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. _____

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, and the County of Brant.

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.

Supervisor, Engineering Services

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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 withing 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 the street lighting system in the Cambridge and North Dumfries service areas within a residential subdivision. Please contact the 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, 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) <u>The City of Cambridge and the Township of North Dumfries:</u>
   a. Design of Electrical Plant
   b. Street Lighting System is the responsible of the Developer. Developer must follow the Municipal and GBE street light standards

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.

b) Co-ordinate design and approvals with Bell Canada, Rogers Cable T.V., Solo Cable, Brant Municipal Enterprises, City of Cambridge, Township of North Dumfries, County of Brant, Regional Municipality of Waterloo, and Enbridge Gas as required.

c) Supply and install easement marking posts as required.

d) Supply and install all materials required to complete terminations, both low and high voltage.

e) Supply and install service cable, from lot line to meter base, including trenching and backfilling.

f) Inspect, test, and energize all electrical plant.

1.3.2 Developer Responsibilities:

a) Supply required drawings via e-mail to GrandBridge Energy.

b) Purchase and install 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.

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 and the Township of North Dumfries:
GrandBridge Energy carries out design of electrical.

County of Brant:
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, 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) GrandBridge Energy receives Municipal approvals (except for City of Cambridge, where the 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, 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, 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 Supervisor 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. Material and installation requirements are provided in standard drawings SLS-003 and SLS-004 for installations in Cambridge and North Dumfries service area. Please contact the 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. 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 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

Cable Class	Size	Over Insulation (mils)	Over SC Shield (mils)	Overall (mils)	Concentric Neutral
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)

ii. Polyethylene or Cross-linked 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.

2.1.3 Street Light Cable

For Cambridge and North Dumfries service areas:

Specify:

No. 6 AWG TWU 600V or RWU 1000V copper
Black, soft drawn
7 strand

and

No. 6 AWG TWU 600V or RWU 1000V copper
White, soft drawn
7 strand

and

No. 6 AWG TWU 600V or RWU 1000V copper
Green, soft drawn
7 strand

Note: All three cables are required.

For Brant County and Brantford service areas, the Developer should reference the latest revision of Development and Engineering Standards.

2.1.4 Grounding Wire

Specification:

1/0 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 GrandBridge Energy Specification MPDL dated MARCH 2023, or latest revision. Specification MPDL is summarized below and 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.

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 Cambridge or Brantford office, respectively, with the transformer shipment. 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 # MPDL, MARCH 2023, 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 # MPDL, MARCH 2023, 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)

2.3.2 Padmounted Single-Phase Switches

Padmounted single-phase switches, as specified by GrandBridge Energy, shall be purchased and installed by the Developer. Switch installations shall be as indicated on individual project drawings.

Approved Supplier:

i. ABB (Elastimold): PMVS12722PS-CS2150 c/w parking stand and enclosure door grounding strap

Padmounted switches shall be shipped directly to site.

GrandBridge Energy is no longer require such switches effective Oct 2023. Contact GrandBridge Energy Engineering team for more details.

2.4 Street Lighting

For Brant County and Brantford, the Developer should reference the latest revision of Development and Engineering Standards.

For Cambridge and North Dumfries, please see below.

2.4.1 Poles

i. 9.9m (32½') Concrete Pole - as per standard drawing UGS-001A.

Specify: StressCrete E-325-APR-G-MOO-S/F-128

or

Utility Structures Inc. HA-325-A-1-PG-10-X

or

SkyCast SC 099 ARO CON DCG P

Each pole shall be Capseal "X75" treated and manufactured in accordance with drawing UGS-001A.

ii. 12.2m (40') Concrete Pole - as per standard drawing UGS-002

Specify: StressCrete E-400-BPR-G-MOO-S/F-128

or

Utility Structures Inc. HA-400-B-1-PG-10-X

or

SkyCast SC 122 BRO CON DCG P

Each pole shall be Capseal "X75" treated and manufactured in accordance with drawing UGS-002.

iii. 13.7m (45') Concrete Pole - as per standard drawing UGS-003

Specify: StressCrete E-450-BPR-G-MOO-S/F-128

or

Utility Structures Inc. HA-450-B-1-PG-10-X

or

SkyCast SC137 BRO CON DCG P

Each pole shall be Capseal "X75" treated and manufactured in accordance with drawing UGS-003.

iv. 35' Octagonal Decorative Concrete Pole - as per standard drawing UGS-028A. Pole, bracket, and luminaire details are provided on this drawing c/w part #'s. Approved supplier is StressCrete.

2.4.2 Tapered Elliptical Mast Arm

i. 1.8m (6') Tapered Elliptical Mast Arm - for 9.9m (32.5'), 12.2m (40') pole or 13.7m (45') pole.

Specify: RE6MA (ABB – formerly Thomas & Betts)

or

TER6MA (USS)

or

71845-002 (Hapco)

or

ALS-RE6M (Aluminum Lighting Standards)

ii. 2.4m (8') Tapered Elliptical Mast Arm - for 9.9m (32.5'), 12.2m (40') pole or 13.7m (45') pole.

Specify: RE8MA (ABB – formerly Thomas & Betts)

or

TER8MA (USS)

or

71845-003 (Hapco)

or

ALS-RE8M (Aluminum Lighting Standards)

iii. 3m (10') Tapered Elliptical Mast Arm - for 9.9m (32.5'), 12.2m (40') pole or 13.7m (45') pole.

Specify: RE10MA (ABB – formerly Thomas & Betts)

or

TER10MA (USS)

or

71845-004 (Hapco)

or

ALS-RE10M (Aluminous)

iv. 1.8 m (6') Victoria Style Mast Arm – see UGS-28A for info

2.4.3 Luminaires

i. For LED luminaires, please contact the City of Cambridge or the Township of North Dumfries for more information.

2.4.4 Luminaire Lamps

ii. For LED luminaires, please contact the City of Cambridge or the Township of North Dumfries for more information.

2.4.5 Luminaire Wiring - for Cobra Head Luminaire

Specify: CSA NMWU 14/2 Supervex (-25°C) 300V (Nexans)

- One black wire, one white wire and bare ground wire all in jacket.

For LED luminaires, please contact the City of Cambridge or the Township of North Dumfries for more information.

2.4.6 Luminaire Control - Photocell

Specify: Ripley Sun Switch 6346 Survivor Series (M.H. Rhodes Inc)

or

7571B EBBA (Fisher Pierce)

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 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 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 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.

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

Specify: Approved manufacturers: Acton Precast or Brooklin Concrete Products

GrandBridge Energy is no longer providing such vault effective Oct 2023.

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) - (IPEX, Royal Pipe)

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

Cable Size	Cap Diameter (inches)
#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)

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-010

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, call 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 and standard drawing No. UGS-009 for single 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 pe-tressed 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, or the County of Brant

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 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. 50mm (2") duct is to be used for street lighting. 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 Cambridge and North Dumfries)

For Brant County the Developer should reference the latest revision of Development and Engineering Standards.

3.6.1 Street Lighting Poles

9.9m (32.5') and 35’ Concrete street lighting poles shall be set at a depth of 1.7m (5.5') below finished grade as per standard drawing No. UGS-001A and UGS-028A. Hand hole is to be 90° to curb.

12.2m (40') Concrete street lighting poles shall be set at a depth of 1.8m (6') below finished grade as per standard drawing No. UGS-002. Hand hole is to be 90° to curb.

13.7m (45') Concrete street lighting poles shall be set at a depth of 2m (6'-6”) below finished grade as per standard drawing No. UGS-003. Hand hole is to be 90° to curb.

Location of street lighting poles within the jurisdiction of the City of Cambridge shall be in accordance with the particular road cross section to be constructed as per City of Cambridge Drawings (latest version).

Compaction around street lighting poles shall meet the requirements of Ontario Provincial Standard Specification 501 dated December 1983, or latest revision. Compaction shall be to 98% Proctor Density.

3.6.2 Street Lighting Cable

Distribution street lighting cable shall be placed in 50mm (2") duct installed in accordance with Section 3.5.2 of this specification, "Placement of Ducts in Sandbedding." No splices are permitted in street lighting cables.

Street Lighting cable shall be installed from the transformer enclosure to the hand hole in the street lighting pole and be tied off, leaving sufficient length for GrandBridge Energy forces or the developer’s contractor (see Section 1.10.2) to connect to luminaire wiring. 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). All cable shall be installed in continuous duct from pole handhole to pole handhole and from transformer to breaker enclosure. 25.4mm (1”) flexible Kortech HDPE duct is specified in drawing SLS-004 for supply conductor installation from the transformer to the Service entrance breaker enclosure and to facilitate the duct installation into the pole handhole.

3.6.3 Cobra Head Luminaire

Tapered elliptical mast arms c/w luminaire shall be installed securely on the concrete pole by the Developer. The Developer shall install GrandBridge Energy approved wire (see section 2.4.5) from the luminaire to the hand hole for termination by GrandBridge Energy

forces or the developer's contractor (see section 1.10.2). Luminaire is to be grounded by Developer. Luminaires are 120V.

3.6.4 Lamps for Luminaires

Lamps shall be installed in the luminaire by the Developer.

3.6.5 Luminaire Control

Luminaires shall be individually controlled by a "Photocell", specified as per Section 2.4.6 installed by the Developer according to the Manufacturer's instructions.

3.6.6 LED Streetlighting

For LED luminaires, please contact the City of Cambridge or the Township of North Dumfries for more information.

3.6.7 Grounding

Both the concrete pole and the luminaire shall be grounded. The Developer shall ground the luminaire using the bare ground wire in the jacketed luminaire to handhole wire. GrandBridge Energy forces or the developer's contractor (see section 1.10.2) shall connect the ground wire of the luminaire wire, the ground wire attached to the rebar of the pole, and the incoming ground wire together at the hand hole.

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 Energy+ for installation through porch/recessed meter bases prior to installation.

3.7.2 Unit Numbering

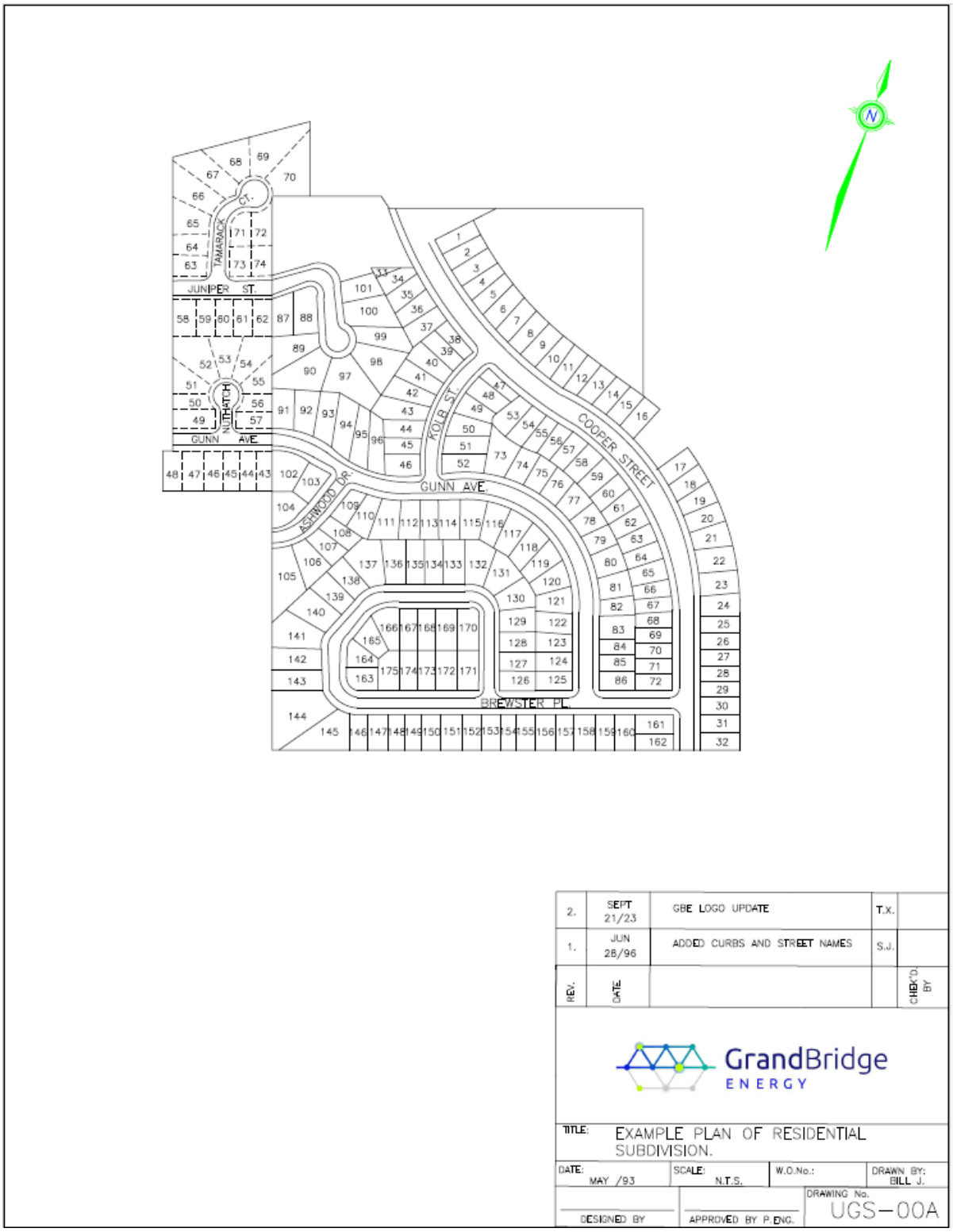
For multiple unit developments, the units, meter bases, and the unit main disconnect switches must have permanent unit numbers installed prior to the installation of any metering apparatus as per standard drawing No. MS-001.

