables. The trench bottom shall be undisturbed and reasonably level.

### 3.5.2 Placement of Ducts in Sandbedding

Ducts shall be placed on 150mm (6") sandbedding and covered with 150mm (6") of sand above the top of the duct. Ducts including street light shall be placed and evenly separated to minimize contact with other ducts as per standard drawing No. UGS-015. 100mm (4") duct (one cable per duct) is to be used for primary and secondary. Proper cable pulling equipment and procedures (ie. use of proper pulling lubricant, keeping tensions under maximum allowable, etc.) are to be used for all cable pulls. A 100mm (4") spare duct is to be installed in all trenches. In addition, one spare 100mm (4") duct is to be placed for each primary cable in the trench.

### 3.5.3 Cable Placement

No splices are permitted in any primary, secondary or street lighting cables. All cable ends shall be sealed with electrical coating and a cable cap.

i. Primary Cable

Primary cable shall be installed into enclosures and a 5m (16') coil of cable left for termination by GrandBridge Energy forces or the developer's contractor – see Section 1.10.2. Where primary cable runs from an overhead primary line to an underground transformer enclosure, the Developer shall install the cable up the pole 3m (10') and tie the cable off. The cable shall be placed on the side of the pole away from traffic flow. Sufficient cable shall be left coiled to reach the top of the pole.

ii. Secondary Cable

Secondary cable shall be installed from transformer enclosures to individual properties, as per standard drawings No. UGS-016 and UGS-017. An electronic marking disc shall mark the location of the service stub. The marking disc shall be placed flat, level, at least 150mm (6") above and directly over the service stub. A 3m (10') coil of cable shall

be left in the enclosure for termination by GrandBridge Energy forces or the developer's contractor – see Section 1.10.2.

iii. Cold Weather Installations

When the outside temperature falls below 0°C (32F), all cable installation must be witnessed by GrandBridge Energy's representative. Cable should be stored inside at a temperature above 0°C (32F) for a minimum of 24 hours prior to transportation to the site for installation. Once transported to the site, the cable is to be installed expediently into the open trench or ductbank and backfilled as per Section 3.5.5.

Cable installation may be discontinued if, at the discretion of GrandBridge Energy's representative, the cable's performance may be affected due to temperature or installation conditions.

When the outside temperature falls below -10°C (14F), cable installation shall be discontinued until such time as installation conditions are acceptable to the GrandBridge Energy representative.

Conforming to this installation practice does not relieve the developer of its obligations or responsibilities under the Development Agreement.

### 3.5.4 Installation of Secondary Service - Property Line to Meter Base

A minimum of 4 working days notice is required for the supply and installation of secondary services from lot line to meter base, including trenching and backfilling.

This portion of the electrical system is normally installed by the GrandBridge Energy contractor when the service installation is required for energization. However, if foundations have been backfilled, rough grading of the site has been completed to within 150mm (6") of finished grade, and the meter base has been securely attached to the foundation wall the developer may, at the GrandBridge Energy inspector's discretion, install the secondary service cable directly to the meter base as per standard drawing No. UGS-027 and UGS-027G. It is the Developer's responsibility to request the rebate applicable for these services.

### 3.5.5 Backfilling of Trench

After duct and sand envelope installation, cable trenches shall be backfilled with native earth backfill meeting the requirements of Ontario Provincial Standard Specification 501, dated November 2014, or latest revision. Compaction shall be to 98% Proctor Density. 150mm (6") wide red polyethylene warning tape(s) with the message, "Caution - Electric Line Buried Below", placed 450mm (18") below finished grade shall be installed continuously along the length of all trenches.

### 3.5.6 Cable Identification

Cables shall be identified by tagging in all enclosures and at point of termination as per standard drawing No. UGS-018.



### 3.5.7 Bell Ends

Bell ends shall be installed on all ducts in enclosures and vaults.

## 3.6 Installation of Street Lighting System

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards.

### 3.6.1 Street Lighting Poles

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards issued by the respective municipality.

### 3.6.2 Street Lighting Cable

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards issued by the respective municipality.

### 3.6.3 Cobra Head Luminaire

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards issued by the respective municipality.

### 3.6.4 Lamps for Luminaires

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards issued by the respective municipality.

### 3.6.5 Luminaire Control

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards issued by the respective municipality.

### 3.6.6 LED Streetlighting

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards issued by the respective municipality.

### 3.6.7 Grounding

For the City of Cambridge, the Township of North Dumfries, Brant County and the City of Brantford, the Developer should reference the latest revision of Development and Engineering Standards issued by the respective municipality.

### 3.6.8 Service Entrance Switch

ESA requirements specify a service entrance rated switch for each streetlight feed. This breaker enclosure is specified on drawing SLS-004. It shall be attached to the pole via an insert on the pole at least 3m above grade. Exposed ducts, wire, connector, and fuse holders shall be CSA approved. Installation and connections shall be completed as per applicable drawings SLS-003 and SLS-004. The 25.4mm (1") duct inside the pole containing the supply conductors shall separate the supply conductors from the load conductors.

## 3.7 Installation of Meter Bases

### 3.7.1 General

Meter bases shall be installed by the Developer at the location specified by GrandBridge Energy's representative. Meter bases shall be surface mounted as per standard drawing UGS-027 or UGS-027G. The height from finished grade to the centre of the meter base shall be 5'-0" +/-6". Installation is subject to inspection and approval by the Electrical Safety Authority.

A mark shall be painted on the foundation by the builder at the meter base location identifying the level of finished grade. This mark will allow the electrician to install the meter base at the correct height. It will also advise GrandBridge Energy if the meter base is installed at the wrong height prior to installation of the service wires. If the meter base is installed at the wrong height, the Developer will be responsible for raising/lowering it to the correct height.

Meter bases shall be as specified in Section 2.5 of this specification. Meter bases shall be securely attached to the wall to comply with the Ontario Electrical Code. All meter base face plates must be self supporting and securely clamped after installation.

The meter base shall be installed in accordance with drawings UGS-027 and UGS-027G. Note that the installation of the 2" rigid PVC conduit from the meter base to 2' below grade is the responsibility of the builder. Additional servicing charges may apply if this downpipe is improperly or not installed.

The Developer should contact GrandBridge Energy for installation through porch/recessed meter bases prior to installation.

### 3.7.2 Unit Numbering

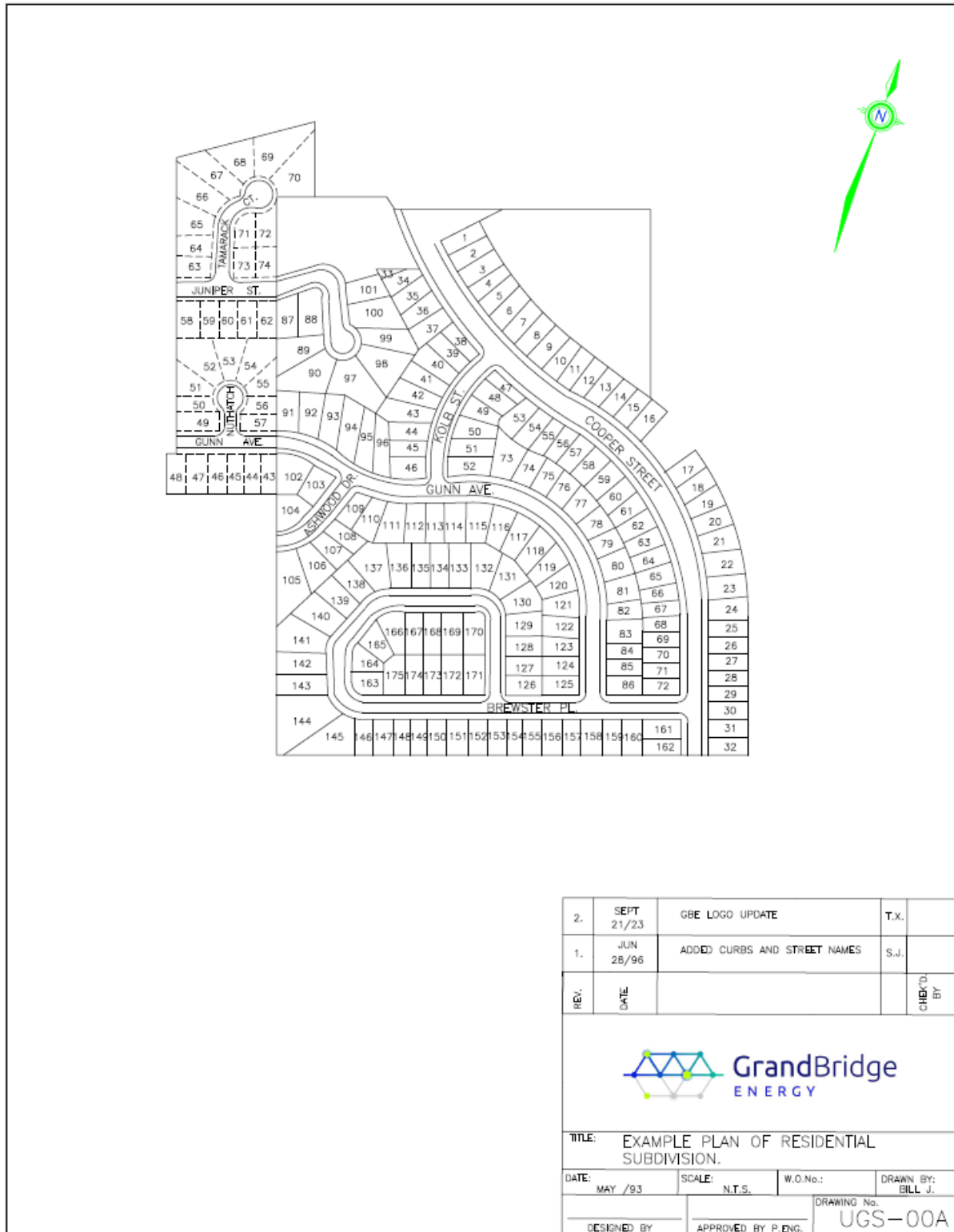
For multiple unit developments, the units, meter bases, and the unit main disconnect switches must have permanent unit numbers installed prior to the installation of any metering apparatus as per standard drawing No. MS-001.


## 3.8 Installation of Temporary Electrical Service

See Drawing UGS-030 for details regarding the installation of a temporary meter panel in subdivisions.