3.8 Installation of Temporary Electrical Service

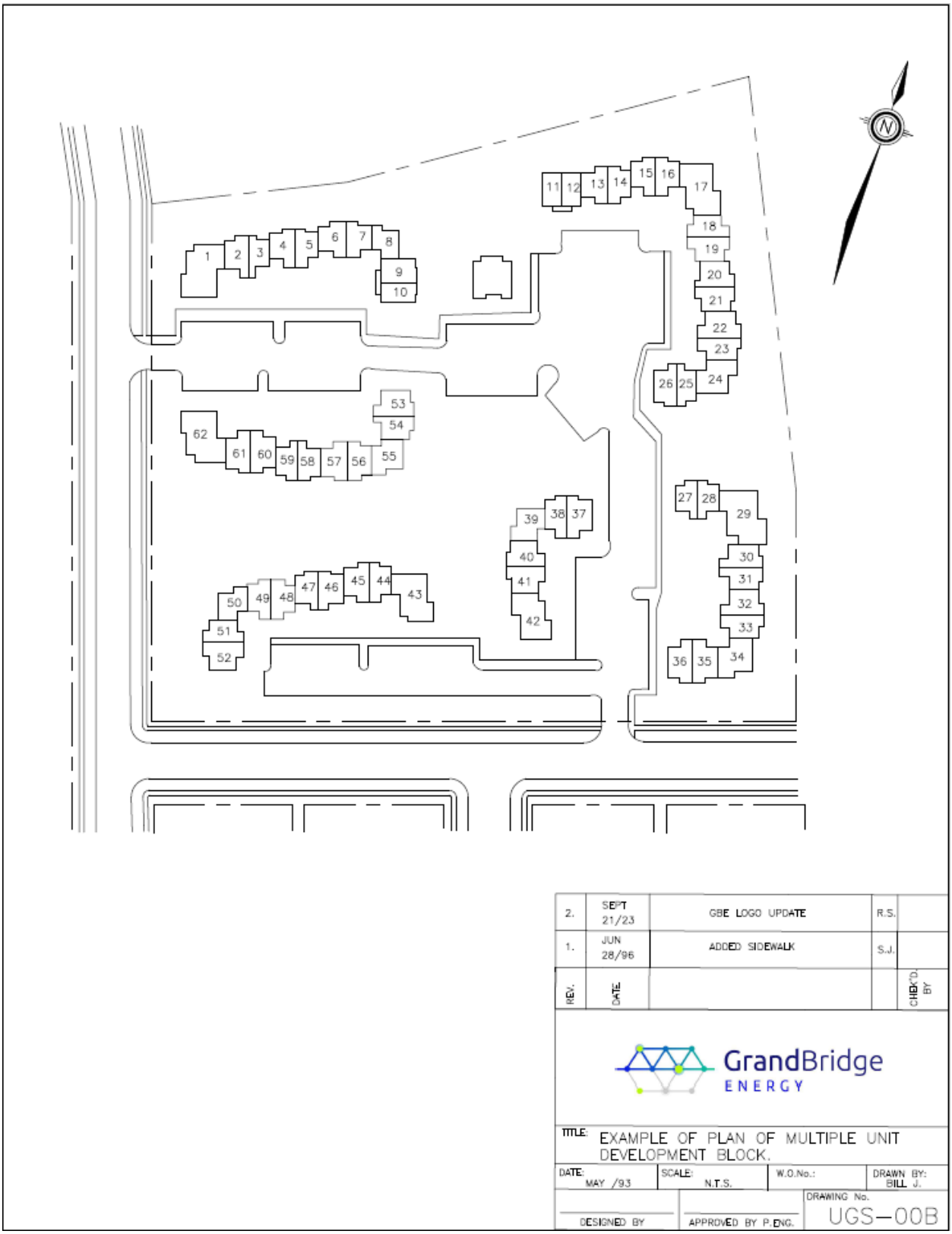
See Drawing UGS-030 for details regarding the installation of a temporary meter panel in subdivisions.

4 Drawings

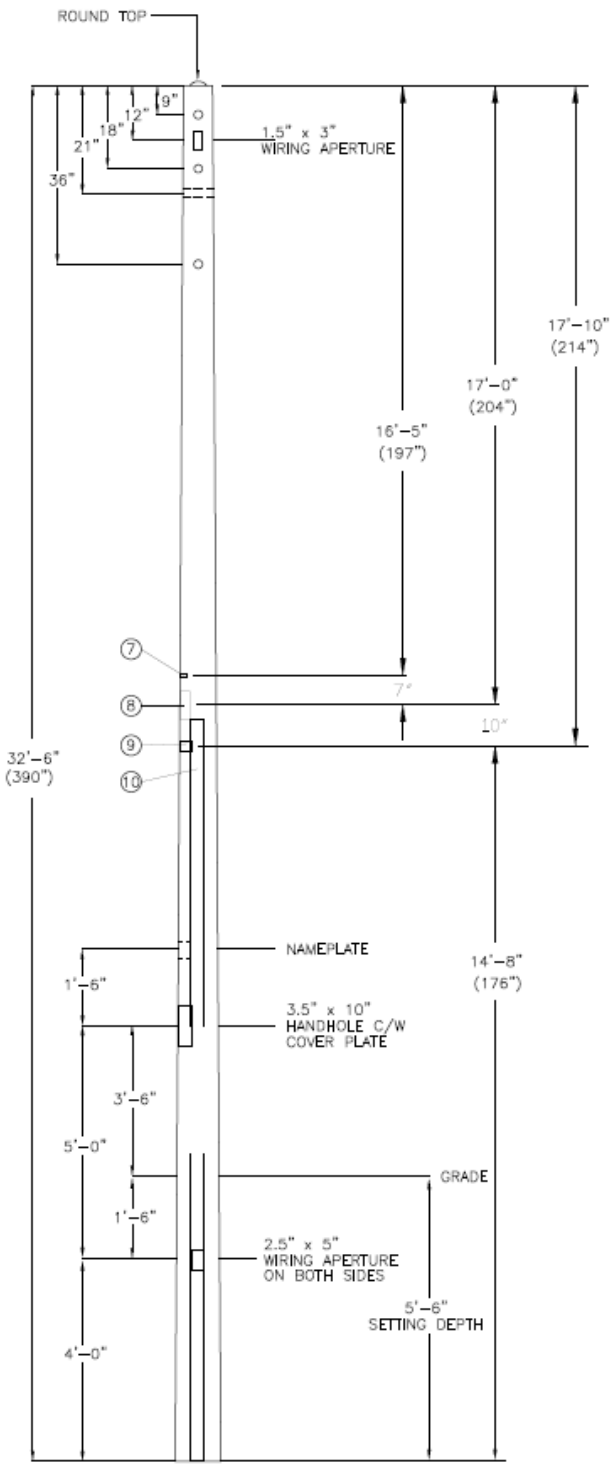
4.1 UGS-000A: Example Plan of Residential Subdivision



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



4.3 UGS-001A: 9.9m (32.5') Concrete Street Light Pole



NOTES:

(1) POLES SHALL BE PRESTRESSED, REINFORCED, SPUN CONCRETE AND MANUFACTURED TO MEET CSA SPECIFICATION A14–00 (LATEST REVISION)

(2) BOLT HOLES SHALL BE CORED FOR 5/8" MACHINE BOLT–MINIMUM DIAMETER 13/16", MAXIMUM DIAMETER 1"

(3) COVER PLATE ON HANDHOLE TO BE FASTENED WITH TAMPERPROOF SCREWS

(4) POLES TO BE TREATED WITH CAPSEAL x 75

(5) MAXIMUM ALLOWABLE PROJECTED AREA OF LUMINAIRE MOUNTED WITH 8' MAST ARM IS 3 SQ. FT

(6) NAMEPLATE AND HANDHOLE SHALL BE PERPENDICULAR TO APERTURES AND LOCATED ON SIDE SHOWN

MATERIAL LIST

ITEM	QTY	DESCRIPTION
7	1	3/8"-16 INSERT X 1" DEEP
8	1	2" X 3" MIDDLE WIRING APERTURE C/W REMOVABLE COVER
9	1	1" NPT COUPLING C/W REMOVABLE COVER
10	1	3" DIA. MINIMUM RACEWAY FROM BUTT TO MIDDLE 2"X3" WIRING APERTURE

REV.	DATE			CHEK'D. BY
6.	SEPT. 21/23	GBE LOGO UPDATED	RS	
5.	NOV. 24/06	ADDED REFERENCE TO CSA SPEC. A14–00.	RS	
4.	April 10/03	Added Items 7 – 10 for ESA service entrance switch mounting. Also increased handhole to 3.5x10"	EV	
3.	JUNE 29/95	REVISED LOCATION OF NAMEPLATE AND HANDHOLE	JJ	
2.	FEB 4/92	REVISED BELOW–GRADE APERTURE	SW	
1.	SEPT 23/88	COMPLETE REVIEW AND REVISION	JG	

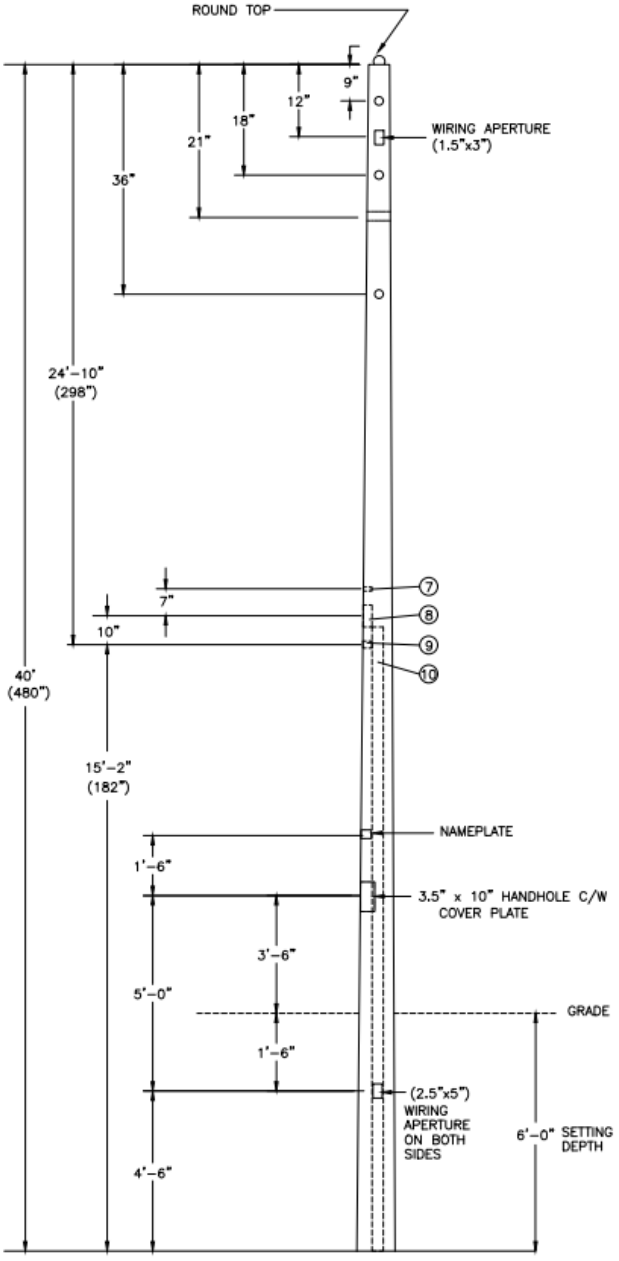
GrandBridge ENERGY

TITLE: 32'–6" CLASS 'A' SPUN ROUND, PRESTRESSED, REINFORCED CONCRETE STREET LIGHT POLE GBE #016–0310.

DATE:	SCALE:	W.O.No.:	DRAWN BY:
JUNE 29/95	N.T.S.		JON JAROSZ

DESIGNED BY	APPROVED BY P.ENG.	DRAWING No.
		UGS–001A

4.4 UGS-002: 12.2m (40') Concrete Street Light Pole



NOTES:

1. POLES SHALL BE PRESTRESSED, REINFORCED, SPUN CONCRETE AND MANUFACTURED TO MEET CSA SPECIFICATION A14-00 (LATEST REVISION).
2. BOLT HOLES SHALL BE CORED FOR 5/8" MACHINE BOLT-MINIMUM DIA. 13/16", MAXIMUM DIA. 1".
3. COVER PLATE ON HAND HOLES TO BE FASTENED WITH TAMPERPROOF SCREWS.
4. POLES TO BE TREATED WITH CAPSEAL "x75".
5. MAXIMUM ALLOWABLE PROJECTED AREA OF LUMINAIRE MOUNTED WITH A 10' MAST ARM IS 3 SQ.FT OR 4 SQ.FT., IF A 8' MOUNTING BRACKET IS USED.
6. NAMEPLATE AND HANDHOLE SHALL BE PERPENDICULAR TO APERTURES AND LOCATED ON SIDE SHOWN.

MATERIAL LIST

ITEM	QTY	DESCRIPTION
7	1	3/8"-16 INSERT X 1" DEEP
8	1	2" X 3" MIDDLE WIRING APERTURE C/W REMOVABLE COVER
9	1	1" NPT COUPLING C/W REMOVABLE COVER
10	1	3" DIA. MINIMUM RACEWAY FROM BUTT TO MIDDLE 2"X3" WIRING APERTURE

REV.	DATE			CHEK'D. BY
4.	SEPT. 21/23	GBE LOGO UPDATED	RS	
3.	NOV. 24/06	ADDED REFERENCE TO CSA SPEC. A14-00.	RS	
2.	April 10/03	ADDED ITEMS 7-10 TO PROVIDE FOR ESA SERVICE ENTRANCE DISCONNECT BOX MOUNTING AND INCREASED HANDHOLE DIMENSION 3.5"x10"	EV	
1.	OCT 10, 1997	GENERAL UPDATE	RS	

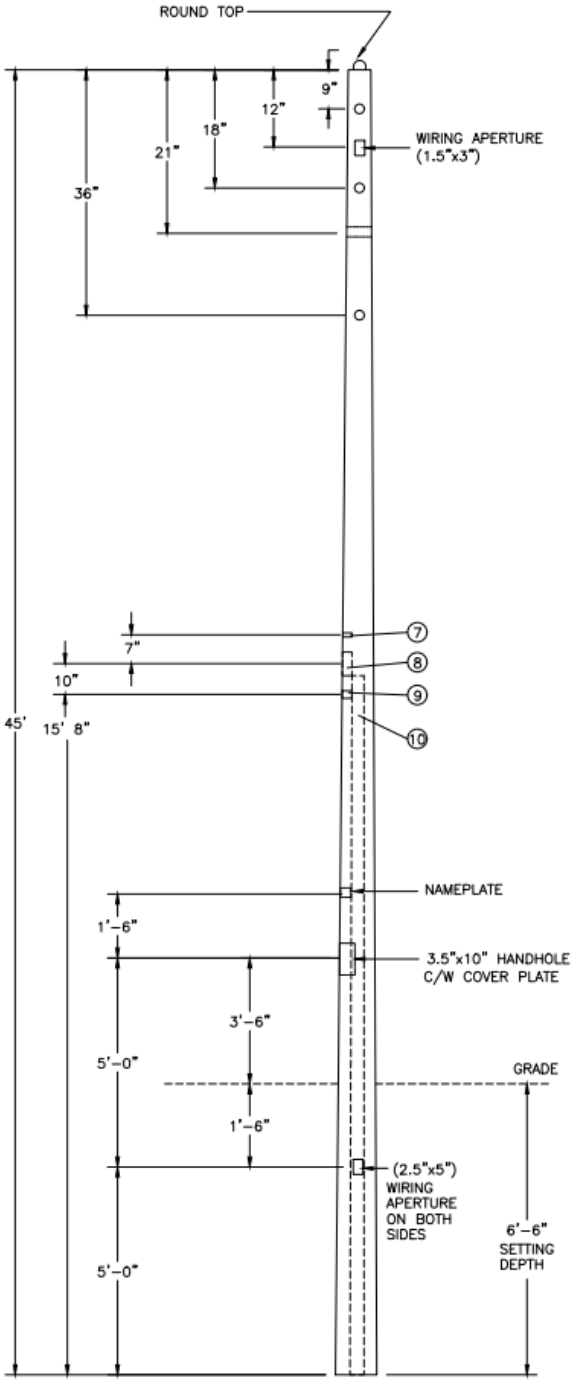
GrandBridge ENERGY

TITLE: 40' CLASS "B" SPUN ROUND, PRESTRESSED, REINFORCED CONCRETE STREET LIGHT POLE. GBE#016-0321

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

DESIGNED BY	APPROVED BY P.ENG.	DRAWING No.
		UGS-002

4.5 UGS-003: 13.7m (45') Concrete Street Light Pole



NOTES:

1. POLES SHALL BE PRESTRESSED, REINFORCED, SPUN CONCRETE AND MANUFACTURED TO MEET CSA SPECIFICATION A14-00 (LATEST REVISION).
2. BOLT HOLES SHALL BE CORED FOR 5/8" MACHINE BOLT-MINIMUM DIA. 13/16", MAXIMUM DIA. 1".
3. COVER PLATE ON HAND HOLES TO BE FASTENED WITH TAMPERPROOF SCREWS.
4. POLES TO BE TREATED WITH CAPSEAL "x75".
5. MAXIMUM ALLOWABLE PROJECTED AREA OF LUMINAIRE MOUNTED WITH A 10' MAST ARM IS 3 SQ.FT OR 4 SQ.FT., IF A 8' MOUNTING BRACKET IS USED.
6. NAMEPLATE AND HANDHOLE SHALL BE PERPENDICULAR TO APERTURES AND LOCATED ON SIDE SHOWN.

MATERIAL LIST

ITEM	QTY	DESCRIPTION
7	1	3/8"-16 INSERT X 1" DEEP
8	1	2" X 3" MIDDLE WIRING APERTURE C/W REMOVABLE COVER
9	1	1" NPT COUPLING C/W REMOVABLE COVER
10	1	3" DIA. MINIMUM RACEWAY FROM BUTT TO MIDDLE 2"X3" WIRING APERTURE

REV.	DATE			CHEK'D. BY
4.	SEPT. 24/23	GBE LOGO UPDATED	RS	
3.	NOV. 24/06	ADDED REFERENCE TO CSA SPEC. A14-00.	RS	
2.	April 10/03	Added items 7, 8, 9, and 10 to provide ESA service entrance disconnect box mounting. Also increased handhole dimension to 3.5x10" as shown.	EV	
1.	JUN 26/96	GENERAL UPDATE	SJ	

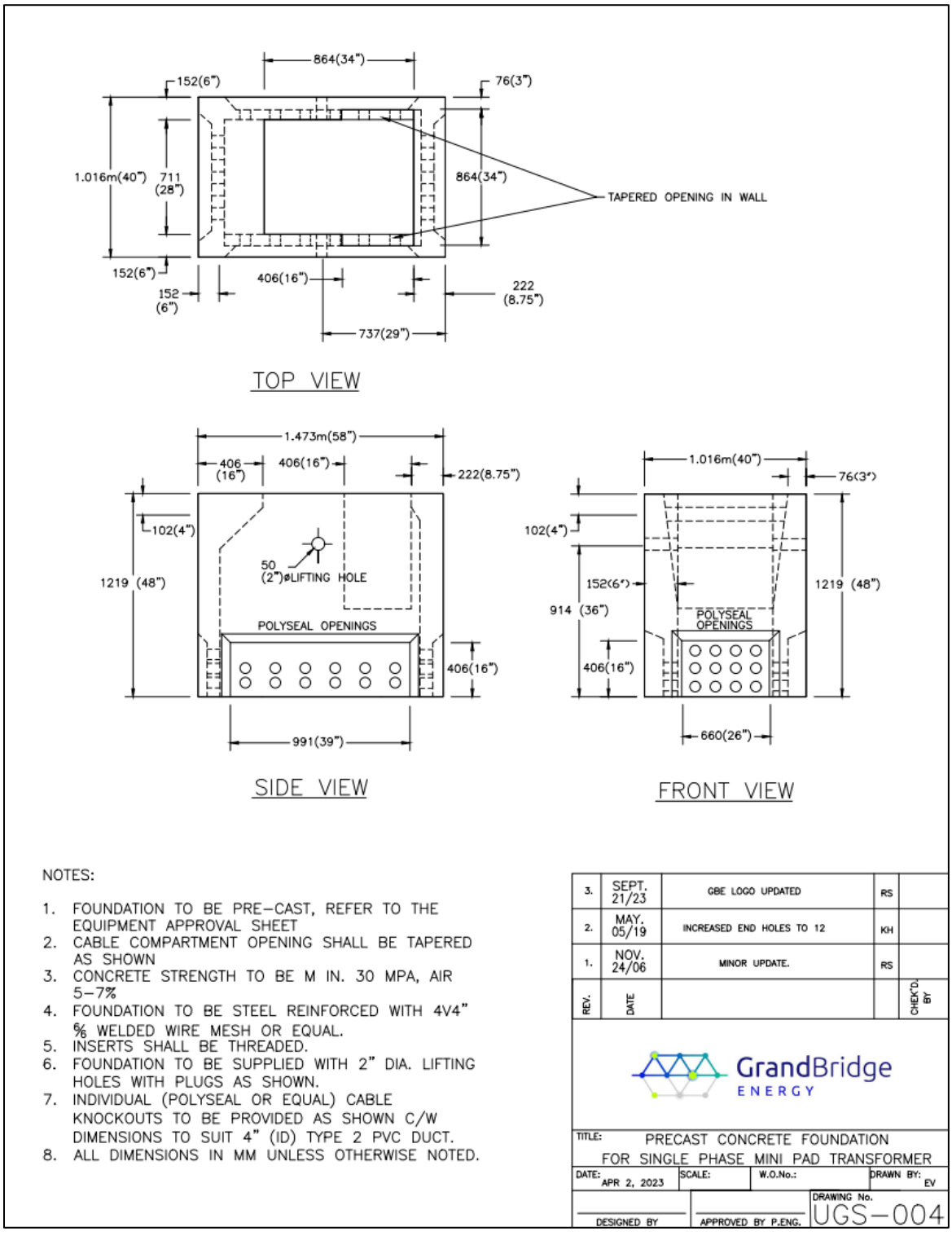
GrandBridge ENERGY

TITLE: 45' CLASS "B" SPUN ROUND,PRESTRESSED, REINFORCED CONCRETE STREET LIGHT POLE. GBE# 016-0326

DATE:	SCALE:	W.O.No.:	DRAWN BY:
APR 15/93.	N.T.S.		S.L.TILLEY

DESIGNED BY	APPROVED BY P.ENG.	DRAWING No.
		UGS-003

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



NOTES:

1. FOUNDATION TO BE PRE-CAST, REFER TO THE EQUIPMENT APPROVAL SHEET
2. CABLE COMPARTMENT OPENING SHALL BE TAPERED AS SHOWN
3. CONCRETE STRENGTH TO BE M IN. 30 MPA, AIR 5-7%
4. FOUNDATION TO BE STEEL REINFORCED WITH 4V4" ⅝ WELDED WIRE MESH OR EQUAL.
5. INSERTS SHALL BE THREADED.
6. FOUNDATION TO BE SUPPLIED WITH 2" DIA. LIFTING HOLES WITH PLUGS AS SHOWN.
7. INDIVIDUAL (POLYSEAL OR EQUAL) CABLE KNOCKOUTS TO BE PROVIDED AS SHOWN C/W DIMENSIONS TO SUIT 4" (ID) TYPE 2 PVC DUCT.
8. ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED.

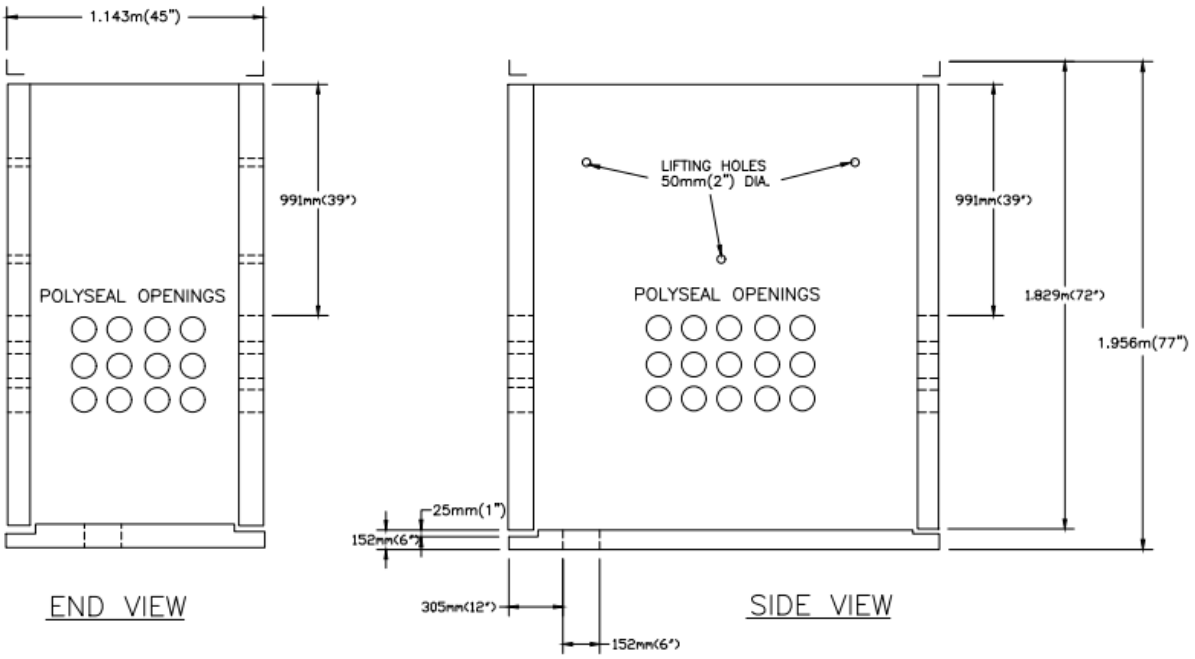
REV.	DATE			CHEK'D. BY
3.	SEPT. 21/23	GBE LOGO UPDATED	RS	
2.	MAY. 05/19	INCREASED END HOLES TO 12	KH	
1.	NOV. 24/06	MINOR UPDATE.	RS	

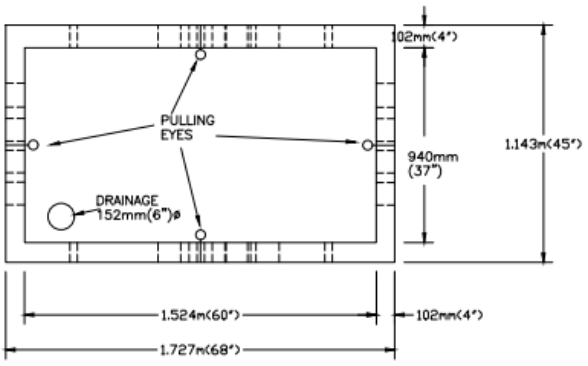
GrandBridge ENERGY

TITLE: PRECAST CONCRETE FOUNDATION FOR SINGLE PHASE MINI PAD TRANSFORMER

DATE: APR 2, 2023	SCALE:	W.O.No.:	DRAWN BY: EV
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS-004	

4.7 UGS-005: Precast Concrete Underground Vault





NOTES:

1. UNDERGROUND VAULT TO BE SUPPLIED BY GBE APPROVED CONTRACTOR.
2. CONCRETE STRENGTH TO BE A MINIMUM OF 30 MPa.
3. VAULT TO BE STEEL REINFORCED.
4. VAULT TO BE SUPPLIED WITH LIFTING HOLES WITH PLUGS.
5. VAULT TO BE SUPPLIED WITH POLYSEAL DUCT OPENINGS TO SUIT 4" (ID) TYPE 2 PVC DUCT.
6. VAULT TO BE SUPPLIED WITH PULLING EYES ON EACH SIDE.
7. STEEL LIDS/FRAME MUST HAVE A PROVISION FOR GROUNDING.

REV.	DATE		CHEK'D. BY
5.	SEPT 21/23	GBE LOGO UPDATED	T.X
4.	NOV. 24/06	MINOR UPDATE.	R.S.
3.	MAY 17/05	UPDATED NOTES.	R.S.
2.	MAY 31/99	ADDED POLYSEAL OPENINGS AND PULLING EYES.	R.S.
1.	NOV. 10/97	ADDED I.C.S. AS A SUPPLIER AND STYROFOAM FOR OPENINGS.	R.S.