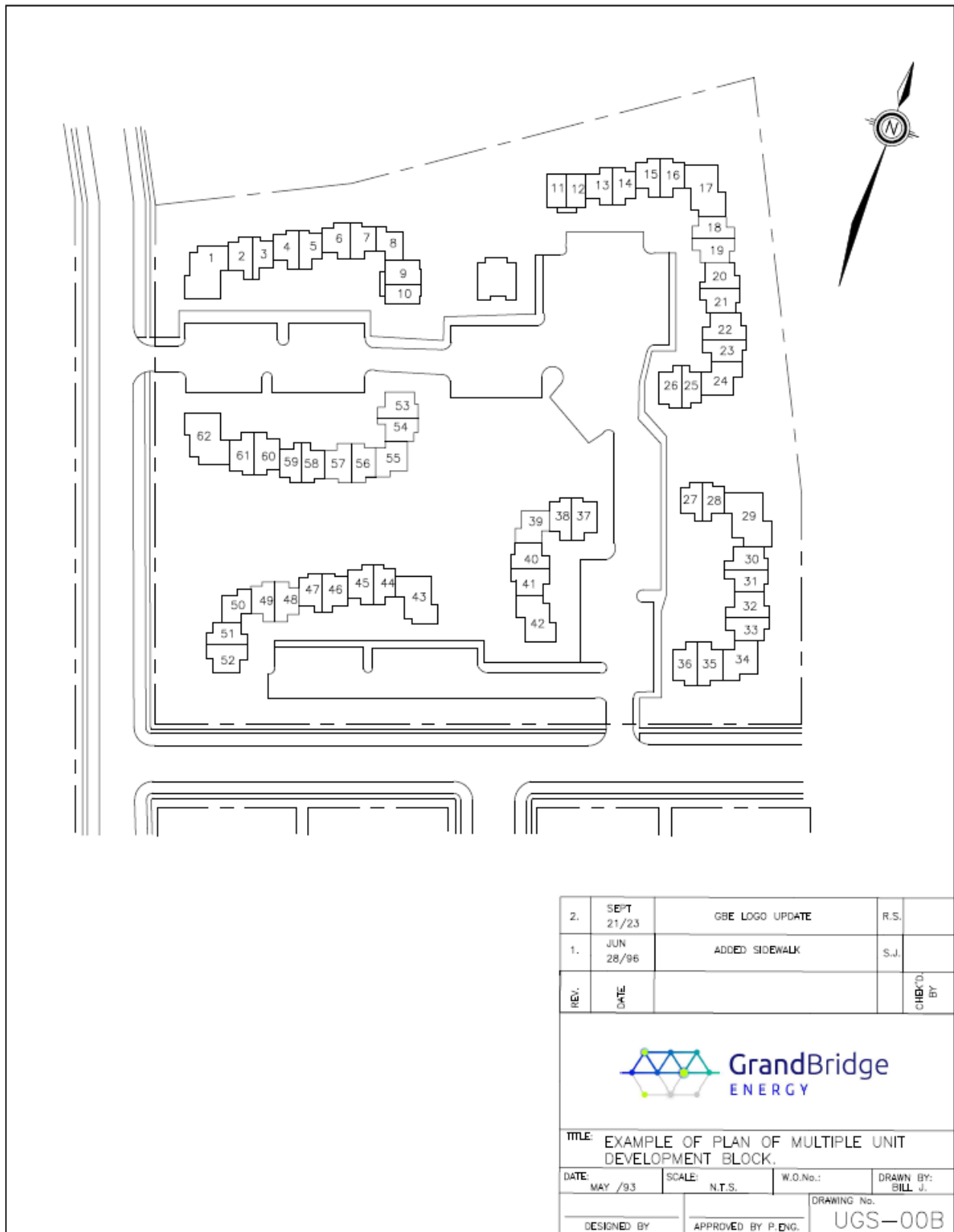
# 4 Drawings


## 4.1 UGS-000A: Example Plan of Residential Subdivision



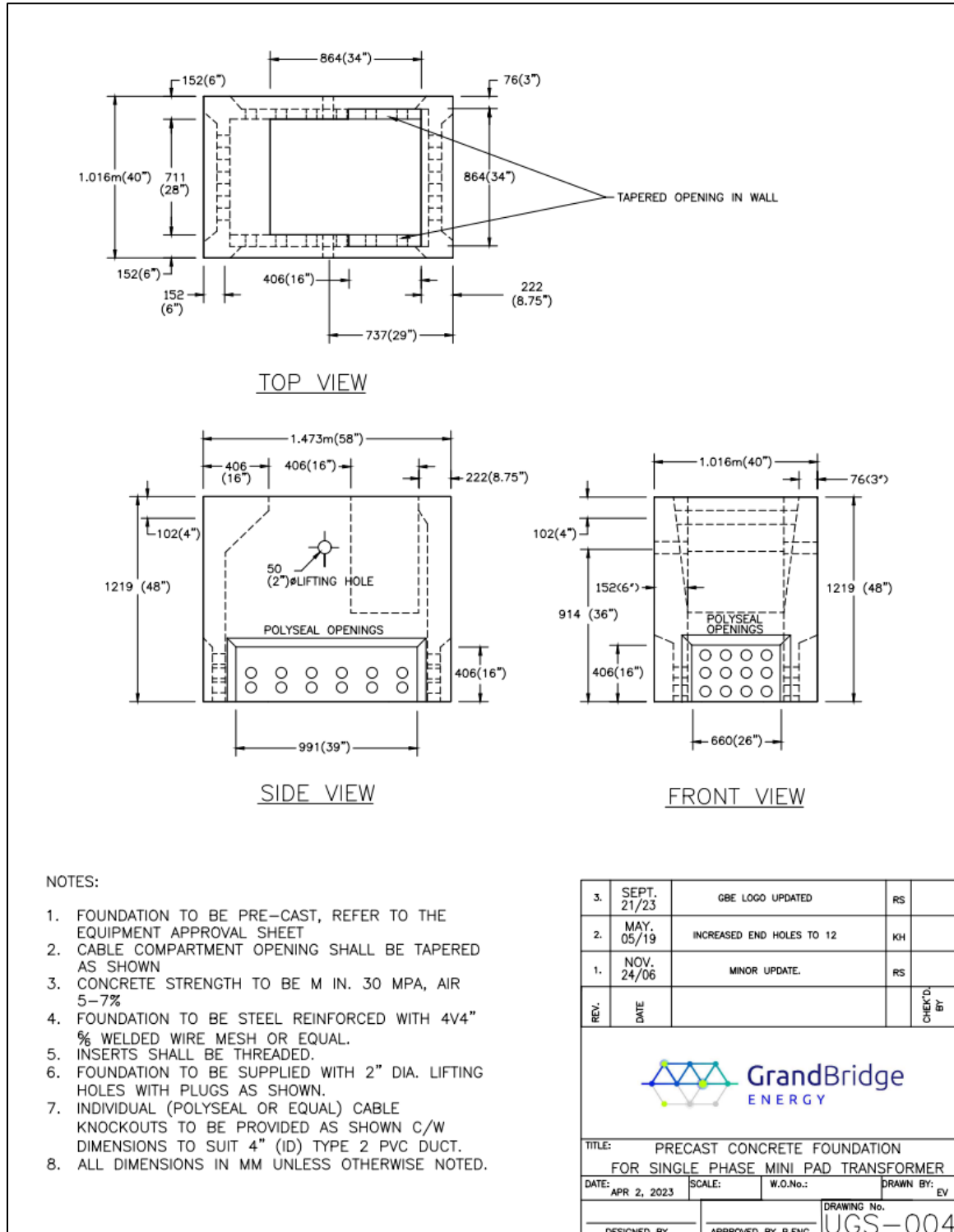
2.	SEPT 21/23	GBE LOGO UPDATE	T.X.
1.	JUN 28/96	ADDED CURBS AND STREET NAMES	S.J.
REV.	DATE		CHECK'D BY
			
TITLE: EXAMPLE PLAN OF RESIDENTIAL SUBDIVISION.			
DATE:	MAY /93	SCALE:	N.T.S.
		W.O.No.:	
		DRAWN BY:	EILL J.
DESIGNED BY:		APPROVED BY:	P.ENG.
			DRAWING No. UGS-00A

### 4.2 UGS-000B Example Plan of Multiple Unit Development Block

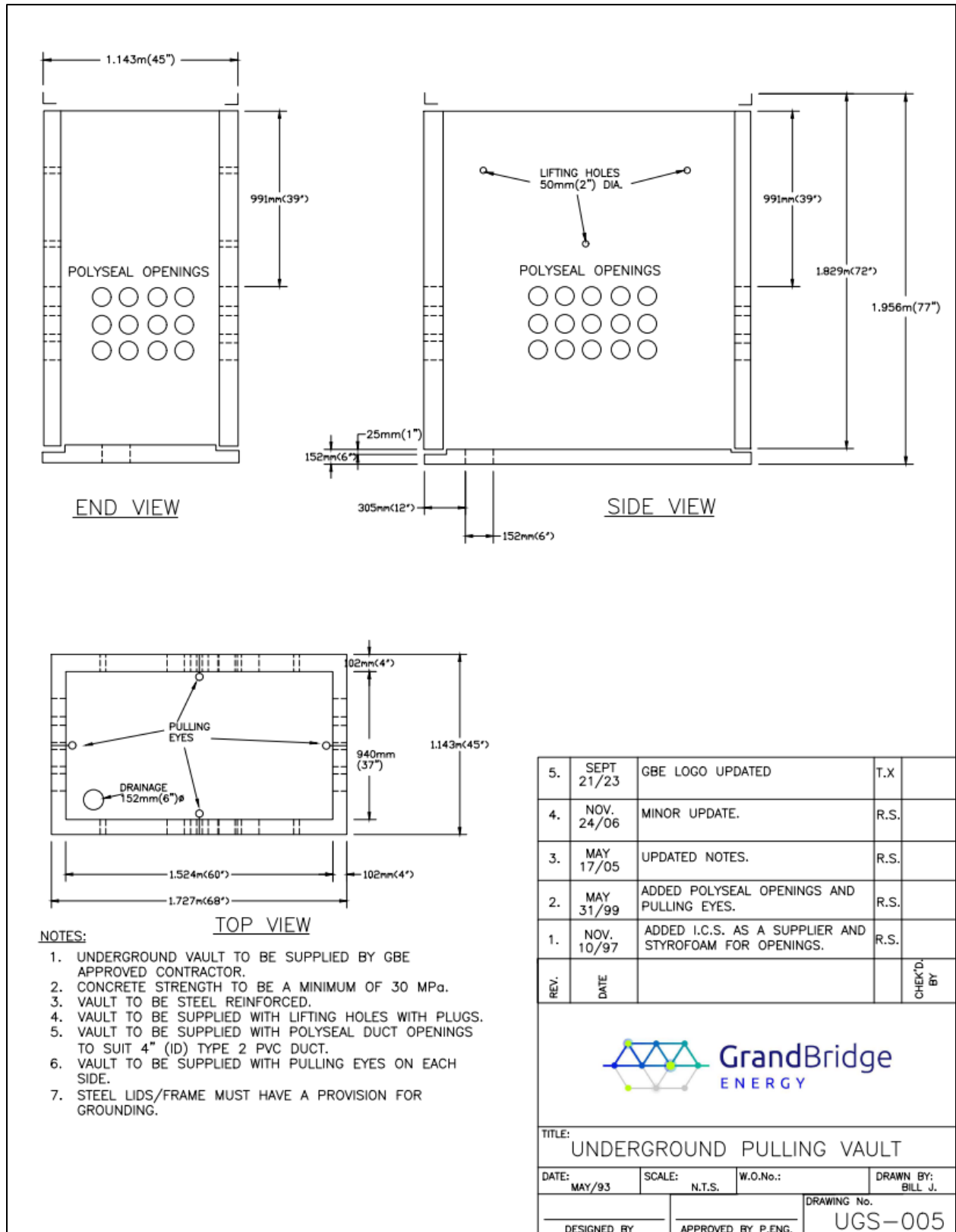


2.	SEPT 21/23	GBE LOGO UPDATE	R.S.	
1.	JUN 28/96	ADDED SIDEWALK	S.J.	
REV.	DATE			CHG'D BY
				
TITLE: EXAMPLE OF PLAN OF MULTIPLE UNIT DEVELOPMENT BLOCK.				
DATE:	MAY /93	SCALE:	N.T.S.	W.O.No.:
				DRAWN BY:
				EILL J.
				DRAWING No.
				UGS-00B
		DESIGNED BY	APPROVED BY P.ENG.	

### 4.3 UGS-004: Precast Concrete Enclosure for Single Phase Mini-pad Transformer



### 4.4 UGS-005: Precast Concrete Underground Vault



## 4.5 UGS-005B: Precast Concrete Lid for 68" x 45" Vault to Accept Mini-pad Transformer

TOP VIEW

SIDE VIEW

FRONT VIEW

**NOTE:**  
DIMENSIONS SHOWN ARE IN (mm)  
EXCEPT AS OTHERWISE NOTED.

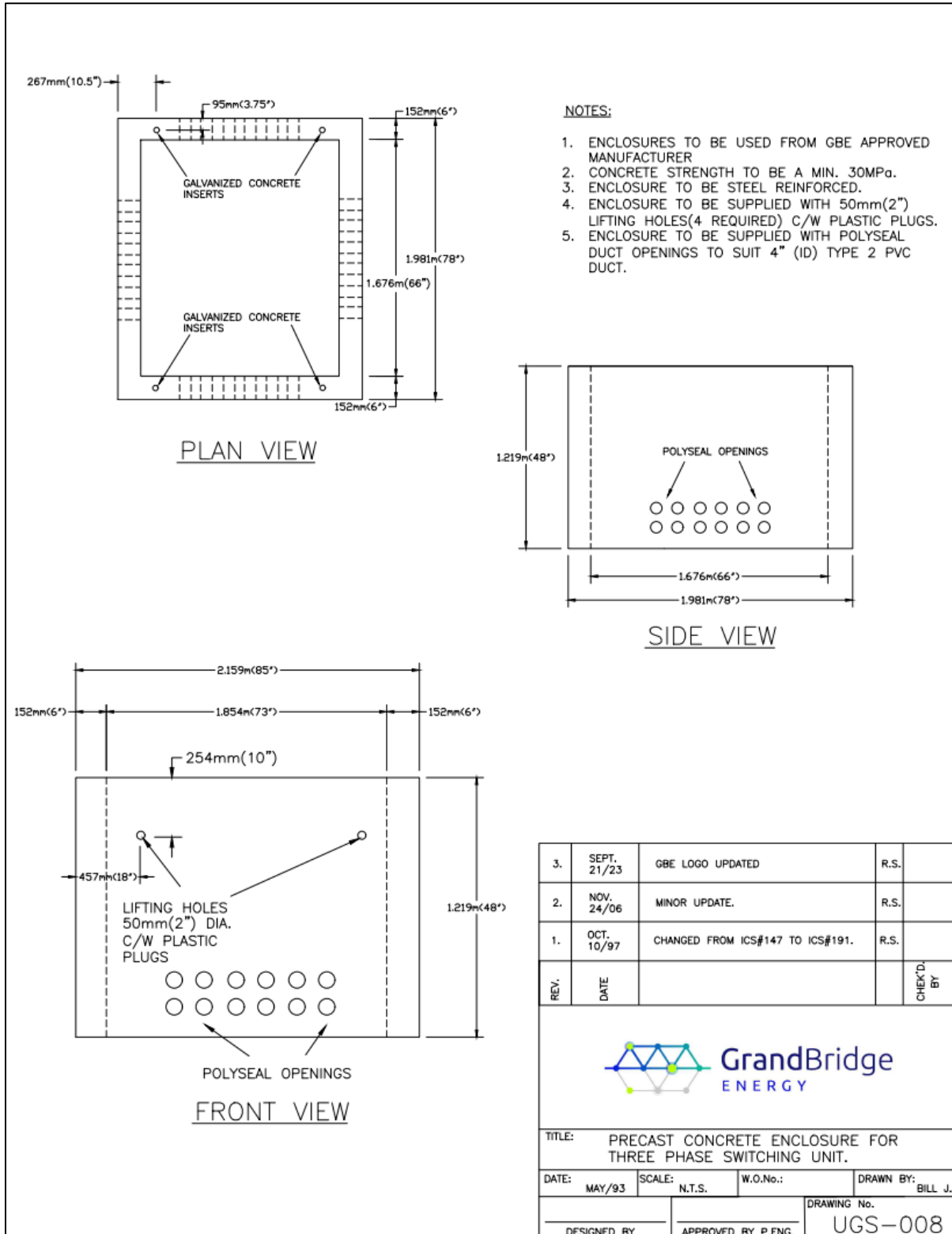
**NOTES:**

1. CONCRETE STRENGTH TO BE A MINIMUM OF 30MPa.
2. LID IS TO BE STEEL REINFORCED.
3. THIS LID IS USED INSTEAD OF METAL COVER PLATES FOR THE TOP OF A 68" X 45" PRECAST VAULT. FOR DETAILS OF PRECAST VAULT, SEE DRAWING UGS-005.
4. A SUITABLE MEANS OF LIFTING THE LID SHALL BE PROVIDED.