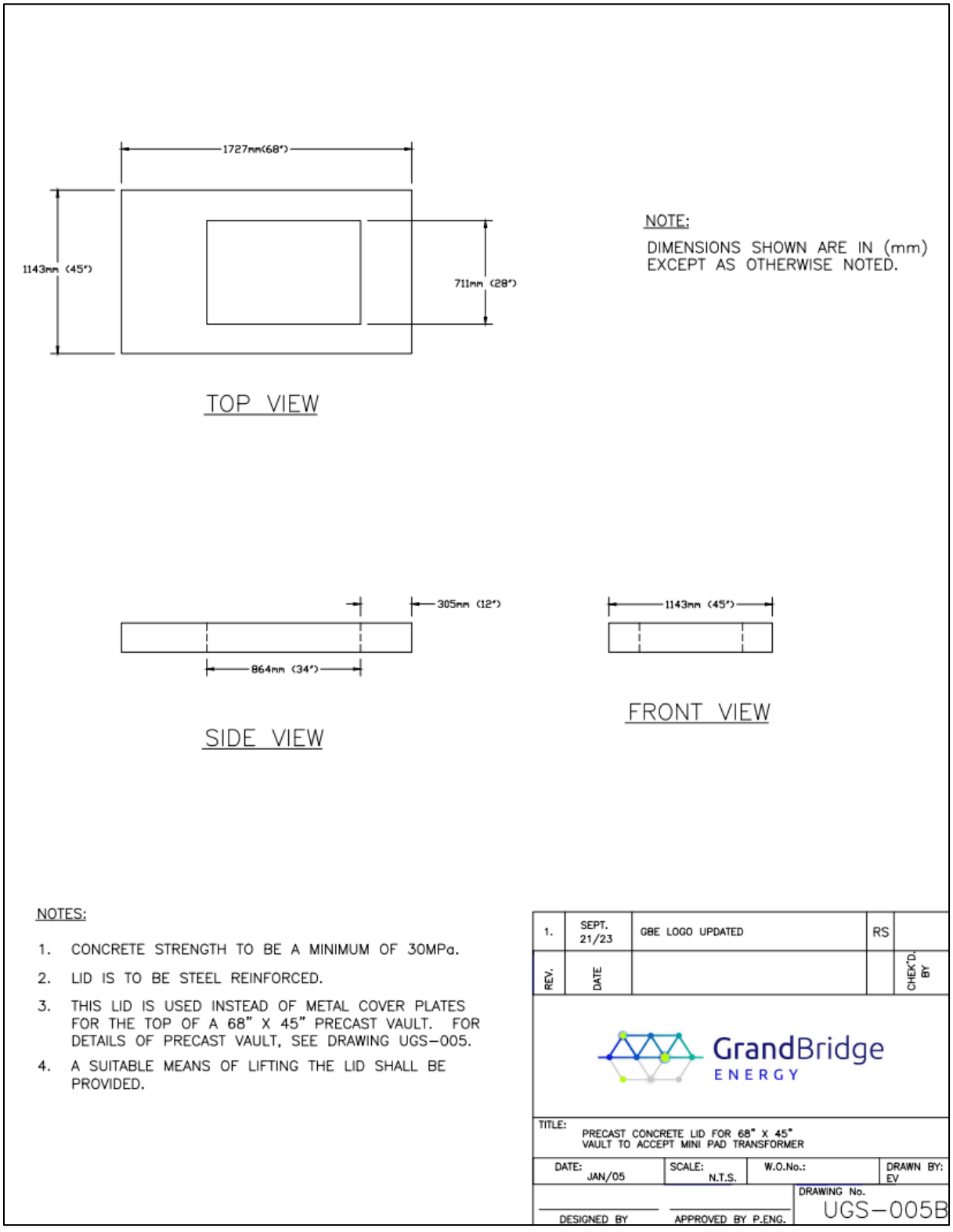
GrandBridge ENERGY

TITLE: UNDERGROUND PULLING VAULT

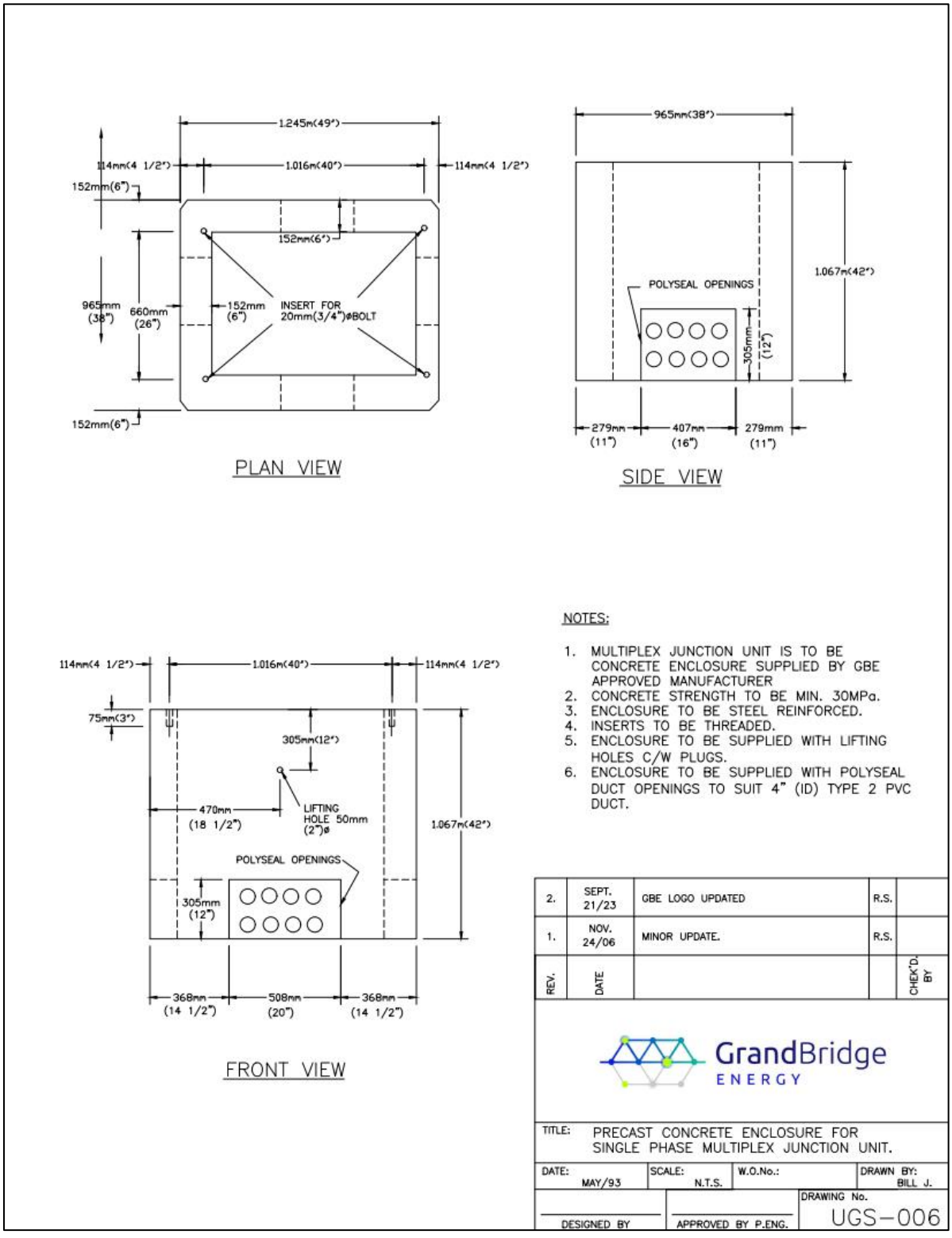
DATE:	SCALE:	W.O.No.:	DRAWN BY:
MAY/93	N.T.S.		BILL J.

DESIGNED BY | APPROVED BY P.ENG. | DRAWING No. UGS-005

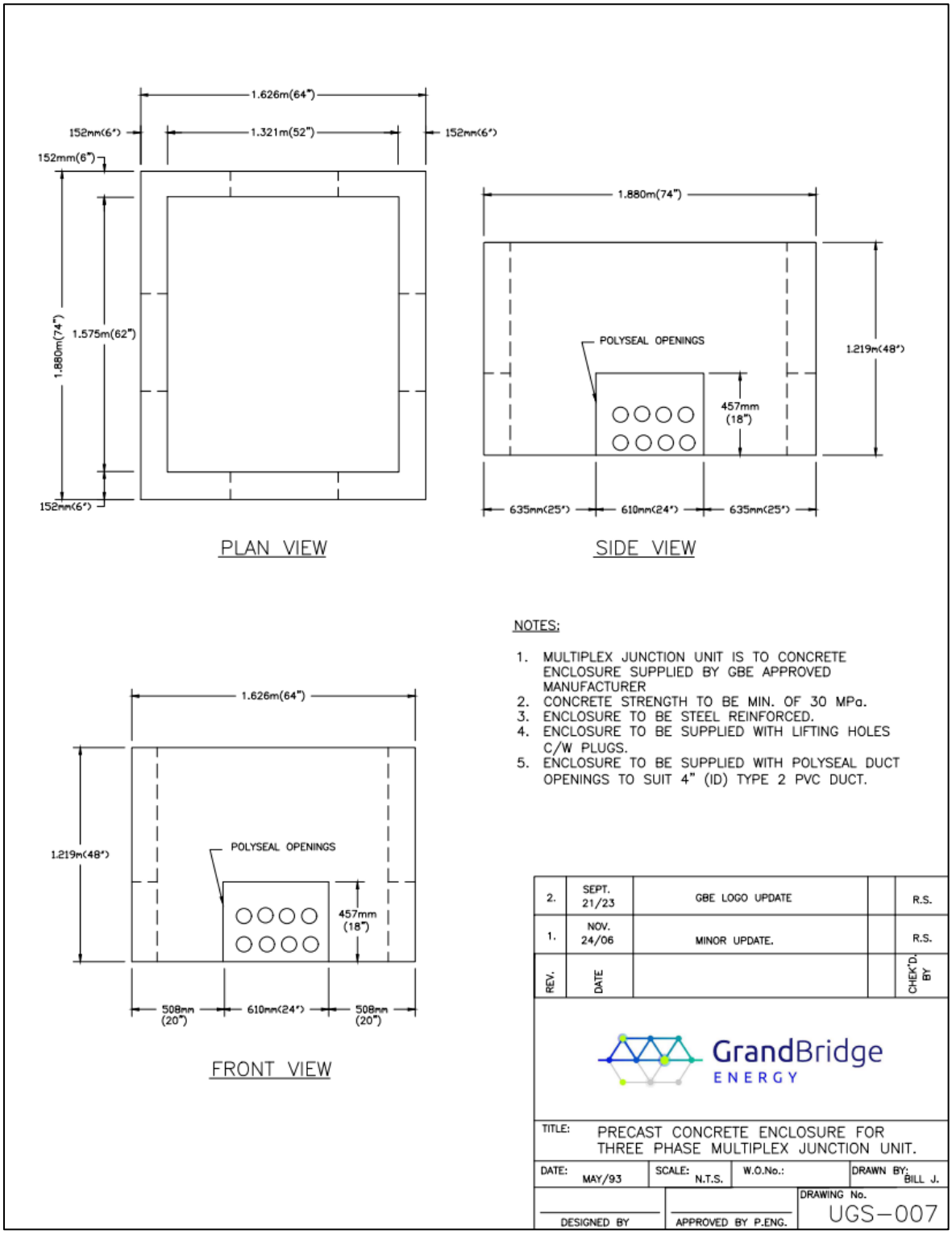
4.8 UGS-005B: Precast Concrete Lid for 68" x 45" Vault to Accept Mini-pad Transformer



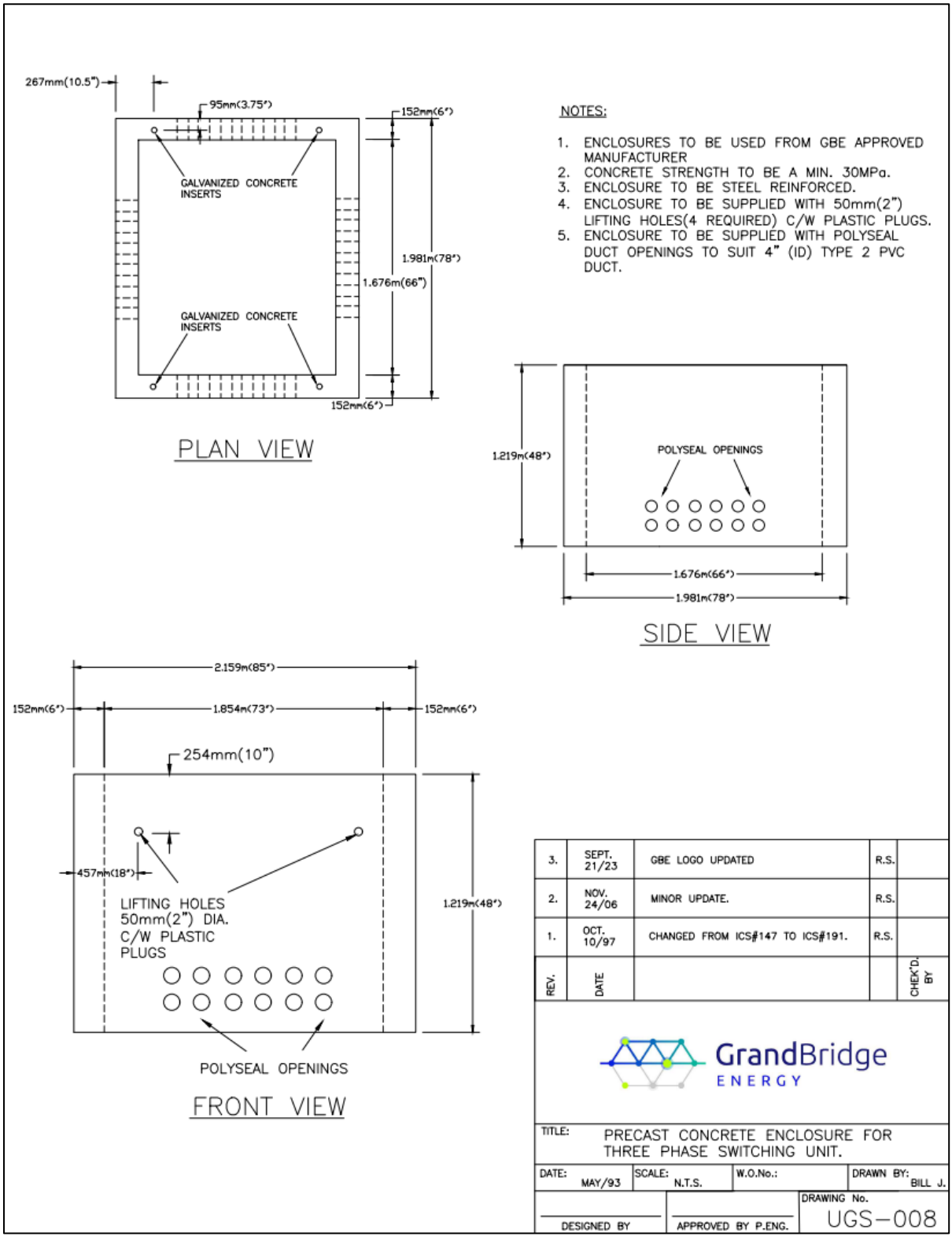
4.9 UGS-006: Precast Concrete Enclosure for Single Phase Multiplex Junction Unit



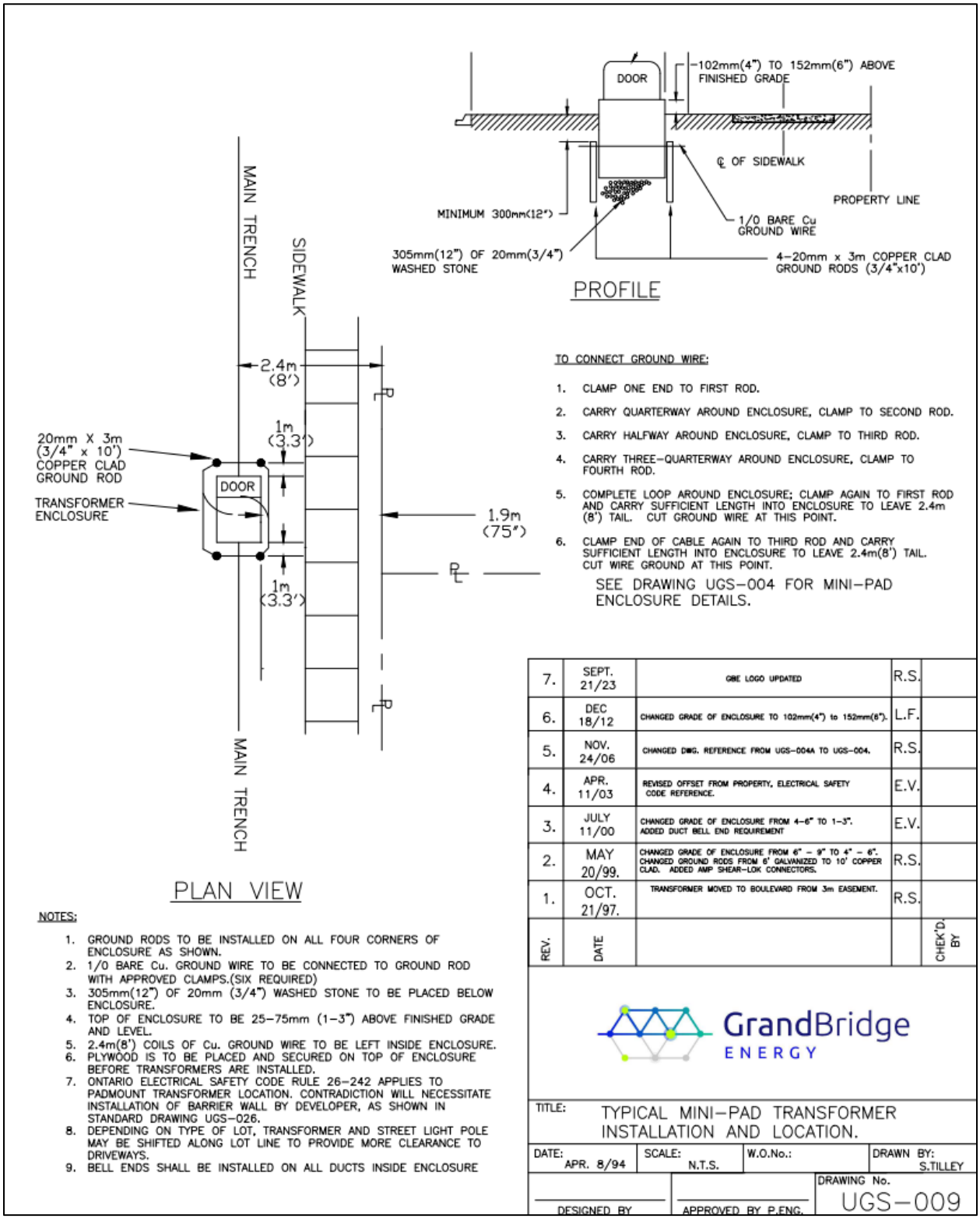
4.10 UGS-007: Precast Concrete Enclosure for Three Phase Multiplex Junction Unit



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



4.12 UGS-009: Typical Mini-pad Transformer Installation and Location



TO CONNECT GROUND WIRE:

1. CLAMP ONE END TO FIRST ROD.
2. CARRY QUARTERWAY AROUND ENCLOSURE, CLAMP TO SECOND ROD.
3. CARRY HALFWAY AROUND ENCLOSURE, CLAMP TO THIRD ROD.
4. CARRY THREE–QUARTERWAY AROUND ENCLOSURE, CLAMP TO FOURTH ROD.
5. COMPLETE LOOP AROUND ENCLOSURE; CLAMP AGAIN TO FIRST ROD AND CARRY SUFFICIENT LENGTH INTO ENCLOSURE TO LEAVE 2.4m (8') TAIL. CUT GROUND WIRE AT THIS POINT.
6. CLAMP END OF CABLE AGAIN TO THIRD ROD AND CARRY SUFFICIENT LENGTH INTO ENCLOSURE TO LEAVE 2.4m(8') TAIL. CUT WIRE GROUND AT THIS POINT.

SEE DRAWING UGS–004 FOR MINI–PAD ENCLOSURE DETAILS.

NOTES:

1. GROUND RODS TO BE INSTALLED ON ALL FOUR CORNERS OF ENCLOSURE AS SHOWN.
2. 1/0 BARE Cu. GROUND WIRE TO BE CONNECTED TO GROUND ROD WITH APPROVED CLAMPS.(SIX REQUIRED)
3. 305mm(12") OF 20mm (3/4") WASHED STONE TO BE PLACED BELOW ENCLOSURE.
4. TOP OF ENCLOSURE TO BE 25–75mm (1–3") ABOVE FINISHED GRADE AND LEVEL.
5. 2.4m(8') COILS OF Cu. GROUND WIRE TO BE LEFT INSIDE ENCLOSURE.
6. PLYWOOD IS TO BE PLACED AND SECURED ON TOP OF ENCLOSURE BEFORE TRANSFORMERS ARE INSTALLED.
7. ONTARIO ELECTRICAL SAFETY CODE RULE 26–242 APPLIES TO PADMOUNT TRANSFORMER LOCATION. CONTRADICTION WILL NECESSITATE INSTALLATION OF BARRIER WALL BY DEVELOPER, AS SHOWN IN STANDARD DRAWING UGS–026.
8. DEPENDING ON TYPE OF LOT, TRANSFORMER AND STREET LIGHT POLE MAY BE SHIFTED ALONG LOT LINE TO PROVIDE MORE CLEARANCE TO DRIVEWAYS.
9. BELL ENDS SHALL BE INSTALLED ON ALL DUCTS INSIDE ENCLOSURE

REV.	DATE		CHEK'D. BY
7.	SEPT. 21/23	GBE LOGO UPDATED	R.S.
6.	DEC 18/12	CHANGED GRADE OF ENCLOSURE TO 102mm(4") to 152mm(6").	L.F.
5.	NOV. 24/06	CHANGED DWG. REFERENCE FROM UGS–004A TO UGS–004.	R.S.
4.	APR. 11/03	REVISED OFFSET FROM PROPERTY, ELECTRICAL SAFETY CODE REFERENCE.	E.V.
3.	JULY 11/00	CHANGED GRADE OF ENCLOSURE FROM 4–6" TO 1–3". ADDED DUCT BELL END REQUIREMENT	E.V.
2.	MAY 20/99.	CHANGED GRADE OF ENCLOSURE FROM 6" – 9" TO 4" – 6". CHANGED GROUND RODS FROM 6' GALVANIZED TO 10' COPPER CLAD. ADDED AMP SHEAR–LOK CONNECTORS.	R.S.
1.	OCT. 21/97.	TRANSFORMER MOVED TO BOULEVARD FROM 3m EASEMENT.	R.S.

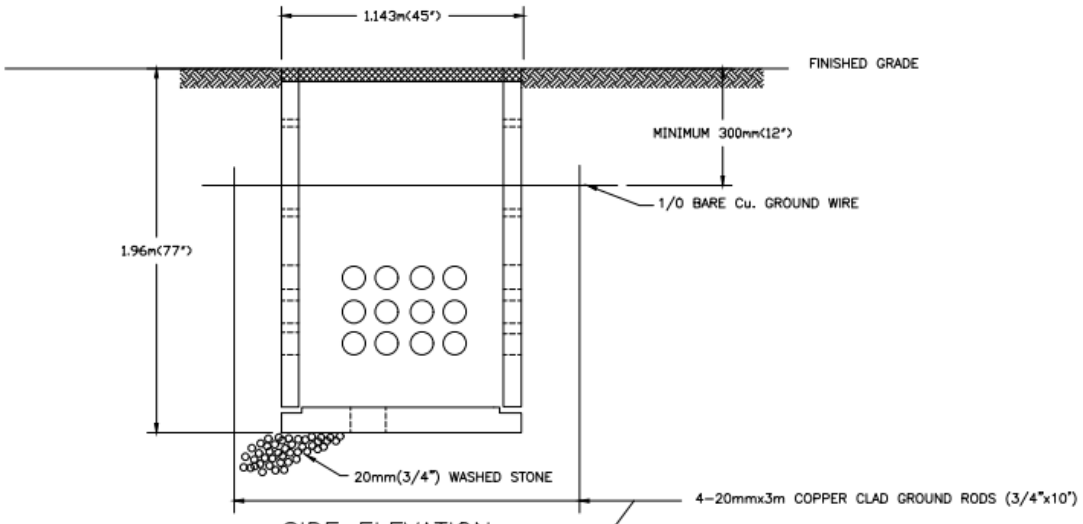
GrandBridge ENERGY

TITLE: TYPICAL MINI–PAD TRANSFORMER INSTALLATION AND LOCATION.

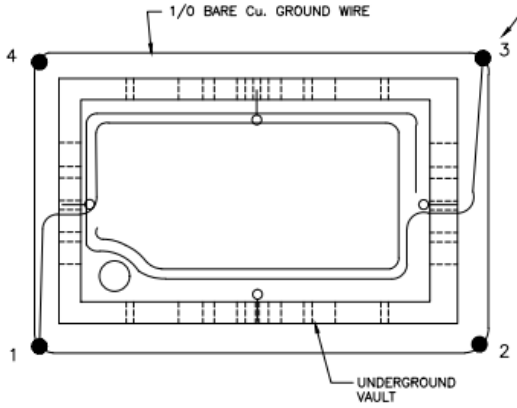
DATE:	SCALE:	W.O.No.:	DRAWN BY:
APR. 8/94	N.T.S.		S.TILLEY

DESIGNED BY | APPROVED BY P.ENG. | DRAWING No. UGS–009

4.13 UGS-010: Typical Precast Underground Vault Installation



SIDE ELEVATION



PLAN VIEW

TO CONNECT GROUND WIRE:

1. CLAMP ONE END TO FIRST ROD.
2. CARRY QUARTERWAY AROUND VAULT, CLAMP TO SECOND ROD.
3. CARRY HALFWAY AROUND VAULT, CLAMP TO THIRD ROD.
4. CARRY THREE-QUARTERWAY AROUND VAULT, CLAMP TO FOURTH ROD.
5. COMPLETE LOOP AROUND VAULT; CLAMP AGAIN TO FIRST ROD AND CARRY SUFFICIENT LENGTH INTO VAULT TO LOOP AROUND VAULT ONCE. CUT GROUND WIRE AT THIS POINT.
6. CLAMP END OF CABLE AGAIN TO THIRD ROD AND CARRY SUFFICIENT LENGTH INTO VAULT TO LOOP AROUND VAULT ONCE. CUT WIRE GROUND AT THIS POINT.

NOTES:

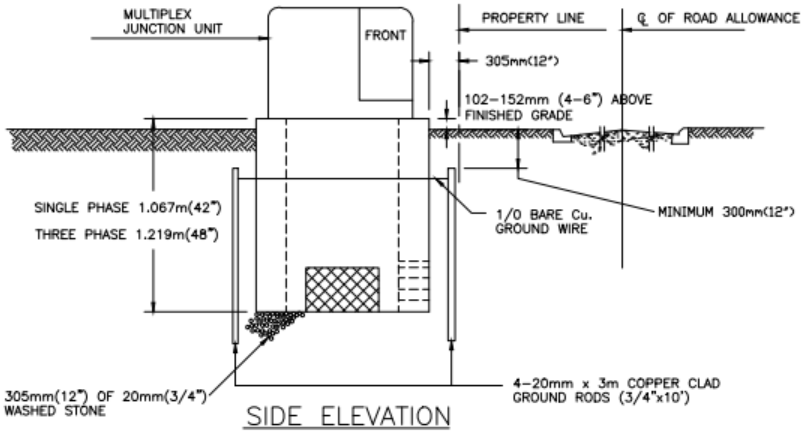
1. GROUND RODS TO BE INSTALLED 1000mm(3.3') FROM VAULT AT EACH CORNER.
2. 1/0 BARE Cu. GROUND WIRE TO BE CONNECTED TO GROUND RODS WITH APPROVED COMPRESSION OR BOLTED JOINT CLAMPS. (SIX REQUIRED)
3. 305mm(12") OF 20mm(3/4") WASHED STONE TO BE PLACED BELOW VAULT.
4. TOP OF VAULT (INCLUDING SIDEWALK COVER PLATE) TO BE AT FINISHED GRADE. IN THE CASE OF VAULTS USED WITH LIDS FOR THE PLACEMENT OF SWITCHES, THE TOP OF THE LID IS TO BE 25-75mm (1-3") ABOVE FINISHED GRADE.
5. SUFFICIENT LENGTH OF 1/0 Cu. GROUND WIRE TO BE LEFT INSIDE VAULT TO LOOP AROUND VAULT ONCE.
6. FOR LOCATION PLEASE REFER TO SUBDIVISION DESIGN DRAWINGS.
7. BELL ENDS SHALL BE INSTALLED ON ALL DUCTS INSIDE ENCLOSURE

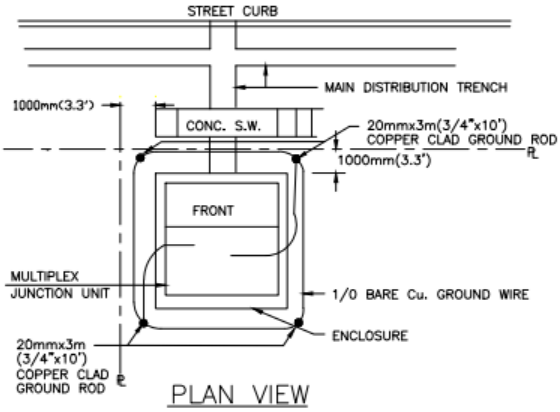
REV.	DATE			CHEK'D. BY
4.	SEPT. 21/23	GBE LOGO UPDATED. ADDED COMPRESSION CLAMPS	RS	
3.	JULY. 11/00	CHANGED GRADE OF VAULTS WITH SWITCHES FROM 4-6" to 1-3". ADDED DUCT BELL END REQ'MT	EV	
2.	MAY 20/99	CHANGED GRADE OF VAULTS WITH SWITCHES FROM 6"-9" TO 4"-6". CHANGED GROUND RODS FROM 6' GALVANIZED TO 10' COPPER CLAD. ADDED AMP SHEAR-LOK CONNECTORS. ADDED POLY SEAL OPENINGS TO VAULT.	RS	
1.	OCT. 22/97	GENERAL UPDATE	RS	

GrandBridge ENERGY

TITLE: TYPICAL PRECAST UNDERGROUND VAULT INSTALLATION.			
DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: BILL J.
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS-010	

4.14 UGS-011: Typical Three Phase Switching Unit Installation





TO CONNECT GROUND WIRE:

1. CLAMP ONE END TO FIRST ROD.
2. CARRY QUARTERWAY AROUND ENCLOSURE, CLAMP TO SECOND ROD.
3. CARRY HALFWAY AROUND ENCLOSURE, CLAMP TO THIRD ROD.
4. CARRY THREE–QUARTERWAY AROUND ENCLOSURE, CLAMP TO FOURTH ROD.
5. COMPLETE LOOP AROUND ENCLOSURE; CLAMP AGAIN TO FIRST ROD AND CARRY SUFFICIENT LENGTH INTO ENCLOSURE TO LEAVE 2.4m (8') TAIL. CUT GROUND WIRE AT THIS POINT.
6. CLAMP END OF CABLE AGAIN TO THIRD ROD AND CARRY SUFFICIENT LENGTH INTO ENCLOSURE TO LEAVE 2.4m(8') TAIL. CUT WIRE GROUND AT THIS POINT.

SEE DRAWING UGS–006 AND UGS–007 FOR SINGLE AND THREE PHASE ENCLOSURE DETAILS

NOTES:

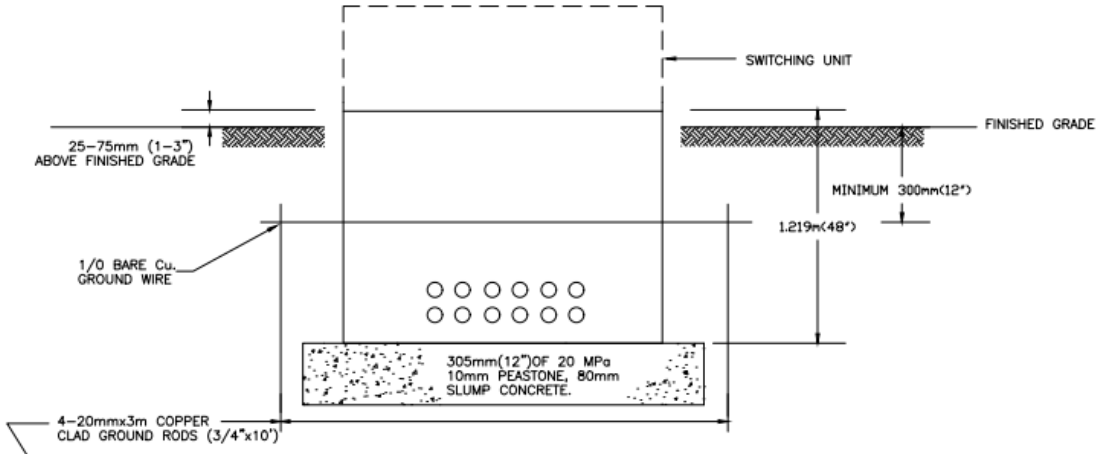
1. GROUND RODS TO BE INSTALLED 1000mm(3.3') FROM ENCLOSURE AT EACH CORNER.
2. 1/0 BARE Cu. GROUND WIRE TO BE CONNECTED TO GROUND ROD WITH APPROVED COMPRESSION OR BOLTED JOINT CLAMPS.(SIX REQUIRED)
3. 305mm(12") OF 20mm (3/4") WASHED STONE TO BE PLACED BELOW ENCLOSURE.
4. TOP OF ENCLOSURE TO BE 102mm(4") TO 152mm(6") ABOVE FINISHED GRADE.
5. 2.4m(8') COILS OF Cu. GROUND WIRE TO BE LEFT INSIDE ENCLOSURE.
6. PLYWOOD IS TO BE PLACED AND SECURED ON TOP OF ENCLOSURE BEFORE JUNCTION IS INSTALLED.
7. BELL ENDS ARE TO BE INSTALLED ON ALL DUCTS INSIDE ENCLOSURE.