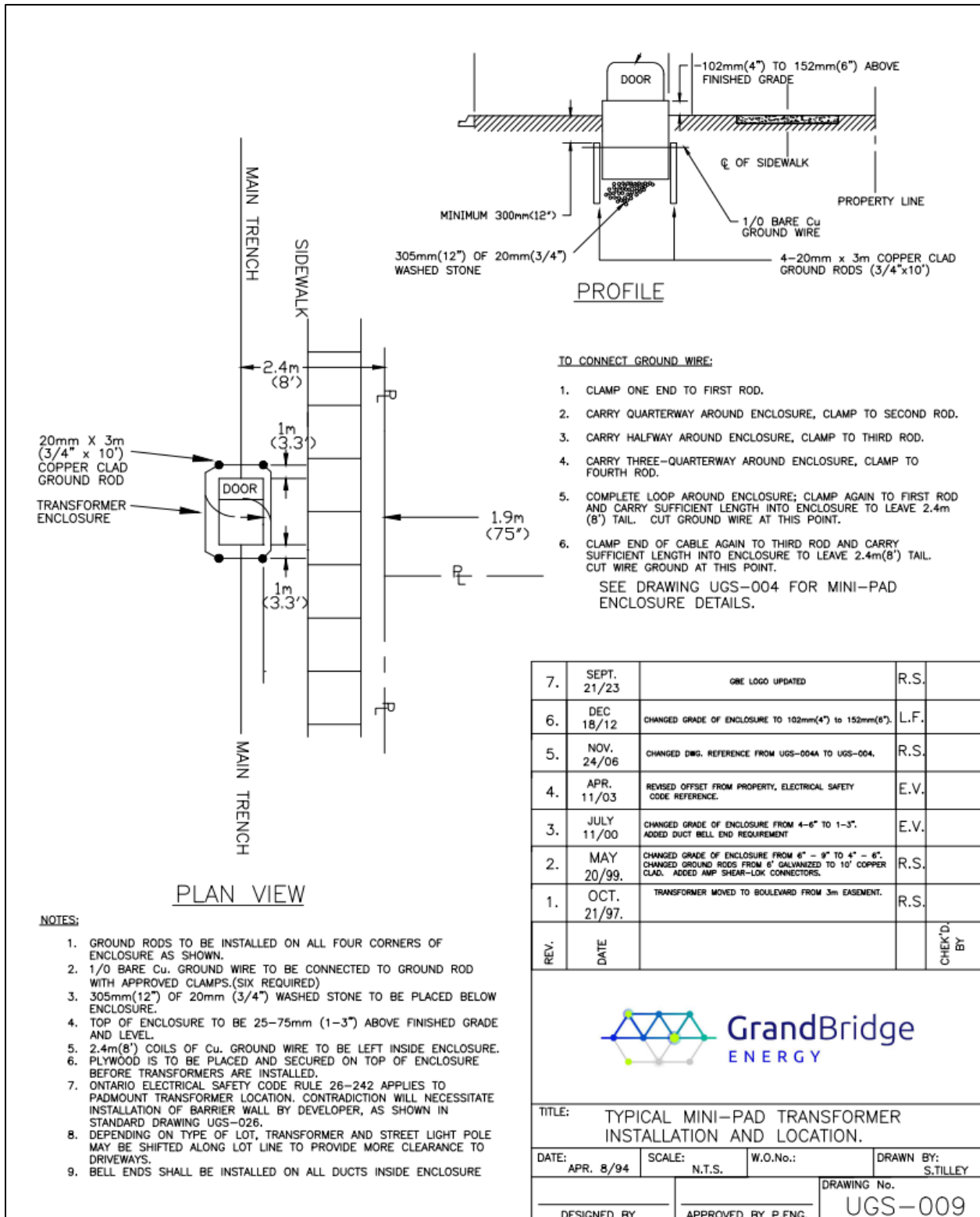
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REV.	DATE			CHECK'D BY
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DATE:	JAN/05	SCALE:	N.T.S.	W.O.No.:
				DRAWN BY: EV
DESIGNED BY			APPROVED BY P.ENG.	
				DRAWING No. UGS-005B



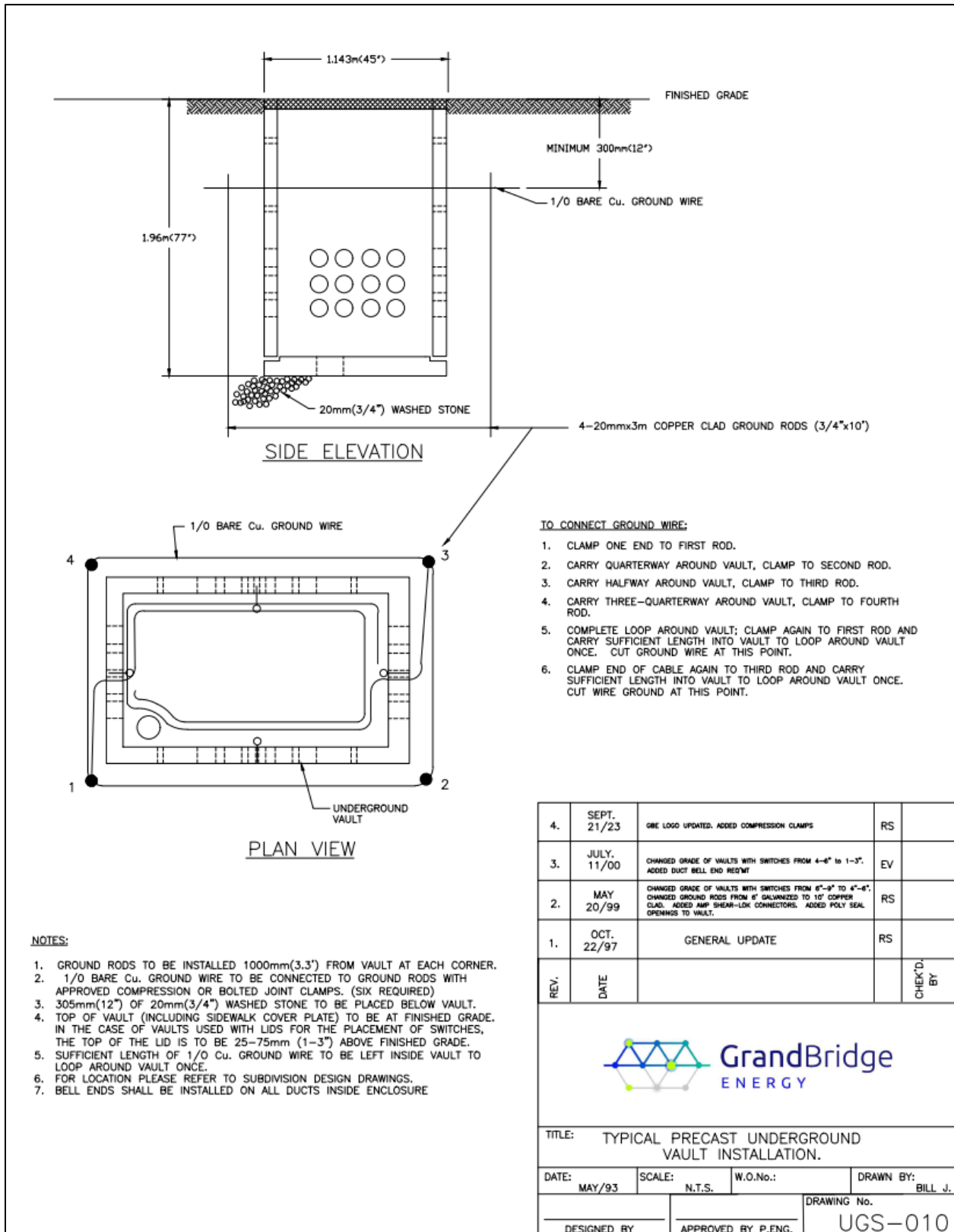
## 4.6 UGS-008: Precast Concrete Enclosure for Three Phase Switching Unit



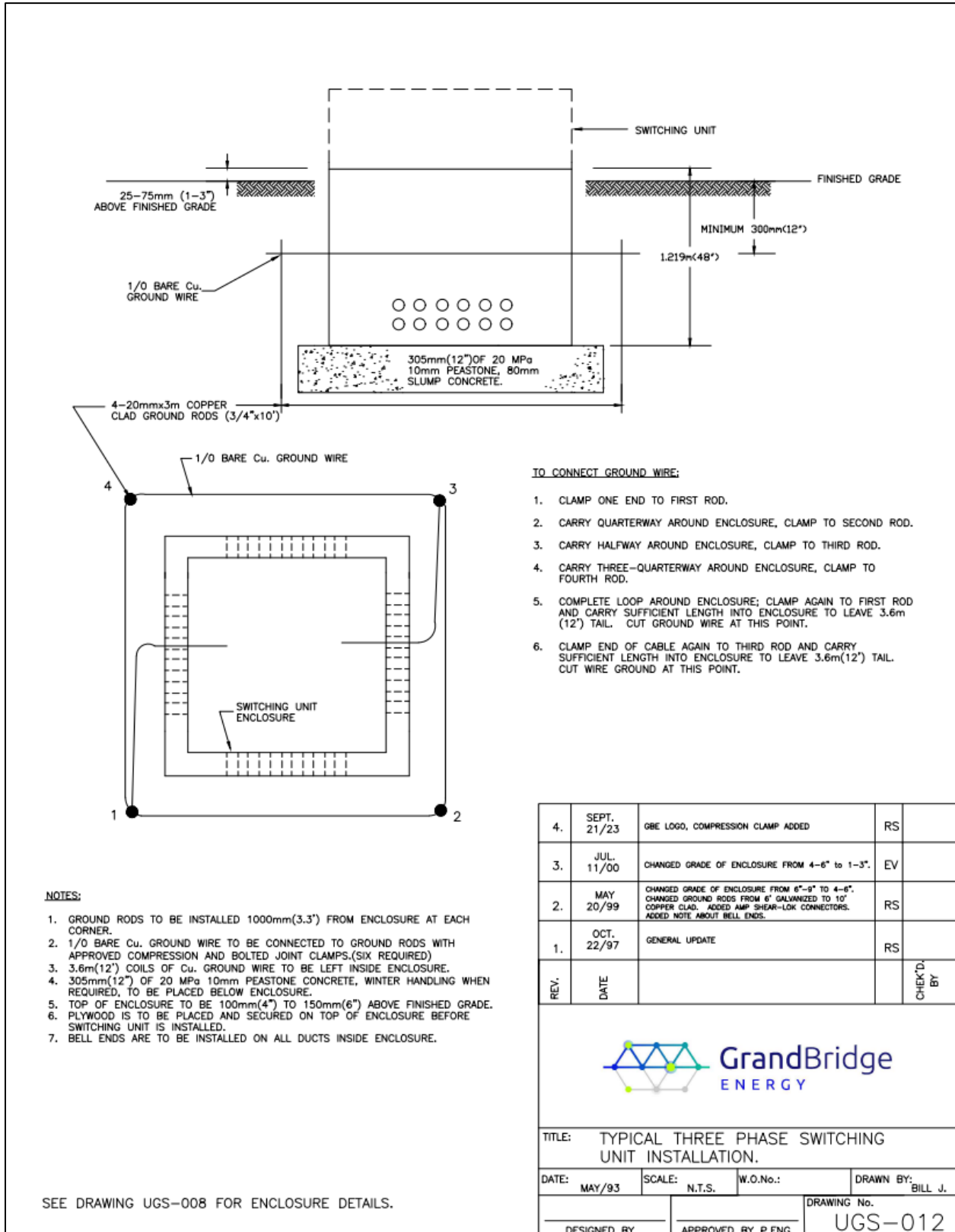
### 4.7 UGS-009: Typical Mini-pad Transformer Installation and Location



### 4.8 UGS-010: Typical Precast Underground Vault Installation



### 4.9 UGS-012: Typical Three Phase Switching Unit Installation



## 4.10 UGS-013: Hydro Crossing Under Roadway - Concrete Encased Duct Structure

### TYPICAL ROAD CROSSING DUCT STRUCTURE

**WARNING TAPE INFORMATION**

TRENCH WIDTH	# OF WARNING TAPES	TAPE PLACEMENT
UP TO 305mm (12")	1	CENTRED ON THE TRENCH.
GREATER THAN 305mm (12") UP TO AND INCLUDING 762mm (30")	2 (OR MORE)	PLACED NO MORE THAN 76mm (3") FROM THE SIDE OF THE TRENCH AND NOT MORE THAN 305mm (12") APART.
GREATER THAN 762mm (30")	3 (OR MORE)	PLACED NO MORE THAN 76mm (3") FROM THE SIDE OF THE TRENCH AND NOT MORE THAN 305mm (12") APART.

NOTE: THE TRENCH WIDTH EXCLUDES THE ADDED WIDTH FOR JOINT USE GAS LINE INSTALLATION (I.E. HYDRO PART OF TRENCH ONLY).

**NOTES:**

1. NUMBER OF 100mm(4") DUCTS MAY VARY AS TO THE NUMBER OF SERVICES CROSSING ROAD.
2. MAXIMUM OF ONE SECONDARY TRIPLEX CABLE PER 100mm(4") DUCT.
3. MAXIMUM OF ONE PRIMARY CABLE PER 100mm(4") DUCT.
4. MAXIMUM OF ONE STREET LIGHTING CABLE (3-#6 WIRES) PER 50mm(2") DUCT.
5. ONE SPARE 100mm (4") DUCT IS TO BE PLACED IN ALL ROAD CROSSINGS UNDER THE ROADWAY FROM 450mm (1.5') PAST EACH CURB. IN ADDITION, SPARE TRENCH DUCTS MAY PASS THROUGH THE ROAD CROSSING.
6. ALL HYDRO DUCTS TO BE ENCASED IN 100mm(4") ENVELOPE OF CONCRETE.
7. CONCRETE TO BE 20 MPa, 10mm PEASTONE, 80mm SLUMP. WINTER HANDLING WHEN REQUIRED.
8. SEE DRAWING No. UGS-014 FOR OTHER VARIATIONS OF CONCRETE ENCASED DUCTS.
9. CITY OF CAMBRIDGE AND TOWNSHIP OF NORTH DUMFRIES – MIN. 914mm (36") TO THE TOP OF CONCRETE.  
BRANT COUNTY – MIN. 1000mm (39") TO MOST SHALLOW UTILITY (I.E. BELL, ROGERS, HYDRO) (GAS IS NOT JOINT USE).  
CITY OF BRANTFORD – MIN. 900mm (36") TO MOST SHALLOW UTILITY (I.E. BELL, ROGERS, HYDRO) (GAS IS NOT JOINT USE).  
FOLLOW OHSA FOR TRENCH DEPTHS/SHORING ETC.