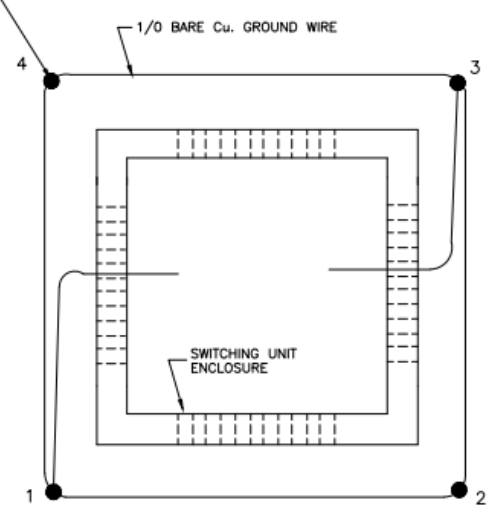
REV.	DATE			CHEK'D. BY
6.	SEPT. 21/23	GBE LOGO UPDATED, SPECS UPDATED TO ACCEPT COMPRESSION CLAMPS	RS	
5.	DEC. 13/12	CHANGED GRADE OF ENCLOSURE FROM 1–3" TO 4–6"	LF	
4.	APR. 11/03	Revised notes to make consistent with drawing	EV	
3.	JUL. 11/00	CHANGED GRADE OF ENCLOSURE FROM 4–6" to 1–3"	EV	
2.	MAY 20/99	CHANGED GRADE OF ENCLOSURE FROM 6"–9" TO 4"–6". CHANGED GROUND RODS FROM 6' GALVANIZED TO 10' COPPER CLAD. ADDED AMP SHEAR–LOK CONNECTORS. ADDED NOTE ABOUT BELL ENDS.	RS	
1.	OCT. 20/97	GENERAL UPDATE	RS	

GrandBridge ENERGY

TITLE:	TYPICAL SINGLE PHASE AND THREE PHASE MULTIPLEX JUNCTION UNIT INSTALLATION & LOCATION		
DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: BILL J.
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No.	UGS–011

4.15 UGS-012: Typical Three Phase Switching Unit Installation





TO CONNECT GROUND WIRE:

1. CLAMP ONE END TO FIRST ROD.
2. CARRY QUARTERWAY AROUND ENCLOSURE, CLAMP TO SECOND ROD.
3. CARRY HALFWAY AROUND ENCLOSURE, CLAMP TO THIRD ROD.
4. CARRY THREE–QUARTERWAY AROUND ENCLOSURE, CLAMP TO FOURTH ROD.
5. COMPLETE LOOP AROUND ENCLOSURE; CLAMP AGAIN TO FIRST ROD AND CARRY SUFFICIENT LENGTH INTO ENCLOSURE TO LEAVE 3.6m (12') TAIL. CUT GROUND WIRE AT THIS POINT.
6. CLAMP END OF CABLE AGAIN TO THIRD ROD AND CARRY SUFFICIENT LENGTH INTO ENCLOSURE TO LEAVE 3.6m(12') TAIL. CUT WIRE GROUND AT THIS POINT.

NOTES:

1. GROUND RODS TO BE INSTALLED 1000mm(3.3') FROM ENCLOSURE AT EACH CORNER.
2. 1/0 BARE Cu. GROUND WIRE TO BE CONNECTED TO GROUND RODS WITH APPROVED COMPRESSION AND BOLTED JOINT CLAMPS.(SIX REQUIRED)
3. 3.6m(12') COILS OF Cu. GROUND WIRE TO BE LEFT INSIDE ENCLOSURE.
4. 305mm(12") OF 20 MPa 10mm PEASTONE CONCRETE, WINTER HANDLING WHEN REQUIRED, TO BE PLACED BELOW ENCLOSURE.
5. TOP OF ENCLOSURE TO BE 100mm(4") TO 150mm(6") ABOVE FINISHED GRADE.
6. PLYWOOD IS TO BE PLACED AND SECURED ON TOP OF ENCLOSURE BEFORE SWITCHING UNIT IS INSTALLED.
7. BELL ENDS ARE TO BE INSTALLED ON ALL DUCTS INSIDE ENCLOSURE.

SEE DRAWING UGS–008 FOR ENCLOSURE DETAILS.

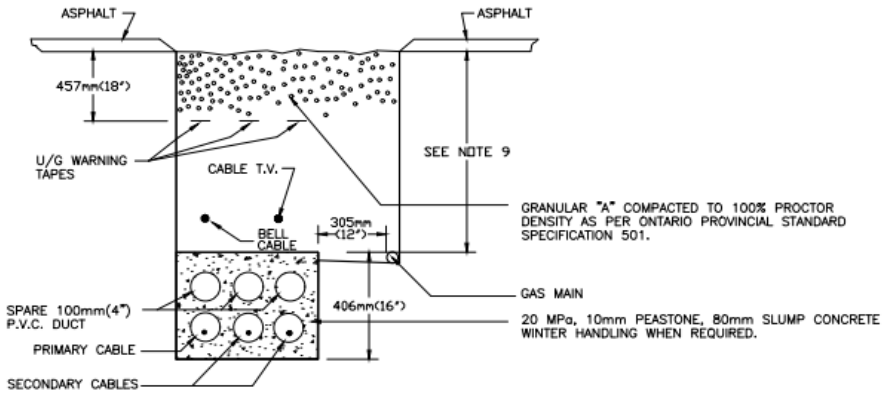
REV.	DATE			CHEK'D. BY
4.	SEPT. 21/23	GBE LOGO, COMPRESSION CLAMP ADDED	RS	
3.	JUL. 11/00	CHANGED GRADE OF ENCLOSURE FROM 4–6" to 1–3".	EV	
2.	MAY 20/99	CHANGED GRADE OF ENCLOSURE FROM 6"–9" TO 4–6". CHANGED GROUND RODS FROM 6' GALVANIZED TO 10' COPPER CLAD. ADDED AMP SHEAR–LOK CONNECTORS. ADDED NOTE ABOUT BELL ENDS.	RS	
1.	OCT. 22/97	GENERAL UPDATE	RS	

GrandBridge ENERGY

TITLE: TYPICAL THREE PHASE SWITCHING UNIT INSTALLATION.			
DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: BILL J.
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS–012	

4.16 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 (IE. 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 (ie. BELL, ROGERS, HYDRO) (GAS IS NOT JOINT USE).
CITY OF BRANTFORD – MIN. 900mm (36") TO MOST SHALLOW UTILITY (ie. BELL, ROGERS, HYDRO) (GAS IS NOT JOINT USE).
FOLLOW OHSA FOR TRENCH DEPTHS/SHORING ETC.

REV.	DATE			CHEK'D. BY
7.	SEPT. 21/23	GBE LOGO UPDATED	RS	
6.	JAN. 12/18	REVISED MINIMUM COVER FOR ADDITION OF BRANT COUNT 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	

GrandBridge ENERGY

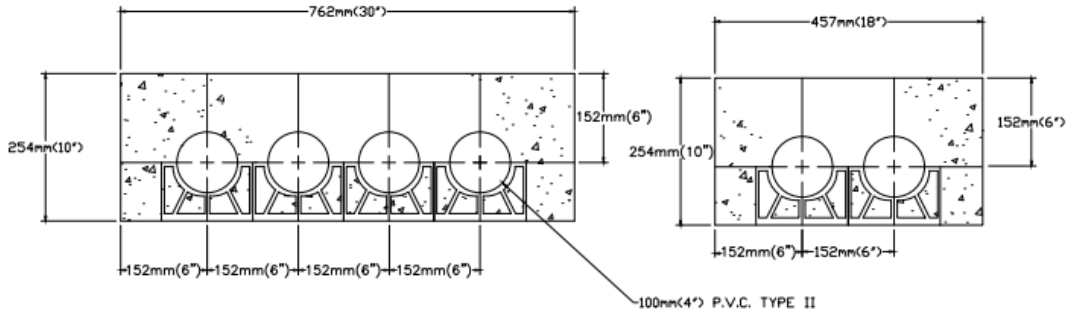
TITLE: HYDRO CROSSING UNDER ROADWAY– CONCRETE ENCASED DUCT STRUCTURE.

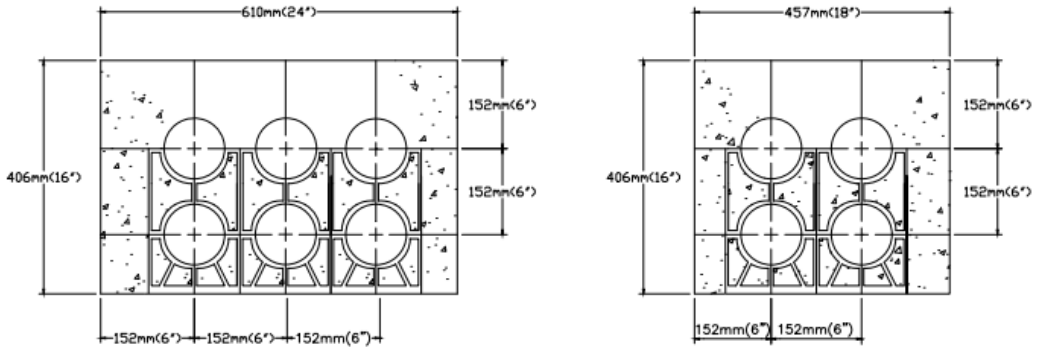
DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: BILL J.
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS–013	

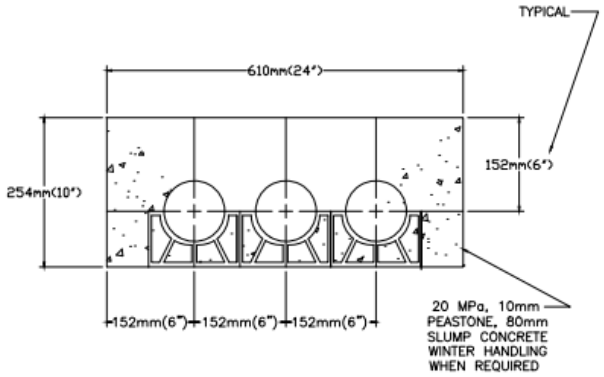
4.17 UGS-014: Typical Concrete Encased Duct Structure

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.







REV.	DATE			CHEK'D. BY
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	

GrandBridge ENERGY

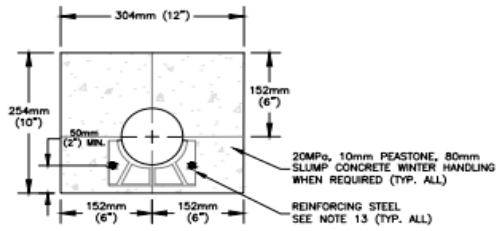
TITLE: TYPICAL CONCRETE ENCASED DUCT STRUCTURE

DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S. TILLEY
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS–014	

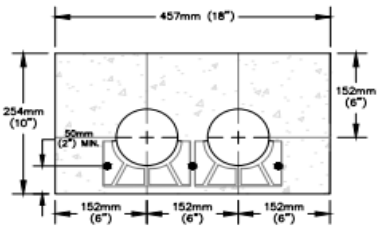
4.18 UGS-014A: Typical Concrete Encased Duct Structures with Reinforcement – 1 to 5 Ducts

NOTES

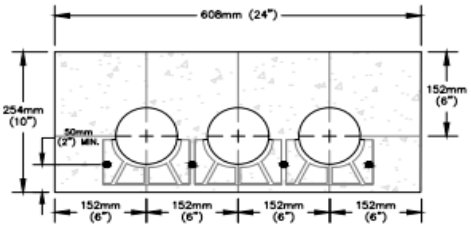
1. DUCT BANK TO HAVE COVER AS SPECIFIED ON DRAWINGS UGS–013 & UGS–015 & TO BE GRADED TOWARDS THE CURB.
2. DUCT TO BE 100mm(4") DB2/ES2 TYPE II PVC PER CSA 22.2 NO.211.1 (LATEST REVISION)
3. ALL DUCT CONNECTIONS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS. WAIT MINIMUM 30 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.



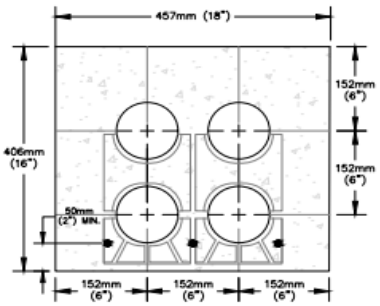
1 DUCT – 1W1H



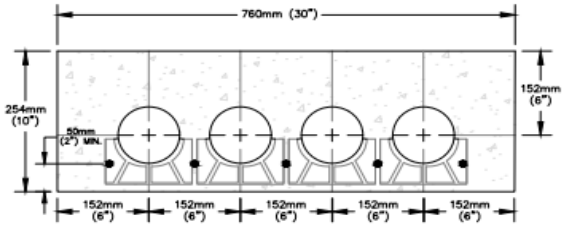
2 DUCTS – 2W1H



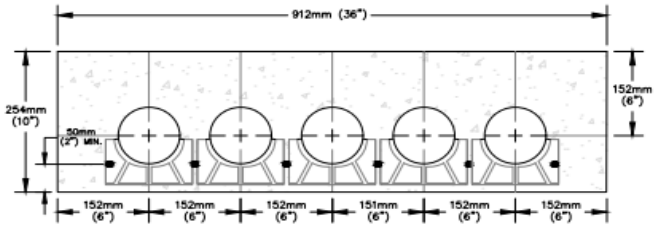
3 DUCTS – 3W1H



4 DUCTS – 2W2H



4 DUCTS – 4W1H



5 DUCTS – 5W1H

0	JUN. 23/15	ADD REINFORCEMENT BARS TO STANDARD DETAIL		SF

GrandBridge ENERGY

TITLE: TYPICAL CONCRETE ENCASED DUCT STRUCTURES WITH REINFORCEMENT – 1 TO 5 DUCTS

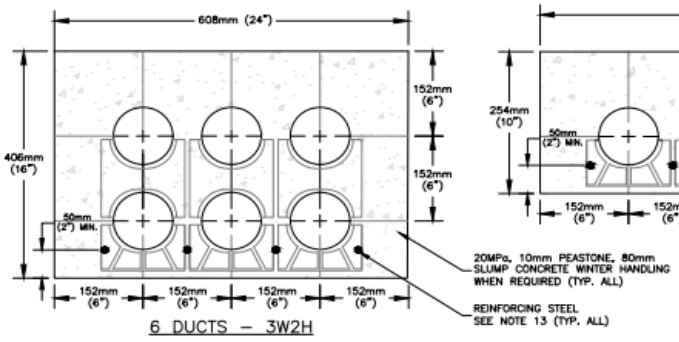
DATE:	SCALE:	W.O.No.:	DRAWN BY:
JUNE/23	N.T.S.		S. FREIHAUT

S. FREIHAUT	P.Eng.	DRAWING No.
DESIGNED BY	APPROVED BY P.ENG.	UGS–014–A

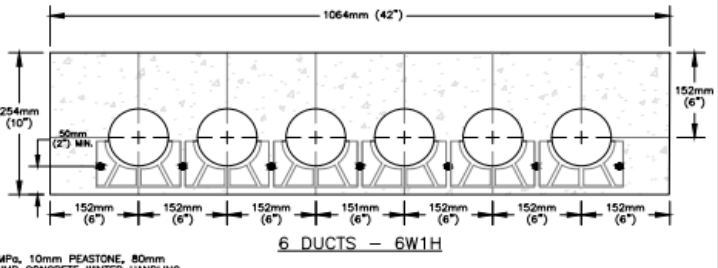
4.19 UGS-014B: Typical Concrete Encased Duct Structures with Reinforcement – 6 to 12 Ducts

NOTES

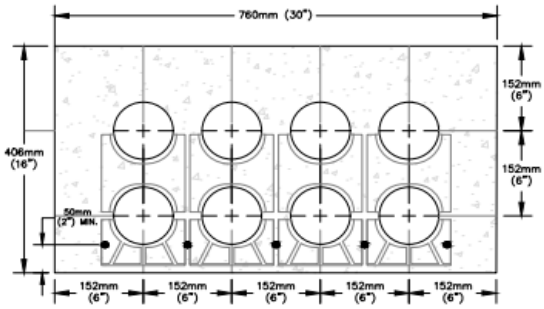
1. DUCT BANK TO HAVE COVER AS SPECIFIED ON DRAWINGS UGS-013 & UGS-015 & TO BE GRADED TOWARDS THE CURB.
2. DUCT TO BE 100mm(4") DB2/ES2 TYPE II PVC PER CSA 22.2 NO.211.1 (LATEST REVISION)
3. ALL DUCT CONNECTIONS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS. WAIT MINIMUM 30 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.