7.	SEPT. 21/23	GBE LOGO UPDATED	RS
6.	JAN. 12/18	REVISED MINIMUM COVER FOR ADDITION OF BRANT COUNTY AND CITY OF BRANTFORD.	STW
5.	NOV. 24/06	ADDED WARNING TAPE INFORMATION. REMOVED FLOWABLE FILL FOR REGION.	RS
4.	APR. 11/03	Revised power cable configuration installation	EV
3.	MAY 10/00	ADDED JOINT USE TRENCH WITH GAS.	RS
2.	MAY 20/99	MINOR UPDATE.	RS
1.	OCT. 22/97	GENERAL UPDATE	RS
REV.	DATE		CHEK'D. BY

**GrandBridge**  
ENERGY

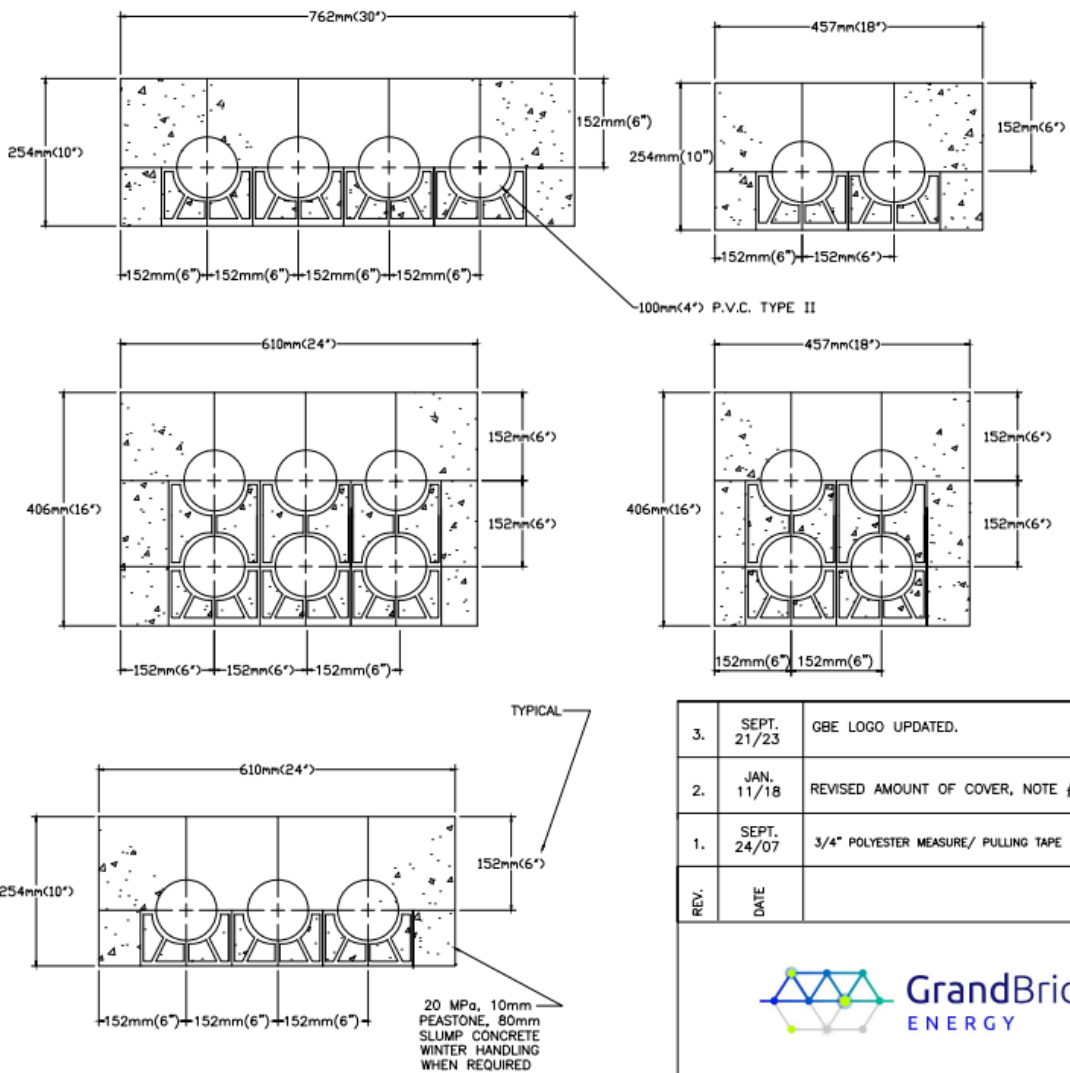
TITLE: HYDRO CROSSING UNDER ROADWAY-  
CONCRETE ENCASED DUCT STRUCTURE.

DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: BILL J.
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS-013	

### 4.11 UGS-014: Typical Concrete Encased Duct Structure

**NOTES**

1. DUCT BANK TO HAVE COVER AS SPECIFIED ON DRAWINGS UGS-013 & UGS-015 & TO BE GRADED TOWARDS THE CURB.
2. DUCT TO BE 100mm(4") TYPE II P.V.C.
3. ALL DUCT CONNECTIONS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS.
4. ENDS OF DUCTS TO BE CAPPED & MARKED WITH MARKING DISC.
5. CONCRETE TO BE 20MPa, 10mm PEASTONE, 80mm SLUMP.
6. ALL DUCTS TO BE ENCASED WITH MIN. 100mm(4") CONCRETE.
7. ALL BOTTOM DUCTS TO HAVE A MIN. 50mm(2") CONC. UNDERNEATH.
8. SPACERS TO BE PLACED UNDER EACH DUCT LAYER WITH MAX. CENTRE TO CENTRE DISTANCE OF 3m(10').
9. DUCT JOINTS TO BE STAGGERED A MIN. OF 152mm(6") & LOCKED WITH AN APPROVED COUPLING.
10. BELL ENDS ARE TO BE USED FOR EACH TERMINATION IN PULLING PITS OR CONCRETE ENCLOSURES.
11. EACH DUCT TO BE CLEANED & 3/4", 2,500 Lbs. POLYESTER MEASURE/PULLING TAPE INSTALLED CONTINUOUSLY – (DO NOT TIE TAPE END TO END OR KNOT TOGETHER).
12. WIRE BANDING SHALL BIND DUCTS & SPACERS EVERY 3m(10'). DUCT BANK IS TO BE ANCHORED TO PREVENT FLOATING.



3.	SEPT. 21/23	GBE LOGO UPDATED.	RS
2.	JAN. 11/18	REVISED AMOUNT OF COVER, NOTE #1.	RS
1.	SEPT. 24/07	3/4" POLYESTER MEASURE/ PULLING TAPE	RS
REV.	DATE		CHECK'D. BY



TITLE: TYPICAL CONCRETE ENCASED DUCT STRUCTURE

DATE: MAY/93 SCALE: N.T.S. W.O.No.: DRAWN BY: S. TILLEY

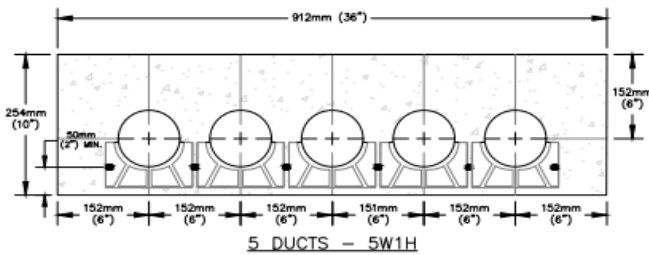
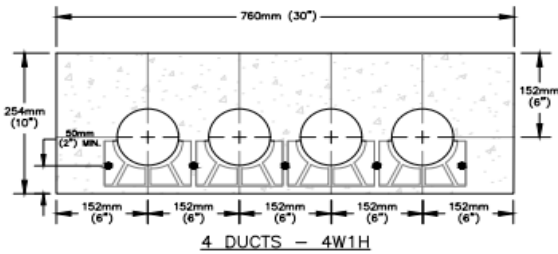
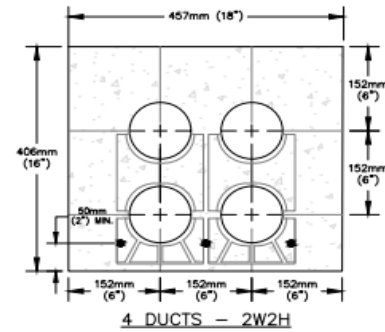
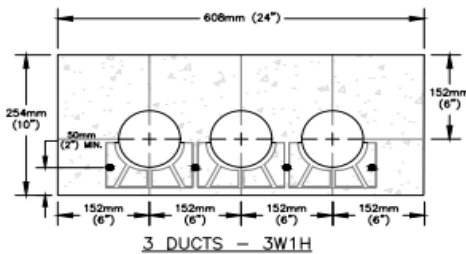
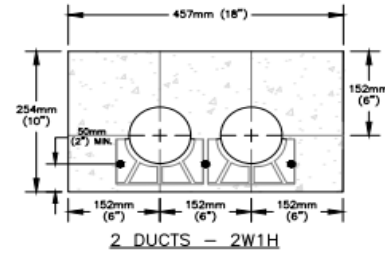
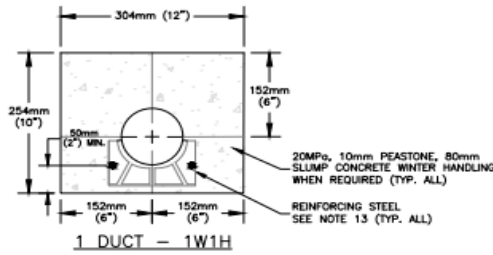
DESIGNED BY: APPROVED BY P.ENG. DRAWING No. UGS-014



## 4.12 UGS-014A: Typical Concrete Encased Duct Structures with Reinforcement – 1 to 5 Ducts

**NOTES**

1. DUCT BANK TO HAVE COVER AS SPECIFIED ON DRAWINGS UGS-013 & UGS-015 & TO BE GRADED TOWARDS THE CURB.
2. DUCT TO BE 100mm(4") DB2/ES2 TYPE II PVC PER CSA 22.2 NO.211.1 (LATEST REVISION)
3. ALL DUCT CONNECTIONS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS. WAIT MINIMUM 30 MINUTES BEFORE POURING CONCRETE AFTER APPLYING SOLVENT.
4. ENDS OF DUCTS TO BE CAPPED & MARKED WITH MARKING DISC.
5. CONCRETE TO BE 20MPa, 10mm PEASTONE, 80mm SLUMP.
6. ALL DUCTS TO BE ENCASED WITH MIN. 100mm(4") CONCRETE.
7. ALL BOTTOM DUCTS TO HAVE A MIN. 50mm(2") CONC. UNDERNEATH.
8. SPACERS TO BE PLACED UNDER EACH DUCT LAYER WITH MAX. CENTER TO CENTER DISTANCE OF 3.0m (10').
9. DUCT JOINTS TO BE STAGGERED A MIN. OF 152mm(6") & LOCKED WITH AN APPROVED COUPLING.
10. BELL ENDS ARE TO BE USED FOR EACH TERMINATION IN PULLING PITS OR CONCRETE ENCLOSURES.
11. EACH DUCT TO BE CLEANED & 3/4", 2,500 Lbs. POLYESTER MULE/PULLING TAPE INSTALLED CONTINUOUSLY – (DO NOT TIE TAPE END TO END OR KNOT TOGETHER).
12. CABLE TIES SHALL BIND DUCTS & SPACERS EVERY 2.0m (6"). DUCT BANK IS TO BE ANCHORED TO PREVENT FLOATING.
13. DUCTBANK SHALL BE REINFORCED WITH NON PRE-STRESSED 15mm (5/8") DEFORMED STEEL REINFORCING BARS. GRADE 400 AND CONFORMING WITH C.S.A. G30.18 (LATEST REVISION). REINFORCING BARS SHALL BE INSTALLED CONTINUOUSLY, MINIMUM 300mm OVERLAP AND TIED.



0	JUN. 23/15	ADD REINFORCEMENT BARS TO STANDARD DETAIL	SF
TITLE: TYPICAL CONCRETE ENCASED DUCT STRUCTURES WITH REINFORCEMENT – 1 TO 5 DUCTS			
DATE: JUNE/23	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S. FREIHAUT
DESIGNED BY: S. FREIHAUT	APPROVED BY: P.Eng. <i>[Signature]</i>	DRAWING No. UGS-014-A	

## 4.13 UGS-014B: Typical Concrete Encased Duct Structures with Reinforcement – 6 to 12 Ducts

**NOTES**

1. DUCT BANK TO HAVE COVER AS SPECIFIED ON DRAWINGS UGS-013 & UGS-015 & TO BE GRADED TOWARDS THE CURB.
2. DUCT TO BE 100mm(4") DB2/ES2 TYPE II PVC PER CSA 22.2 NO.211.1 (LATEST REVISION)
3. ALL DUCT CONNECTIONS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS. WAIT MINIMUM 30 MINUTES BEFORE POURING CONCRETE AFTER APPLYING SOLVENT.
4. ENDS OF DUCTS TO BE CAPPED & MARKED WITH MARKING DISC.
5. CONCRETE TO BE 20MPa, 10mm PEASTONE, 80mm SLUMP.
6. ALL DUCTS TO BE ENCASED WITH MIN. 100mm(4") CONCRETE.
7. ALL BOTTOM DUCTS TO HAVE A MIN. 50mm(2") CONC. UNDERNEATH.
8. SPACERS TO BE PLACED UNDER EACH DUCT LAYER WITH MAX. CENTER TO CENTER DISTANCE OF 3.0m (10').
9. DUCT JOINTS TO BE STAGGERED A MIN. OF 152mm(6") & LOCKED WITH AN APPROVED COUPLING.
10. BELL ENDS ARE TO BE USED FOR EACH TERMINATION IN PULLING PITS OR CONCRETE ENCLOSURES.
11. EACH DUCT TO BE CLEANED & 3/4", 2,500 Lbs. POLYESTER MULE/PULLING TAPE INSTALLED CONTINUOUSLY – (DO NOT TIE TAPE END TO END OR KNOT TOGETHER).
12. CABLE TIES SHALL BIND DUCTS & SPACERS EVERY 2.0m (6"). DUCT BANK IS TO BE ANCHORED TO PREVENT FLOATING.
13. DUCTBANK SHALL BE REINFORCED WITH NON PRE-STRESSED 15mm (5/8") DEFORMED STEEL REINFORCING BARS. GRADE 400 AND CONFORMING WITH C.S.A. G30.18 (LATEST REVISION). REINFORCING BARS SHALL BE INSTALLED CONTINUOUSLY, MINIMUM 300mm OVERLAP AND TIED.