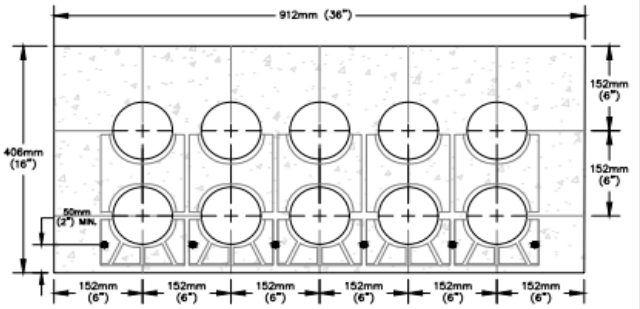
6 DUCTS – 3W2H



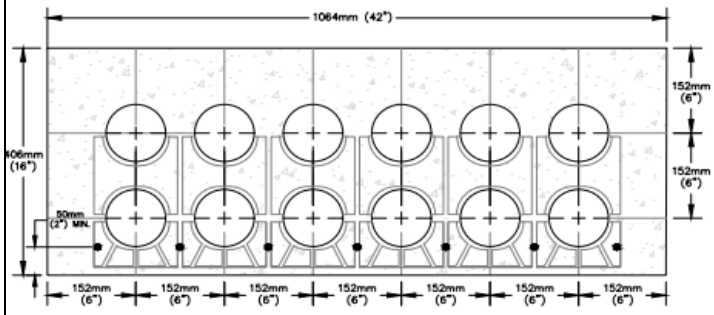
6 DUCTS – 6W1H



8 DUCTS – 4W2H



10 DUCTS – 5W2H



12 DUCTS – 6W2H

0	JUN. 23/15	ADD REINFORCEMENT BARS TO STANDARD DETAIL		SF

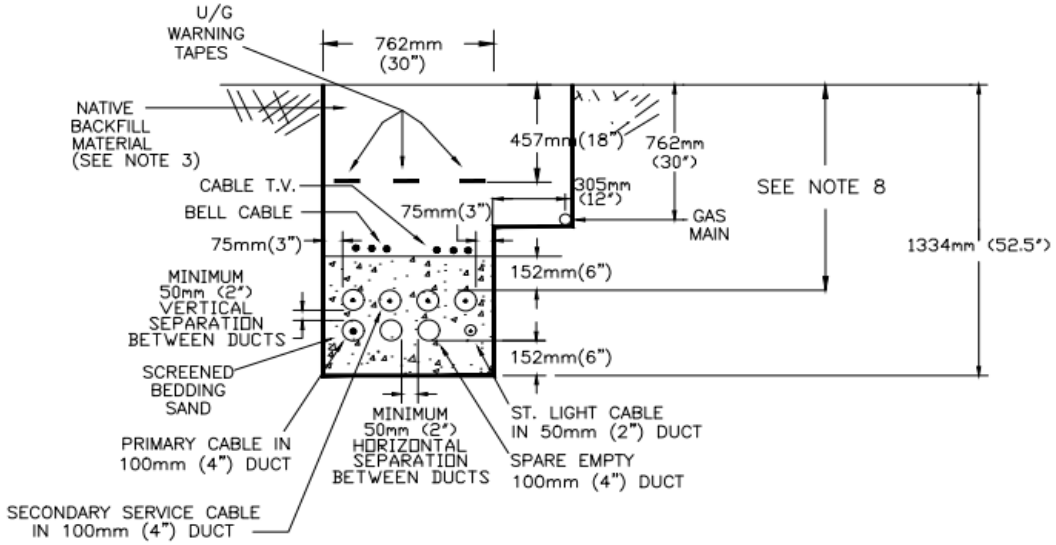
GrandBridge ENERGY

TITLE: TYPICAL CONCRETE ENCASED DUCT STRUCTURES WITH REINFORCEMENT – 6 TO 12 DUCTS

DATE:	SCALE:	W.O.No.:	DRAWN BY:
JUNE/23	N.T.S.		S. FREIHAUT

S. FREIHAUT	P.Eng.	DRAWING No.
DESIGNED BY	APPROVED BY P.ENG.	UGS-014-B

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



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 (IE. HYDRO PART OF TRENCH ONLY).

NOTES

1) DEPTH OF ALL DUCTS TO BE AS INDICATED IN DETAIL/NOTES.
2) ALL DUCTS TO HAVE 152mm(6") OF CLEAN BEDDING SAND BELOW AND 152mm(6") ABOVE DUCTS.
3) NATIVE BACKFILL MATERIAL TO BE COMPACTED TO 98% PROCTOR DENSITY AS PER ONTARIO PROVINCIAL STANDARD SPECIFICATION 501.
4) SAND SHALL BE SCREENED BEDDING APPROVED BY GBE.
5) ALL CABLES ARE TO BE INSTALLED IN DIRECT BURIED DUCT (1 CABLE PER DUCT, 100mm DUCT FOR PRIMARY AND SECONDARY, 50mm DUCT FOR STREET LIGHTING).
6) ONE SPARE 100mm DUCT IS TO BE PLACED IN ALL TRENCHES. IN ADDITION, ONE SPARE 100mm DUCT IS TO BE PLACED FOR EACH PRIMARY CABLE IN THE TRENCH.
7) ALL DUCT CONNECTIONS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS. 8)CITY OF CAMBRIDGE AND TOWNSHIP OF NORTH DUMFRIES –MIN. 914mm (36") TO THE TOP OF GBE DUCT. BRANT COUNTY – MIN. 1000mm (39") TO MOST SHALLOW UTILITY (ie. BELL, ROGERS, HYDRO) (GAS IS NOT JOINT USE). CITY OF BRANTFORD – MIN. 900mm (36") TO MOST SHALLOW UTILITY (ie. BELL, ROGERS, HYDRO) (GAS IS NOT JOINT USE).

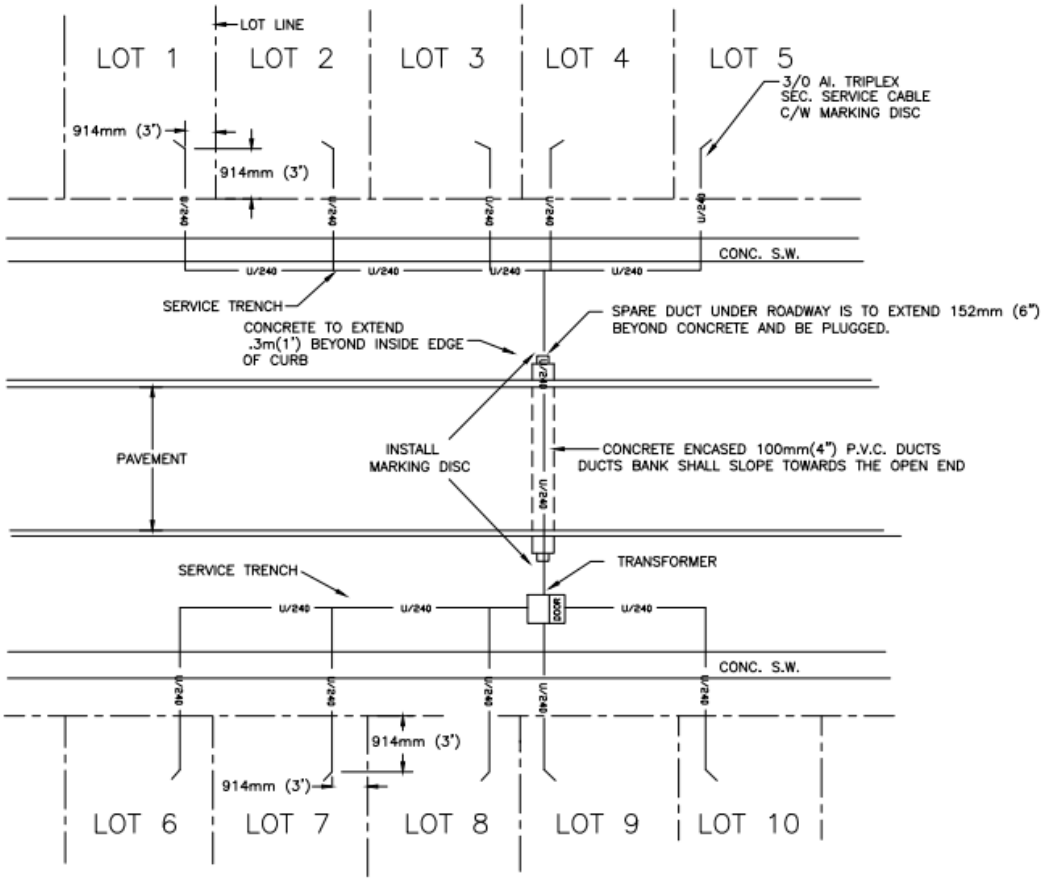
REV.	DATE			CHEK'D. BY
7.	SEPT. 21/23	GBE LOGO UPDATED	RS	
6.	JAN. 12/18	REVISED DEPTH OF DUCTS FOR ADDITION OF BRANT COUNTY AND CITY OF BRANTFORD.	STW	
5.	NOV. 24/06	ADDED WARNING TAPE INFORMATION.	RS	
4.	APR. 11/03	Revised Sand Specification and Gas Plant Depth	EV	
3.	NOV. 22/00	REVISED GAS LOCATION	ST	
2.	MAY 10/00	ADDED JOINT USE TRENCH WITH GAS.	RS	
1.	OCT. 22/97	COMPLETE UPDATE	RS	

GrandBridge ENERGY

TITLE: TYPICAL TRENCH SECTIONS SHOWING HYDRO, BELL, CABLE T.V. & GAS

DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S. TILLEY
ENGINEERING DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS–015	

4.21 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.

REV.	DATE		CHEK'D. BY
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

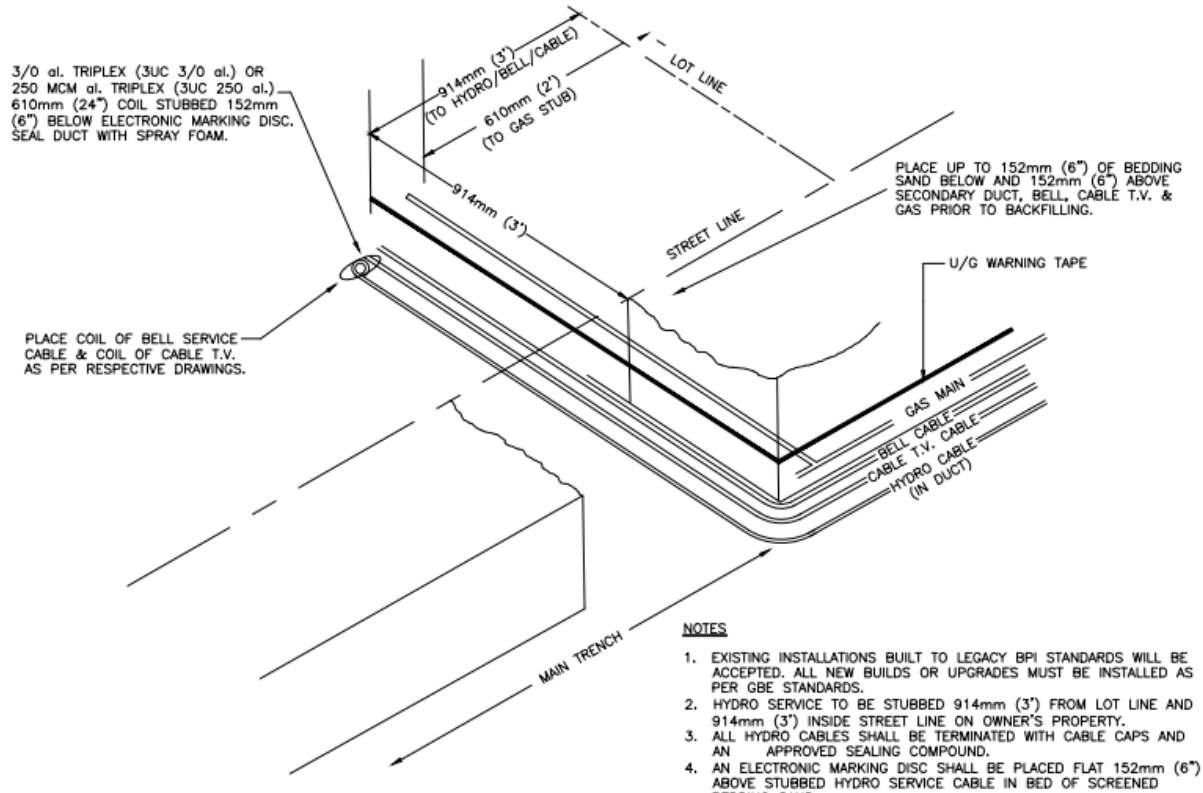
GrandBridge ENERGY

TITLE: TYPICAL SERVICING LAYOUT.