**6 DUCTS – 3W2H**

**6 DUCTS – 6W1H**

**8 DUCTS – 4W2H**

**10 DUCTS – 5W2H**

**12 DUCTS – 6W2H**

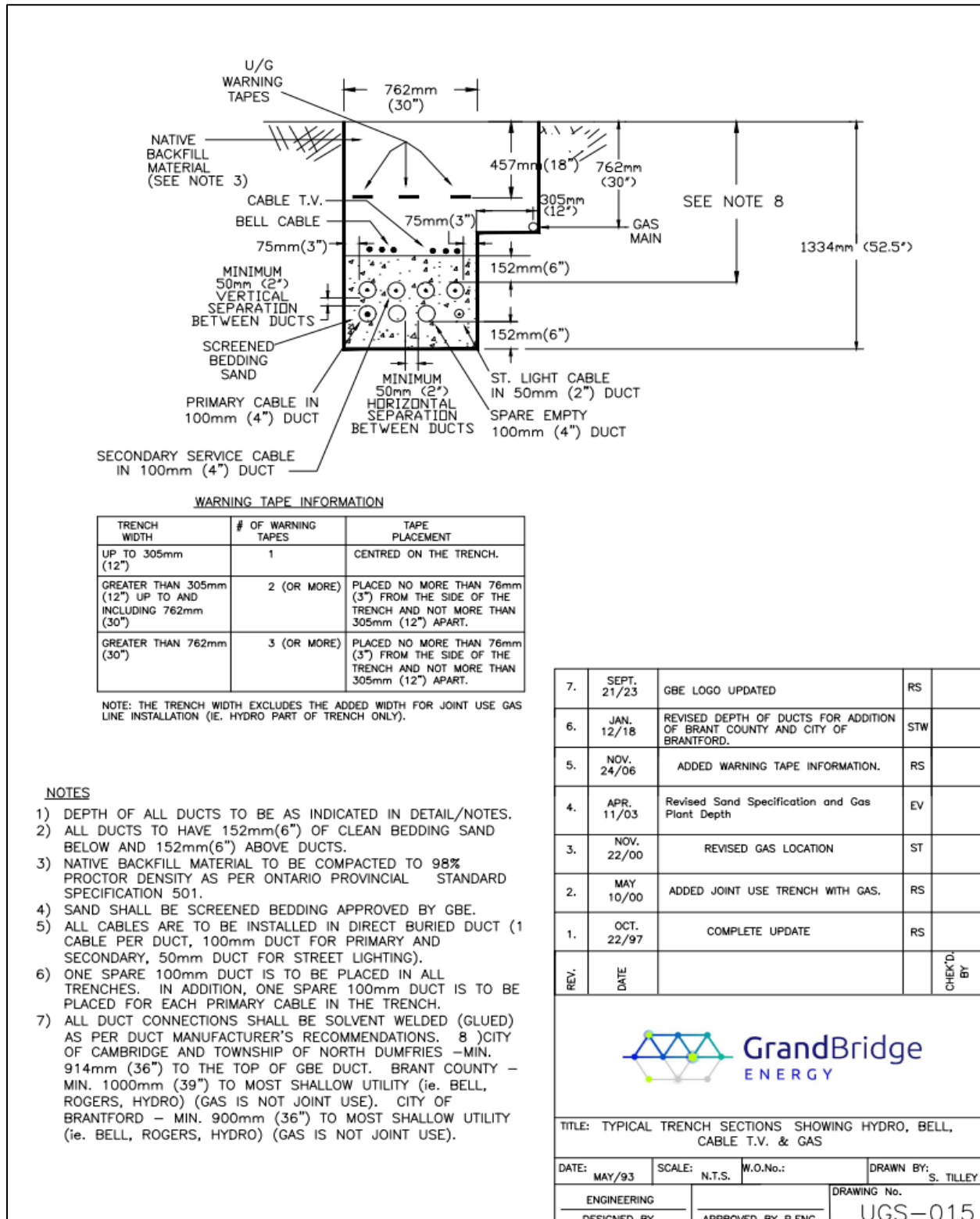
20MPa, 10mm PEASTONE, 80mm SLUMP CONCRETE WINTER HANDLING WHEN REQUIRED (TYP. ALL)

REINFORCING STEEL SEE NOTE 13 (TYP. ALL)

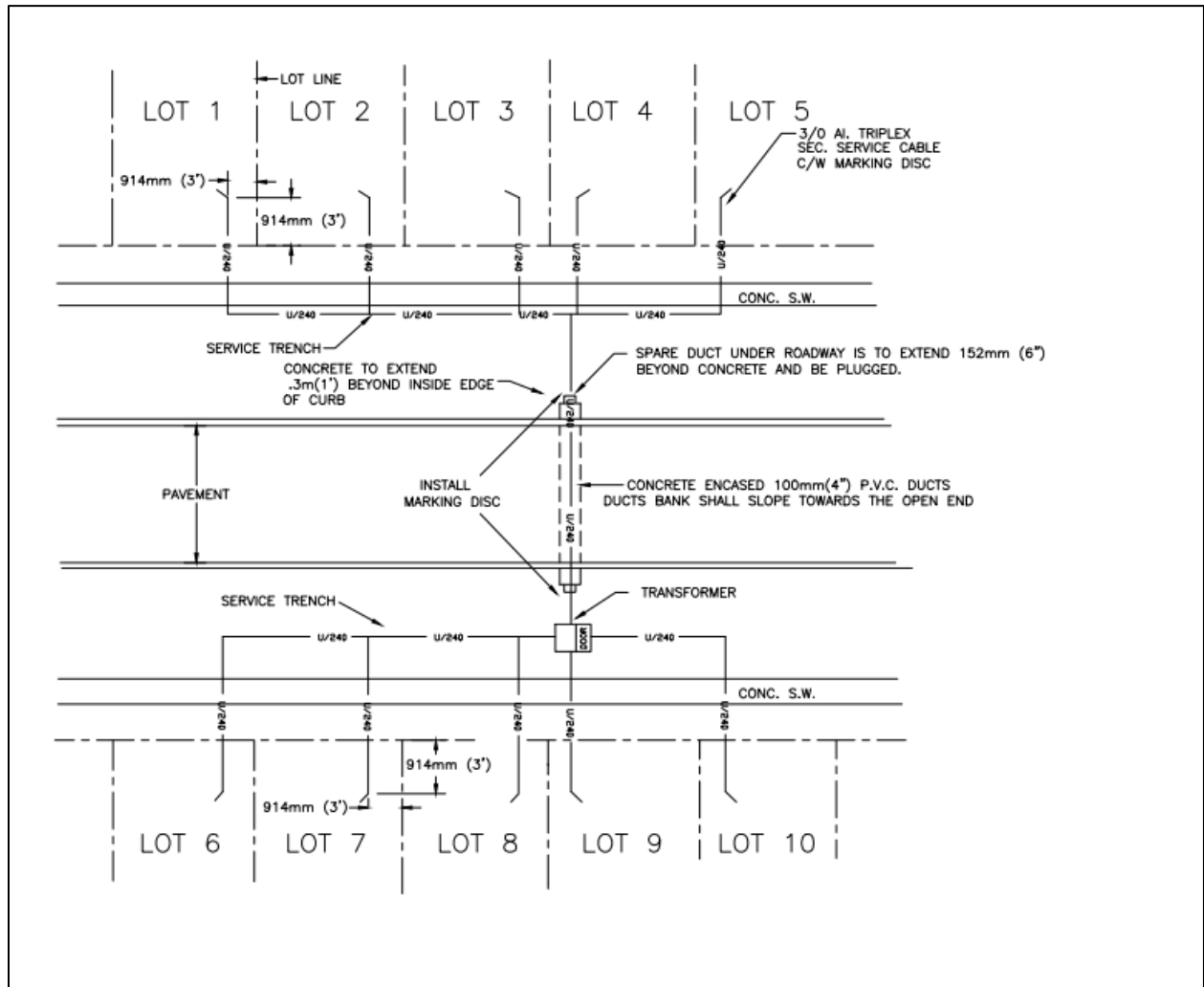
0	JUN. 23/15	ADD REINFORCEMENT BARS TO STANDARD DETAIL	SF
TITLE: TYPICAL CONCRETE ENCASED DUCT STRUCTURES WITH REINFORCEMENT – 6 TO 12 DUCTS			
DATE: JUNE/23	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S. FREIHAUT
DESIGNED BY: S. FREIHAUT	APPROVED BY P.ENG. <i>[Signature]</i>	DRAWING No. UGS-014-B	



### 4.14 UGS-015: Typical Trench Sections, showing Hydro, Bell, Cable T.V. and Gas, Rev.6



### 4.15 UGS-016: Typical Servicing Layout



**NOTES**

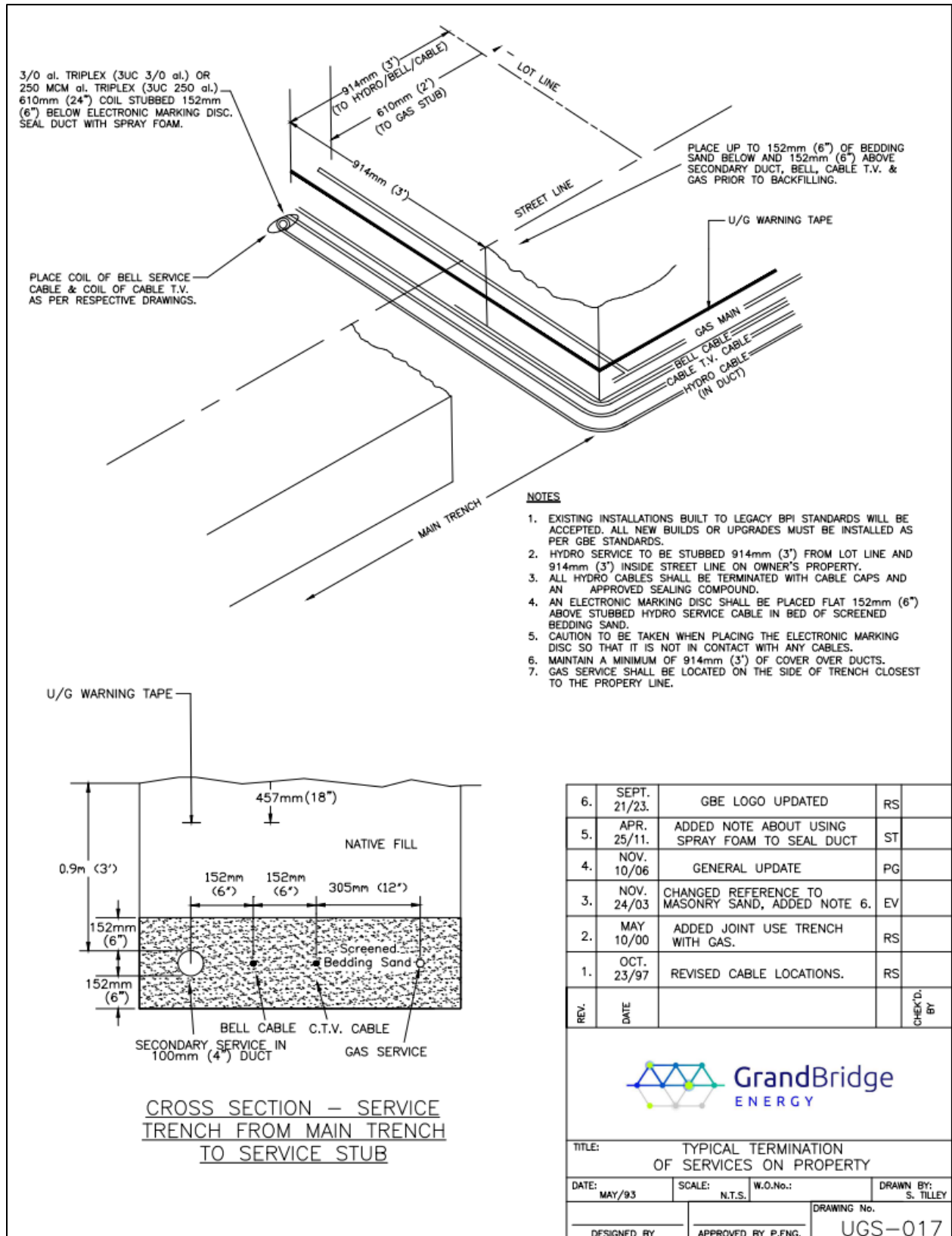
- 1) CONCRETE ENCASED DUCTS TO CROSS ROAD AT RIGHT ANGLES TO THE CURB, DUCTS BANK SHALL SLOPE TOWARDS THE OPEN END
- 2) CONCRETE STRENGTH 20MPa, 10mm PEASTONE & 80mm SLUMP. WINTER HANDLING WHEN REQUIRED.
- 3) DUCT STRUCTURE TO HAVE A MINIMUM OF 914mm (3') DEPTH (MEASURED FROM THE TOP OF THE DUCT STRUCTURE TO THE FINISH GRADE).
- 4) SPARE DUCTS TO HAVE 6mm (1/4") POLYPROPYLENE PULL ROPE INSTALLED AND BE PLUGGED.
- 5) ENDS OF SERVICE CABLES AND DUCTBANKS TO BE MARKED WITH AN ELECTRONIC MARKING DISC.

3.	SEPT. 21/23	GBE LOGO, SPECS UPDATED	RS	
2.	APR. 11/03	REMOVED REFERENCE TO OFFSETS.	EV	
1.	OCT. 23/97	MOVED TRANSFORMER OUT TO BOULEVARD.	RS	
REV.	DATE			CHECK'D. BY

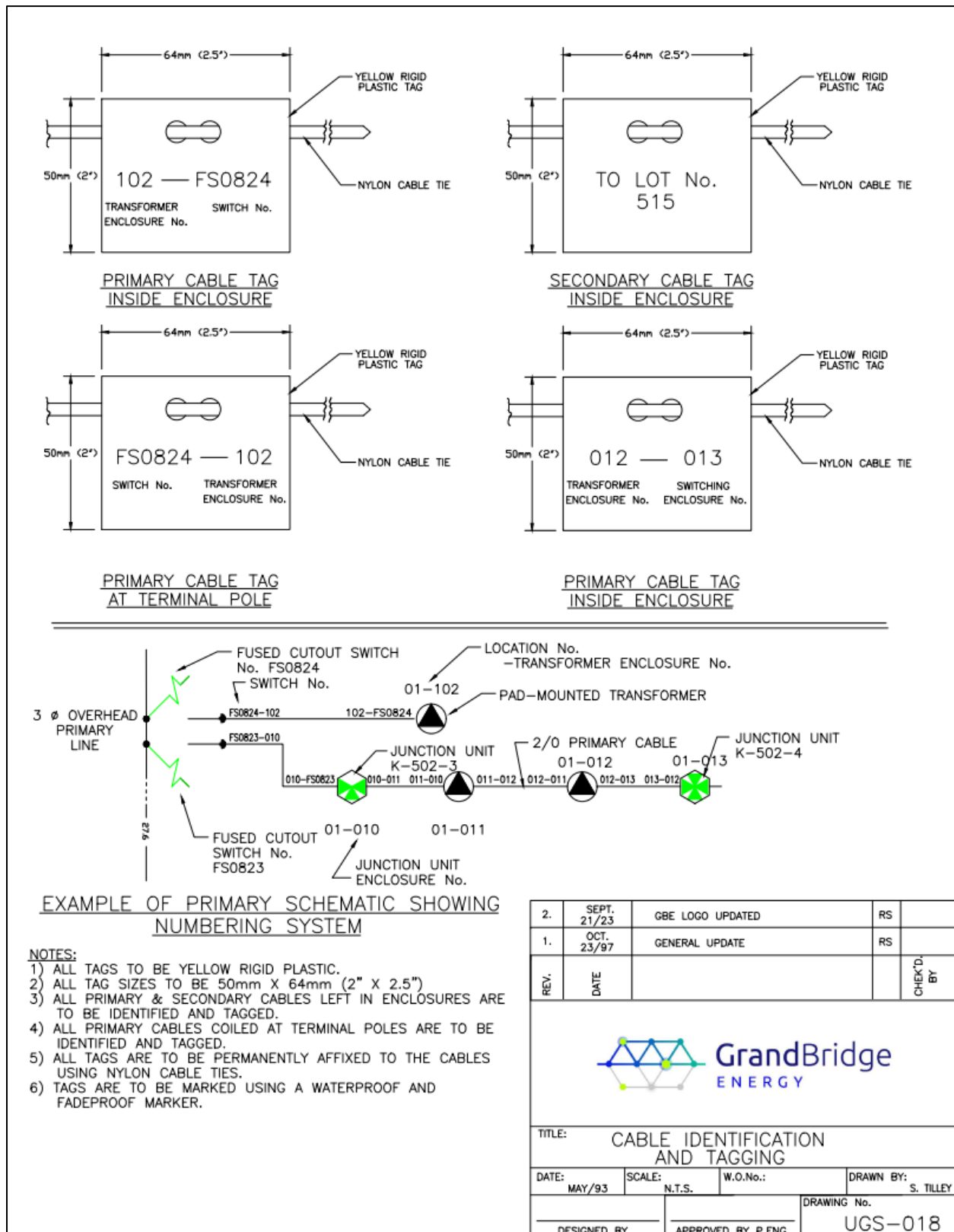


TITLE: TYPICAL SERVICING LAYOUT.			
DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S. TILLEY
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS-016	

### 4.16 UGS-017: Typical Termination of Services on Property



### 4.17 UGS-018: Cable Identification and Tagging



# 4.18 UGS-026: Timber Barrier Wall for Single Phase Transformer Enclosure

TOP VIEW

40" X 58" TRANSFORMER ENCLOSURE

**MATERIAL LIST**

1) TIMBER - 6"x6" PRESSURE TREATED  
 4-16' LENGTHS  
 1-12' LENGTH

CUT 1-16' INTO 3-5'-3" LENGTHS  
 1-16' INTO 3-4'-4" LENGTHS + 1-2'-9" LENGTH  
 1-16' INTO 1-4'-4" + 2-3'-5" + 1-2'-9" + 1-2'-0" LENGTH  
 1-16' INTO 2-3' + 3-2' + 4-1' LENGTH  
 1-12' INTO 1-5'-3" + 2-3'-0" LENGTH

**NOTES**

- 1) ALL TIMBER TO BE BEST CONSTRUCTION GRADE JACK OR RED PINE PRESSURE TREATED WITH PRESSURE TREAT OR EQUAL.
- 2) TIMBER EDGING TO BE INSTALLED LEVEL, TRUE & SQUARE.
- 3) ALL NAILS TO BE HOT DIPPED GALVANIZED.
- 4) CUT TIMBER ENDS TO BE TREATED WITH 2 COATS PENTOX OR EQUIVALENT.

SIDE VIEW

END VIEW

COMPACTED GRANULAR A

ALL 6" X 6" TIMBERS TO BE SPIKED WITH 2-10" GALVANIZED SPIKES EVERY 2'-6" C.C. OR AS REQUIRED.

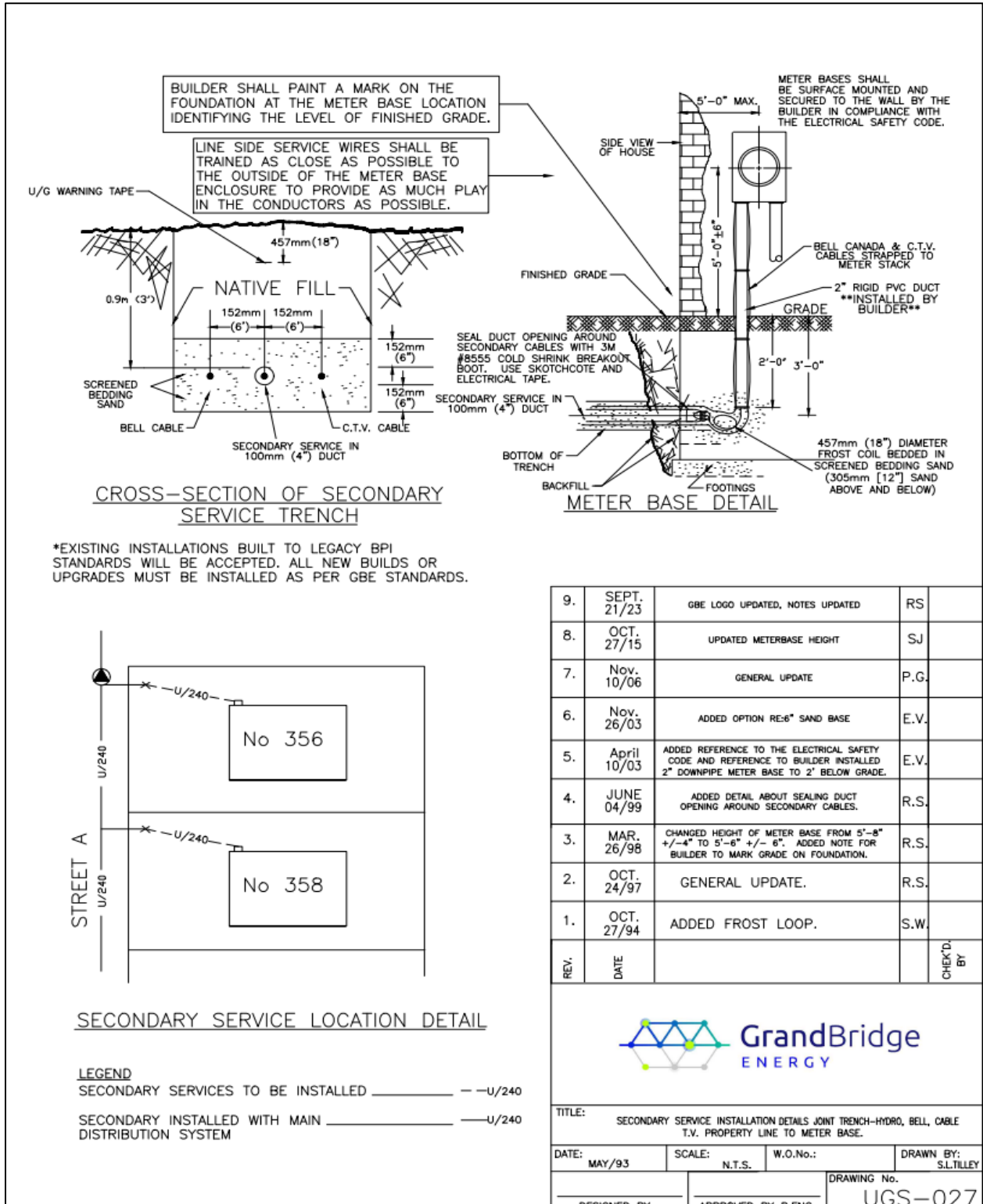
2.	SEPT. 21/23	GBE LOGO UPDATED	RS
1.	JUL 02/06	ROTATED AND REARRANGED DRAWING	SJ
REV.	DATE		CHECKED BY

**TITLE:** 6" X 6" PRESSURE TREATED TIMBER BARRIER WALL FOR 1Ø TRANSFORMER ENCLOSURE.

DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S.J.TILLEY
DESIGNED BY:	APPROVED BY: P.F.P.	DRAWING No. UGS-026	

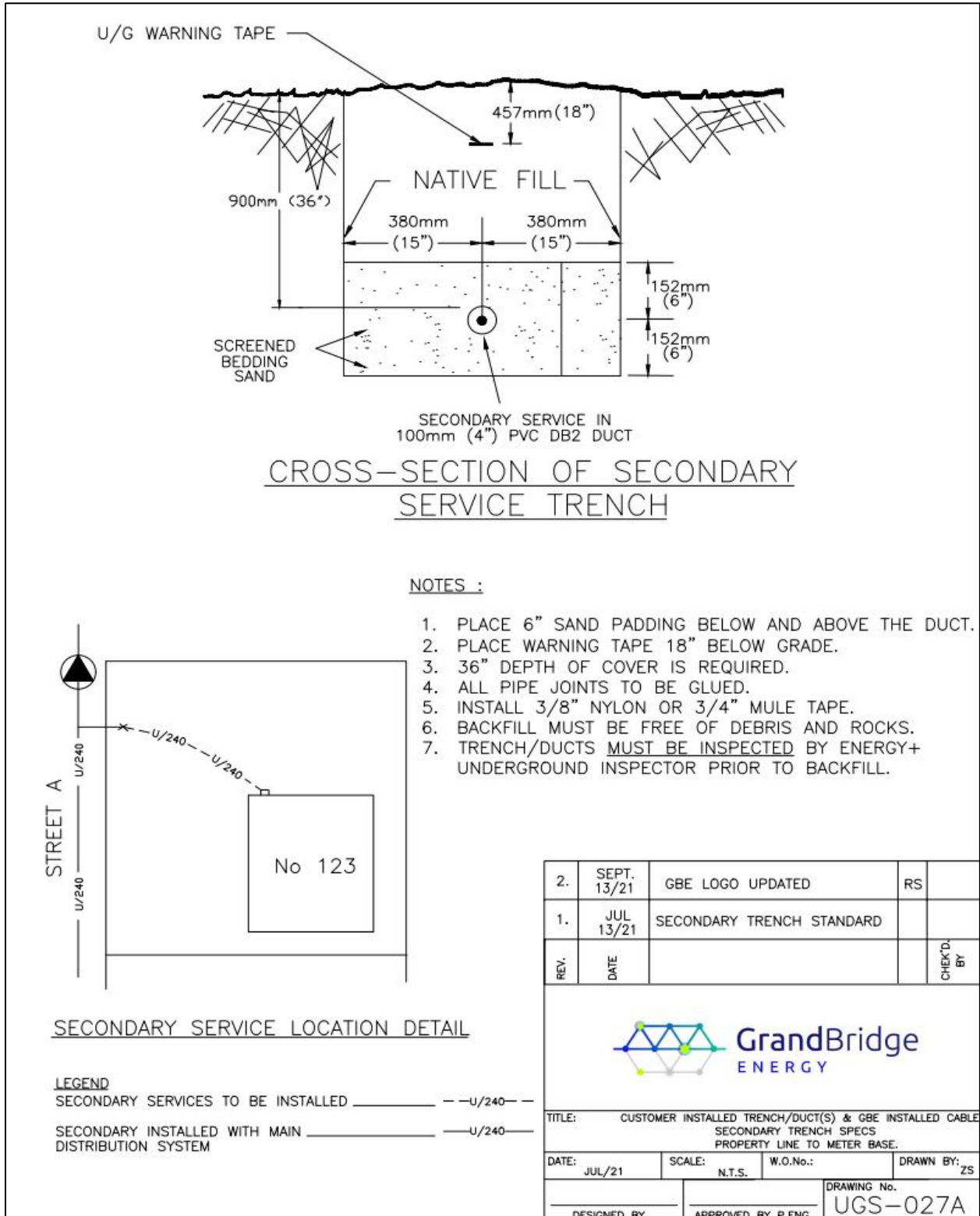
# 4.19 UGS-027: Secondary Service Installation - Hydro, Bell and Cable

## T.V. Property Line to Meter Base

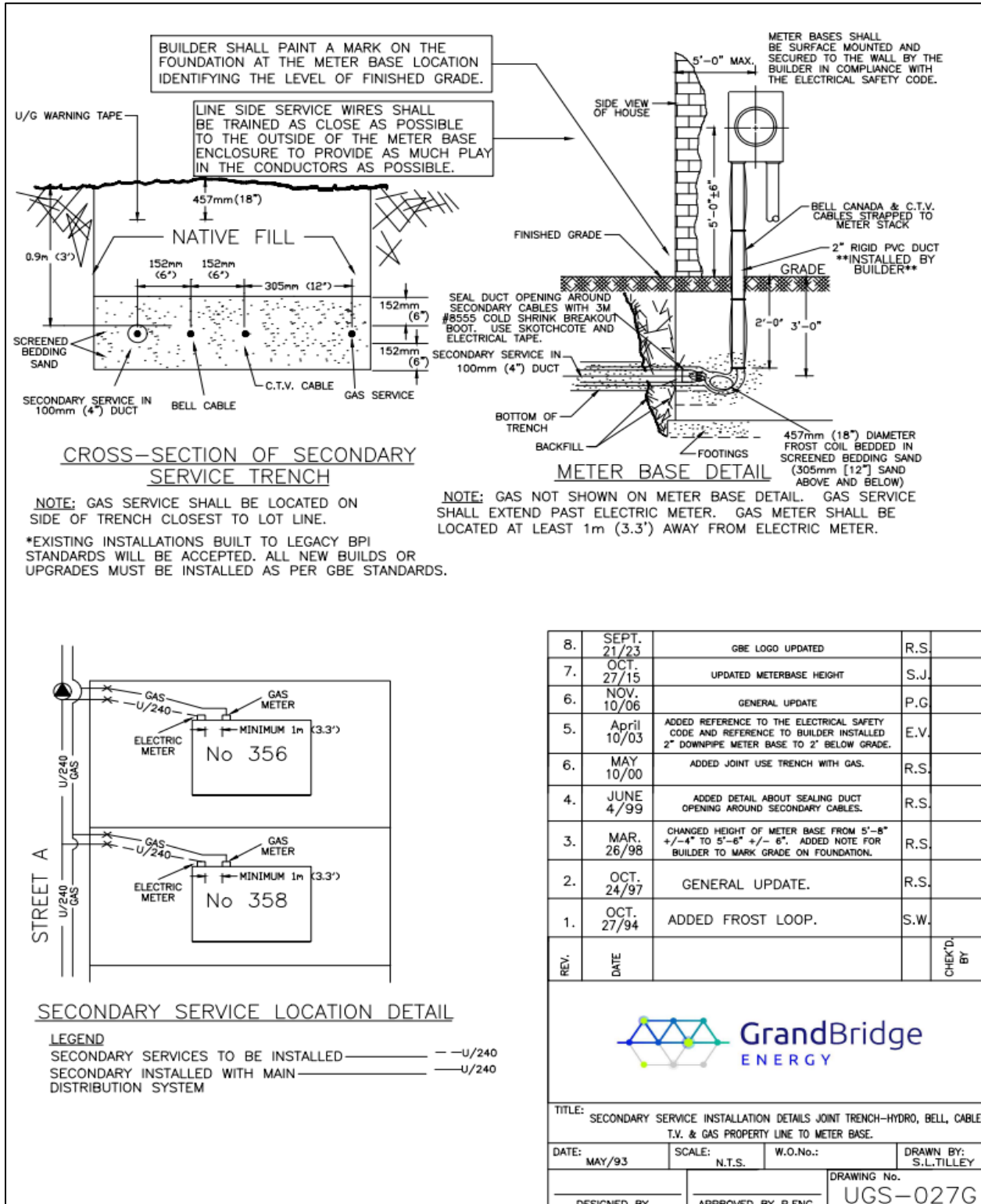




### 4.20 UGS-027A: Customer Installed Trench/Duct(s) & GBE Installed Cable Secondary Trench Specs Property Line to Meter Base



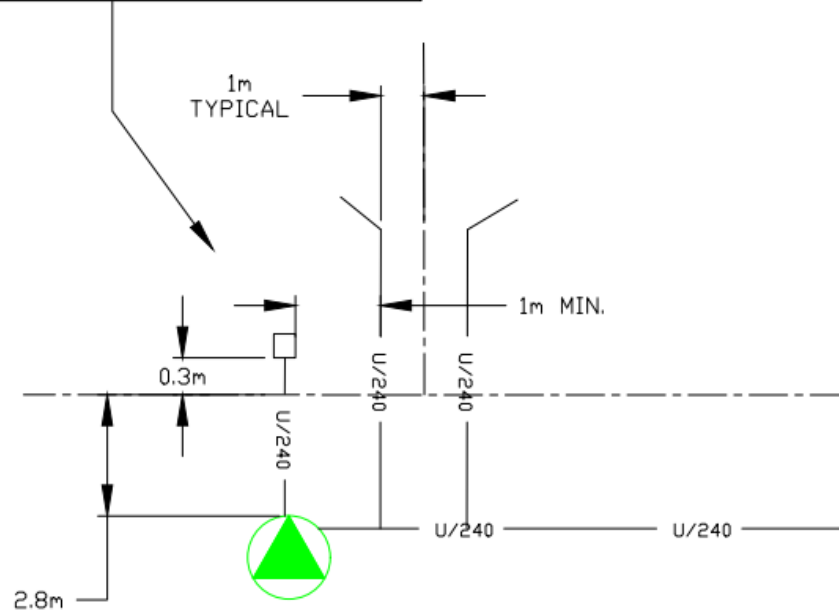
## 4.21 UGS-027G: Secondary Service Installation - Hydro, Bell, Cable T.V., and Gas Property Line to Meter Base





### 4.22 UGS-030: Detail for Temporary Meter Panel in Subdivisions

DEVELOPER IS TO INSTALL A 6"x6" WOLMANIZED PRESSURE TREATED POST TO MOUNT METER BASE ON AS PER ESA CODE. INSTALL 1-3/0 AL. TRI. IN 1-100mm D.B. DUCT FROM THE Tx. TO THE POST. LEAVE MIN. 3m TAILS AT Tx. (SEE DRAWING UGS-027 FOR SECONDARY CONDUCTOR AND METER BASE INSTALLATION.)



**NOTES:**

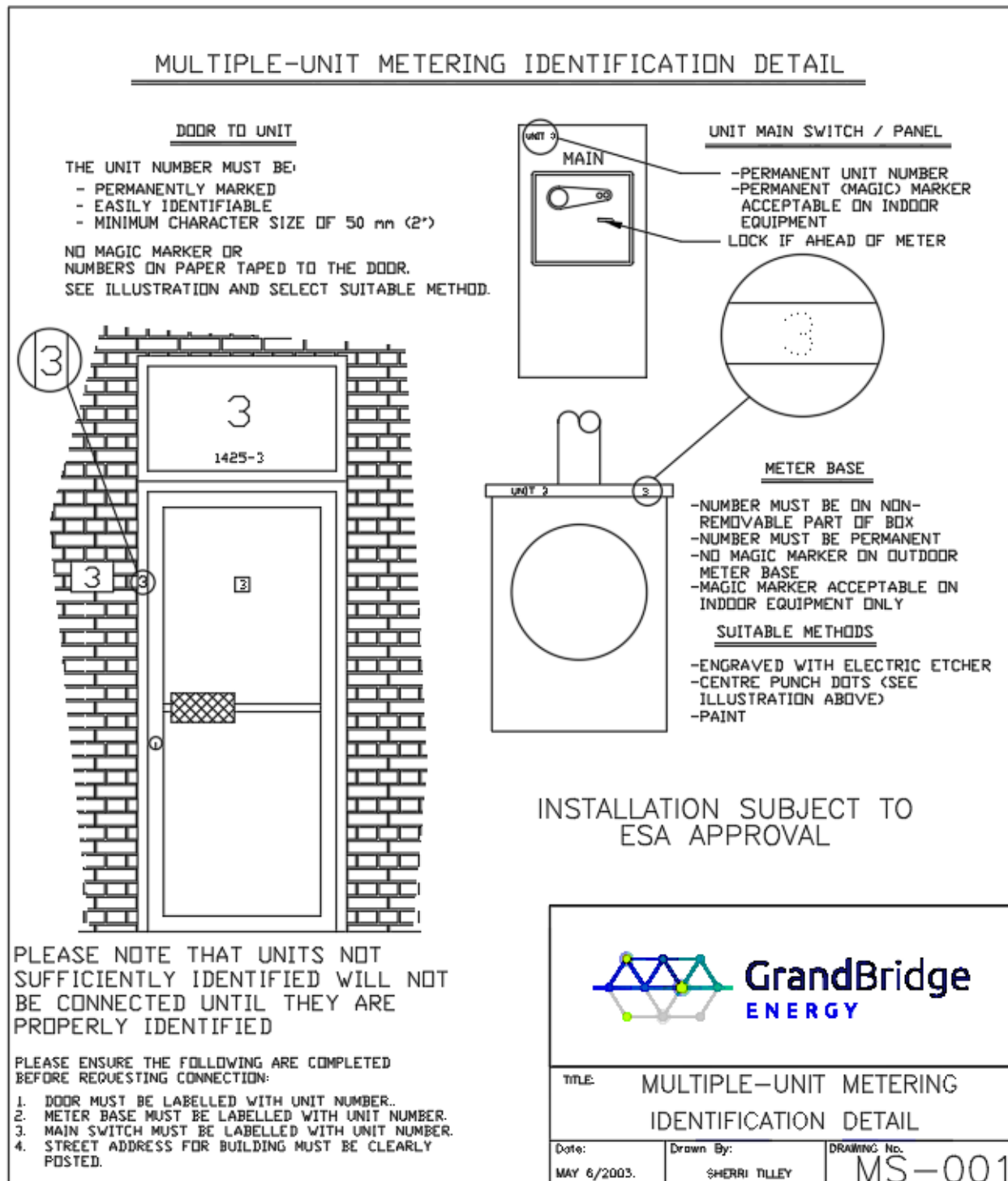
- 1) A 'TEMPORARY SERVICE CHARGE' WILL APPLY FOR SERVICE AT LOCATION.
- 2) 6"x6" POST IS TO BE INSATALLED AT TRANSFORMER LOCATIONS ONLY. MIN. 1m FROM LOT SERVICE STUB.

2.	SEPT. 21/23	GBE LOGO UPDATED	R.S.	
1.	MAY 03/00	GENERAL UPDATE	B.B.	
REV.	DATE			CHECK'D. BY

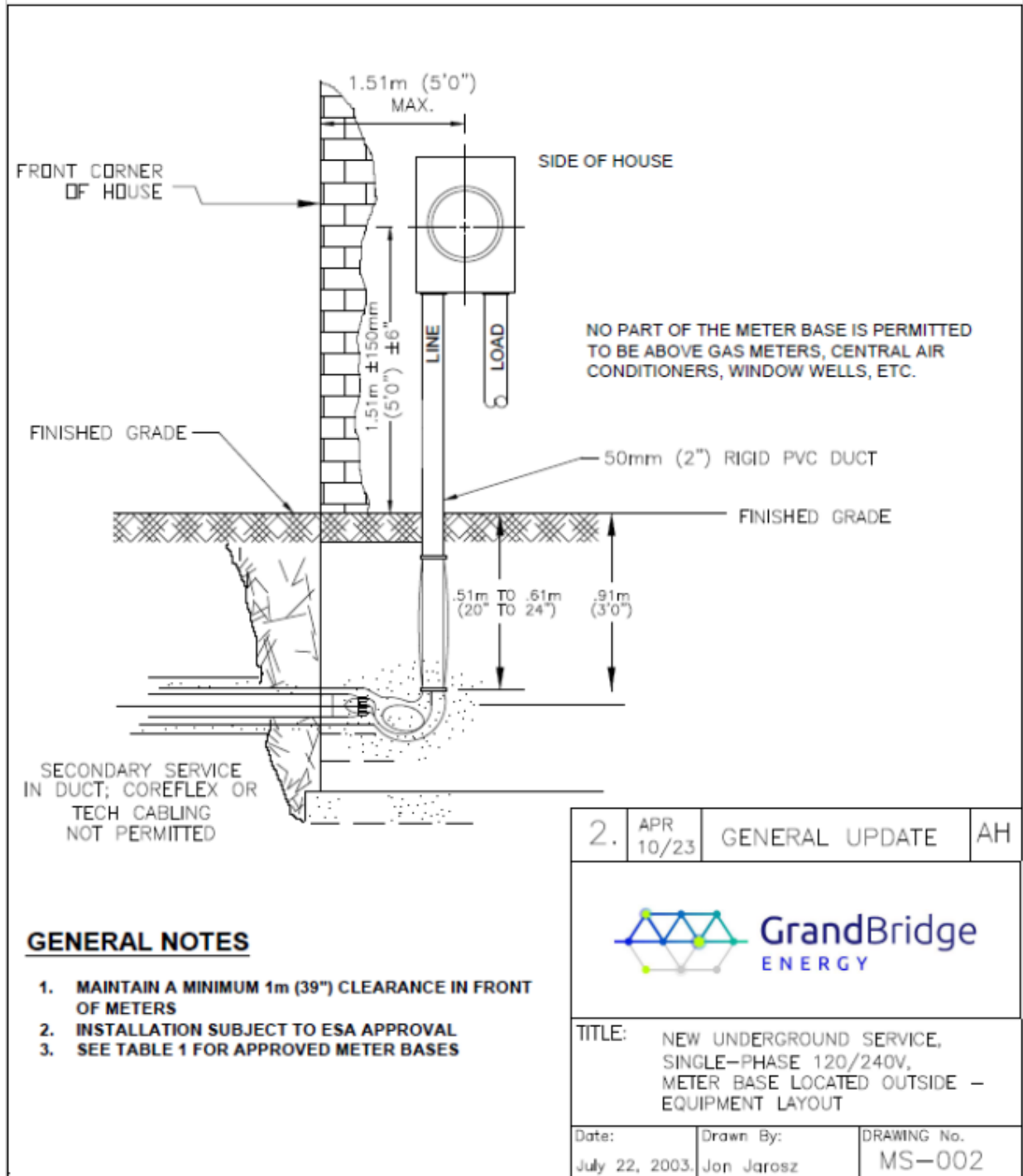


TITLE: DETAIL FOR TEMPORARY METER PANEL IN SUBDIVISIONS.			
DATE: MAY 3/00	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S.L.TILLEY
DESIGNED BY:	APPROVED BY: P.ENG.	DRAWING No. UGS-030	

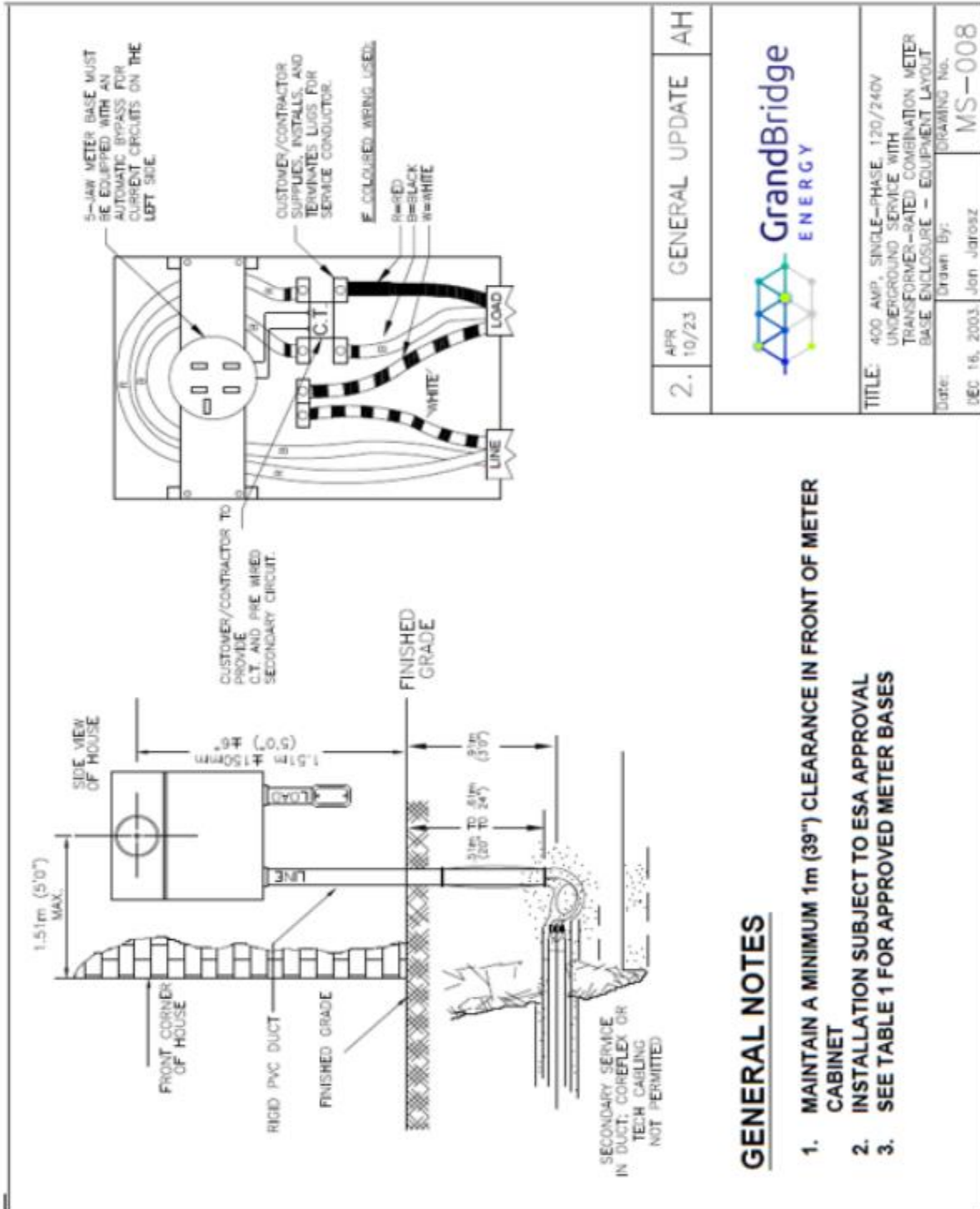
### 4.23 MS-001 Multiple Unit Metering Identification Detail



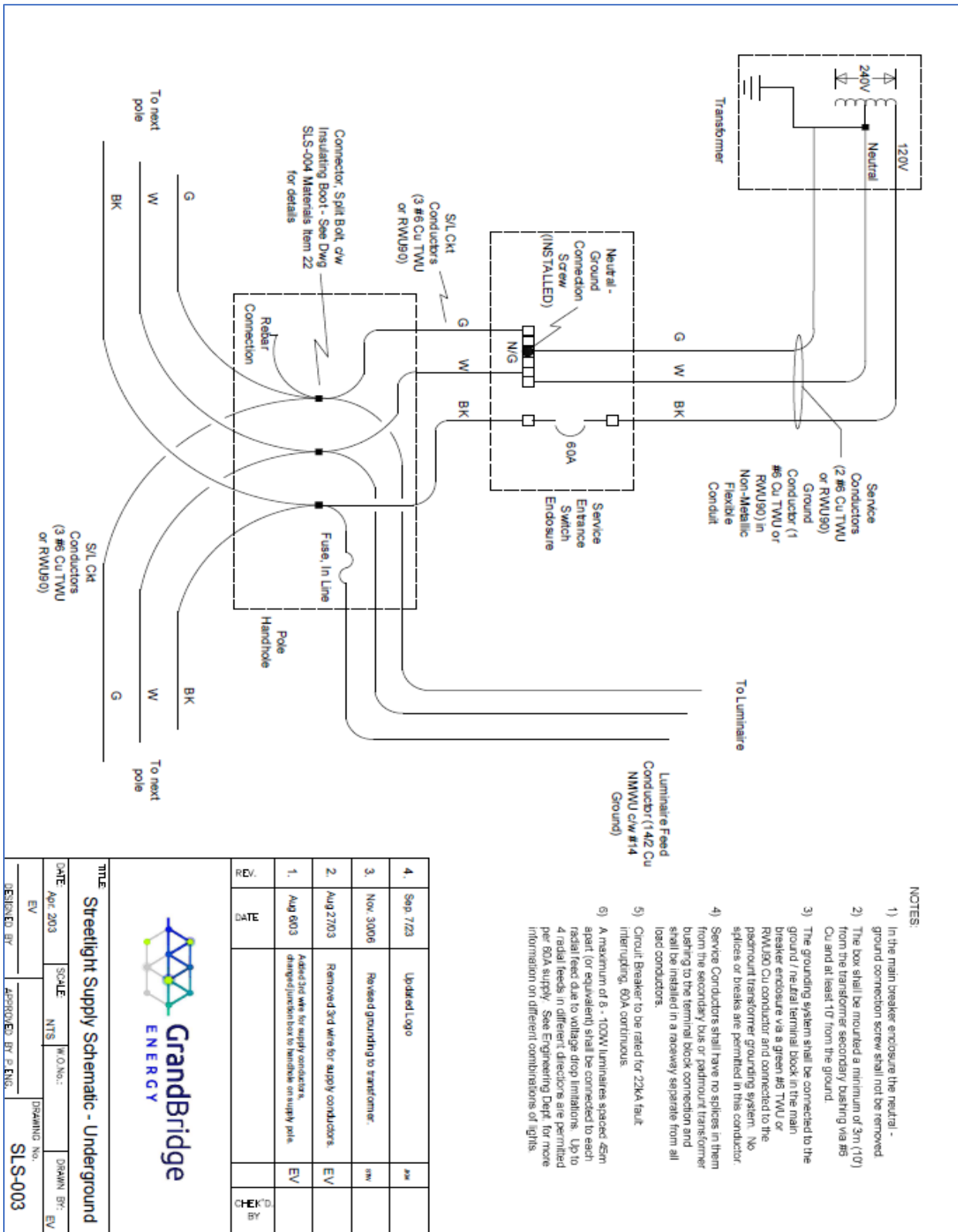
### 4.24 MS-002 New Underground Service, Single-Phase 120/240V, Meter Base Located Outside – Equipment Layout



### 4.25 MS-008 400 Amp, Single-Phase, 120/240V Underground Service with Transformer–Rated Combination Meter Base Enclosure - Equipment Layout



### 4.26 SLS-003 Streetlight Supply Schematic – Underground



**NOTES**

- 1) In the main breaker enclosure the neutral - ground connection screw shall not be removed.
- 2) The box shall be mounted a minimum of 3m (10') from the transformer secondary bushing via #6 Cu and at least 10' from the ground.
- 3) The grounding system shall be connected to the ground / neutral terminal block in the main breaker enclosure via a green #6 TWU or RWU90 Cu conductor and connected to the padmount transformer grounding system. No splices or breaks are permitted in this conductor.
- 4) Service Conductors shall have no splices in them from the secondary bus or padmount transformer bushing to the terminal block connection and shall be installed in a raceway separate from all load conductors.
- 5) Circuit Breaker to be rated for 22kA fault interrupting, 60A continuous.
- 6) A maximum of 5 - 100W luminaires spaced 45m apart (or equivalent) shall be connected to each radial feed due to voltage drop limitations. Up to 4 radial feeds in different directions are permitted per 60A supply. See Engineering Dept. for more information on different combinations of lights.

REV.	DATE	DESCRIPTION	BY	CHECK'D BY
4.	Sep 7/23	Updated Logo	ms	
3.	Nov. 30/06	Revised grounding to transformer.	ms	
2.	Aug 27/03	Removed 3rd wire for supply conductors.	EV	
1.	Aug 6/03	Added 3rd wire for supply conductors, changed junction box to handhole on supply pole.	EV	



**TITLE**  
Streetlight Supply Schematic - Underground

**DATE**  
Apr 2003

**SCALE**  
N.T.S.

**W.O. NO.**

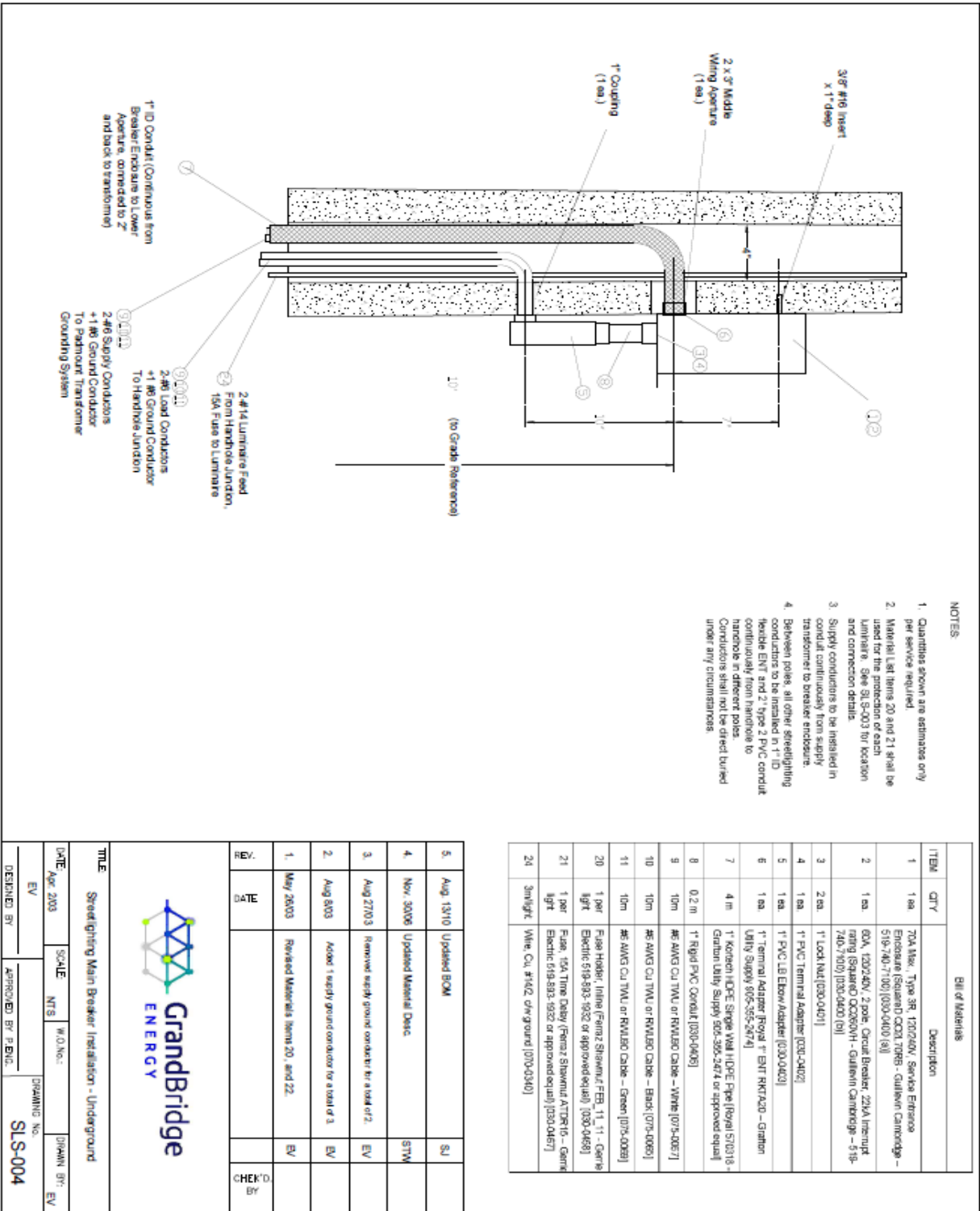
**DRAWING NO.**  
SLS-003

**DESIGNED BY**  
EV

**APPROVED BY**  
P. ENG.

**DRAWN BY**  
EV


### 4.27 SLS-004 Streetlighting Main Breaker Installation – Underground



- NOTES**
- Quantities shown are estimates only per service required.
  - Materials List Items 20 and 21 shall be used for the protection of each luminaire. See SLS-003 for location and connection details.
  - Supply conductors to be installed in conduit continuously from supply transformer to breaker enclosure.
  - Between poles, all other streetlighting conductors to be installed in 1" ID flexible EMT and 2" Type 2 PVC conduit continuously from handhole to handhole in different poles. Conductors shall not be direct buried under any circumstances.

ITEM	QTY	Description
1	1 ea	70A Max., Type SR, 120/240V, Service Entrance Enclosure (Isoland) CCCC 70RB - Cutless Canopy - 519-740-7100 [030-0400 (8)]
2	1 ea	60A, 120/240V, 2 pole, Circuit Breaker, 25kA Interrupt rating (Square D)QCC60VH - Cutless Canopy - 519-740-7100 [030-0400 (8)]
3	2 ea	1" Lock Nut [030-0401]
4	1 ea	1" PVC Terminal Adapter [030-0402]
5	1 ea	1" PVC LB Elbow Adapter [030-0403]
6	1 ea	1" Terminal Adapter (Fused) 1" EMT RFRAD - Grafton Utility Supply 805-585-2874
7	4 m	1" Konech HDPE Single Wall HDPE Pipe (Rural) 50318 - Grafton Utility Supply 505-395-2472 or approved equal
8	0.2 m	1" Rigid PVC Conduit [030-0405]
9	10m	#6 AWG CU THW or RWALSO Cable - White [075-0057]
10	10m	#6 AWG CU THW or RWALSO Cable - Black [075-0059]
11	10m	#6 AWG CU THW or RWALSO Cable - Green [075-0058]
20	1 per light	Fuser Huber, (Inlet) (Fusing) Shown (FEB, 11, 11 - Grafton Electric 519-833-1932 or approved equal) [030-0483]
21	1 per light	Fuse, 15A Time Delay (Fuser) Shown ATFR16 - Grafton Electric 519-833-1932 or approved equal [030-0487]
24	3m/light	Wire, Cu, #14G, (w/ground) [070-0340]

REV.	DATE	CHECK'D BY	
5	Aug 13/10	Updated BOM	SLJ
4	Nov 30/06	Updated Material Desc.	STW
3	Aug 27/03	Removed supply ground conductor for a total of 2.	EV
2	Aug 8/03	Added 1 supply ground conductor for a total of 3.	EV
1	May 26/03	Revised Materials Items 20, and 22.	EV



**GrandBridge**  
ENERGY

**TITLE**  
Streetlighting Main Breaker Installation - Underground

DATE: Apr 2003	SCALE: NTS	W.D. No.:	DRAWN BY: EV
DESIGNED BY: EV	APPROVED BY: P. ENG.	DRAWING No.:	SLS-004