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

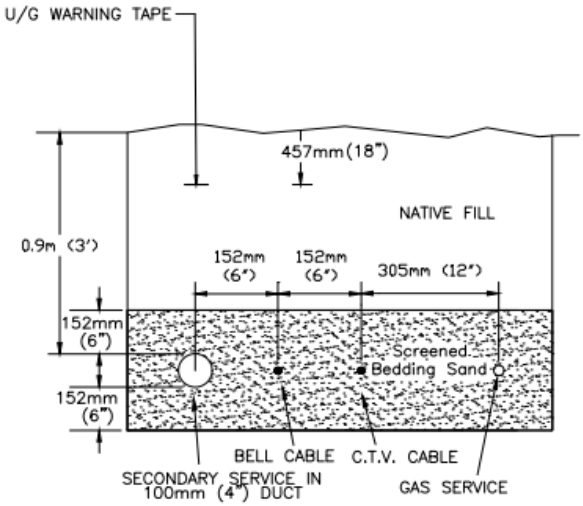
DESIGNED BY | APPROVED BY P.ENG. | DRAWING No. UGS-016

4.22 UGS-017: Typical Termination of Services on Property



NOTES

1. EXISTING INSTALLATIONS BUILT TO LEGACY BPI STANDARDS WILL BE ACCEPTED. ALL NEW BUILDS OR UPGRADES MUST BE INSTALLED AS PER GBE STANDARDS.
2. HYDRO SERVICE TO BE STUBBED 914mm (3') FROM LOT LINE AND 914mm (3') INSIDE STREET LINE ON OWNER'S PROPERTY.
3. ALL HYDRO CABLES SHALL BE TERMINATED WITH CABLE CAPS AND AN APPROVED SEALING COMPOUND.
4. AN ELECTRONIC MARKING DISC SHALL BE PLACED FLAT 152mm (6") ABOVE STUBBED HYDRO SERVICE CABLE IN BED OF SCREENED BEDDING SAND.
5. CAUTION TO BE TAKEN WHEN PLACING THE ELECTRONIC MARKING DISC SO THAT IT IS NOT IN CONTACT WITH ANY CABLES.
6. MAINTAIN A MINIMUM OF 914mm (3') OF COVER OVER DUCTS.
7. GAS SERVICE SHALL BE LOCATED ON THE SIDE OF TRENCH CLOSEST TO THE PROPERY LINE.



CROSS SECTION – SERVICE TRENCH FROM MAIN TRENCH TO SERVICE STUB

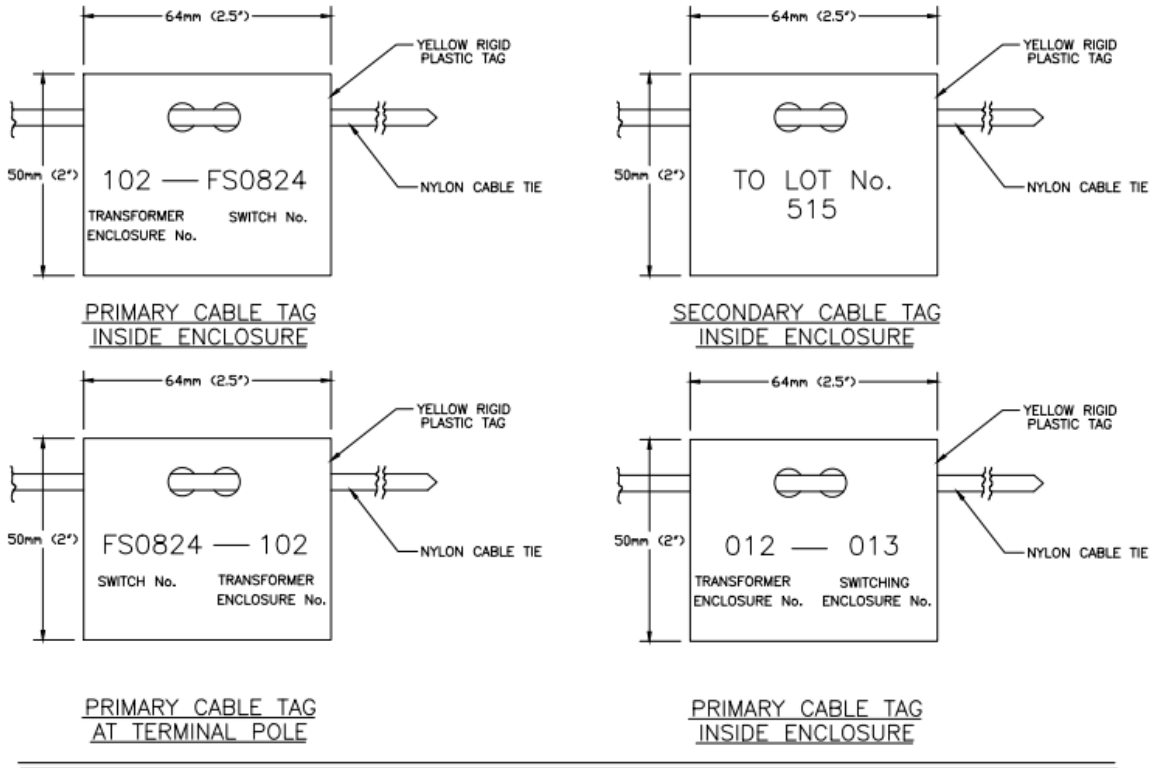
REV.	DATE			CHEK'D. BY
6.	SEPT. 21/23.	GBE LOGO UPDATED	RS	
5.	APR. 25/11.	ADDED NOTE ABOUT USING SPRAY FOAM TO SEAL DUCT	ST	
4.	NOV. 10/06	GENERAL UPDATE	PG	
3.	NOV. 24/03	CHANGED REFERENCE TO MASONRY SAND, ADDED NOTE 6.	EV	
2.	MAY 10/00	ADDED JOINT USE TRENCH WITH GAS.	RS	
1.	OCT. 23/97	REVISED CABLE LOCATIONS.	RS	

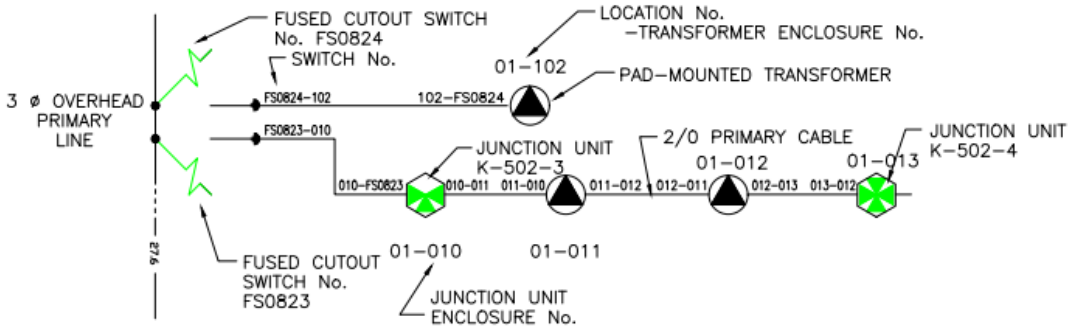
GrandBridge ENERGY

TITLE: TYPICAL TERMINATION OF SERVICES ON PROPERTY

DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S. TILLEY
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS–017	

4.23 UGS-018: Cable Identification and Tagging





EXAMPLE OF PRIMARY SCHEMATIC SHOWING NUMBERING SYSTEM

NOTES:
1) ALL TAGS TO BE YELLOW RIGID PLASTIC.
2) ALL TAG SIZES TO BE 50mm X 64mm (2" X 2.5")
3) ALL PRIMARY & SECONDARY CABLES LEFT IN ENCLOSURES ARE TO BE IDENTIFIED AND TAGGED.
4) ALL PRIMARY CABLES COILED AT TERMINAL POLES ARE TO BE IDENTIFIED AND TAGGED.
5) ALL TAGS ARE TO BE PERMANENTLY AFFIXED TO THE CABLES USING NYLON CABLE TIES.
6) TAGS ARE TO BE MARKED USING A WATERPROOF AND FADEPROOF MARKER.

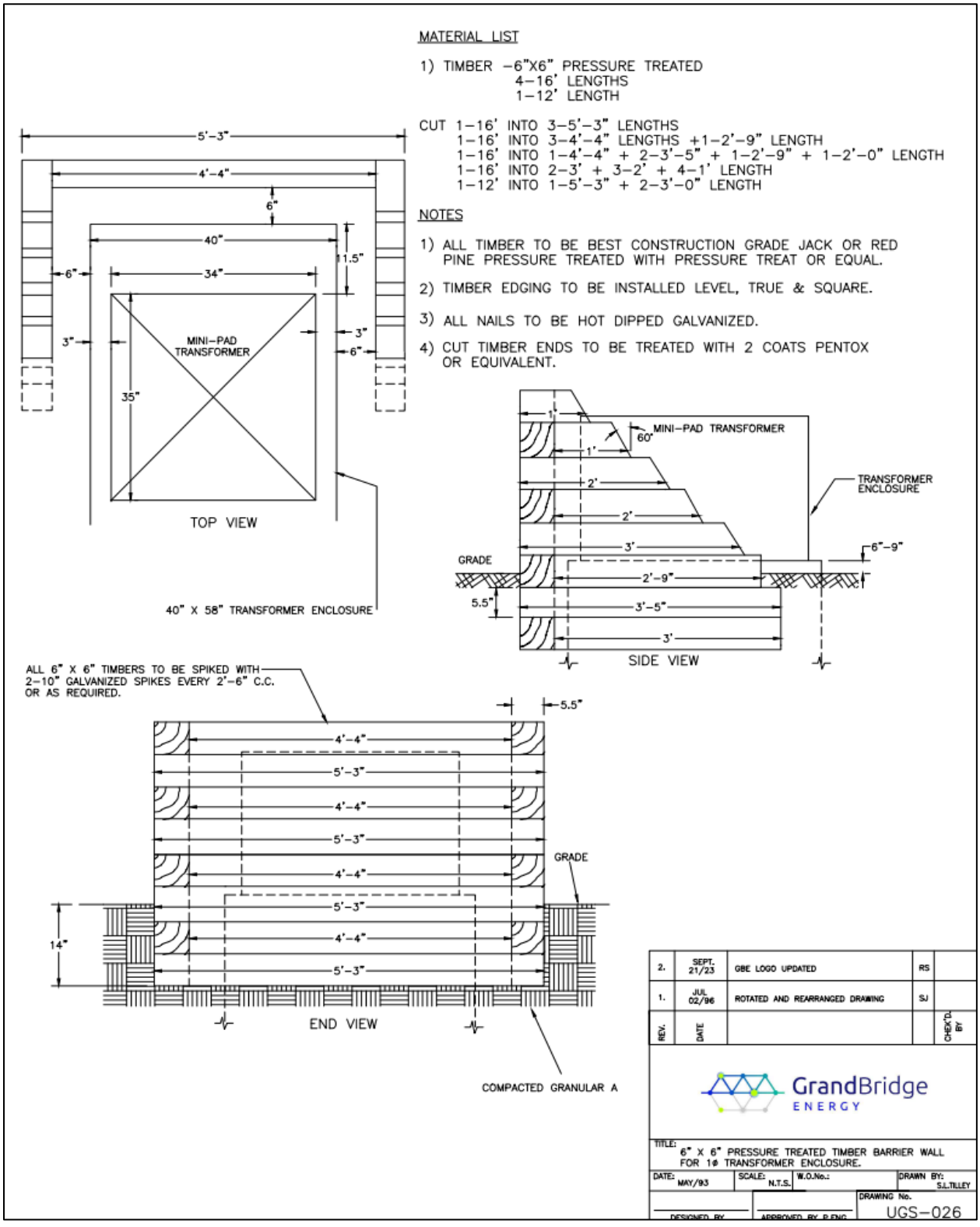
REV.	DATE		CHEK'D. BY
2.	SEPT. 21/23	GBE LOGO UPDATED	RS
1.	OCT. 23/97	GENERAL UPDATE	RS

GrandBridge ENERGY

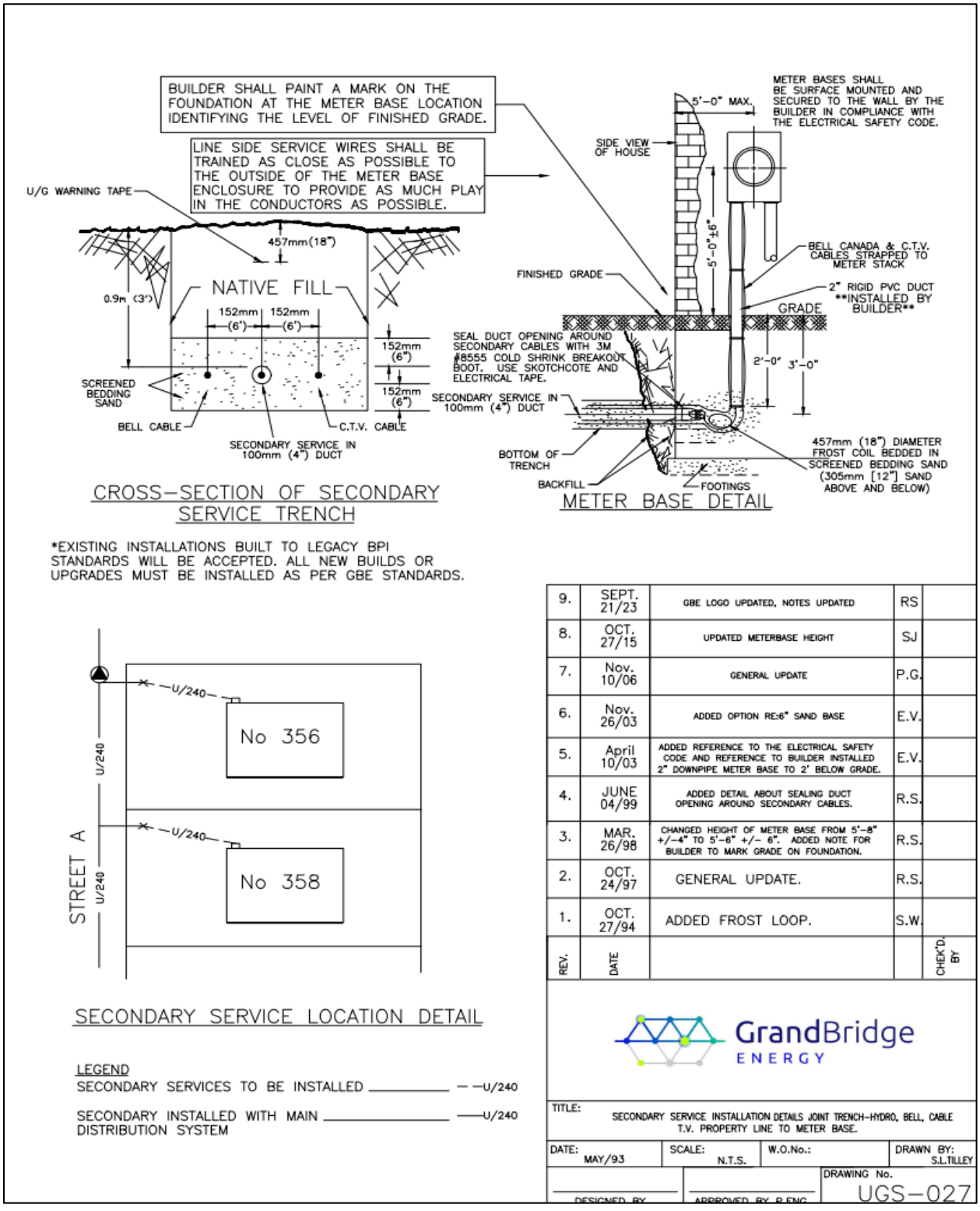
TITLE: CABLE IDENTIFICATION AND TAGGING

DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S. TILLEY
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS–018	

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



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



*EXISTING INSTALLATIONS BUILT TO LEGACY BPI STANDARDS WILL BE ACCEPTED. ALL NEW BUILDS OR UPGRADES MUST BE INSTALLED AS PER GBE STANDARDS.

SECONDARY SERVICE LOCATION DETAIL

LEGEND
SECONDARY SERVICES TO BE INSTALLED ——— — —U/240
SECONDARY INSTALLED WITH MAIN DISTRIBUTION SYSTEM ——— ——U/240

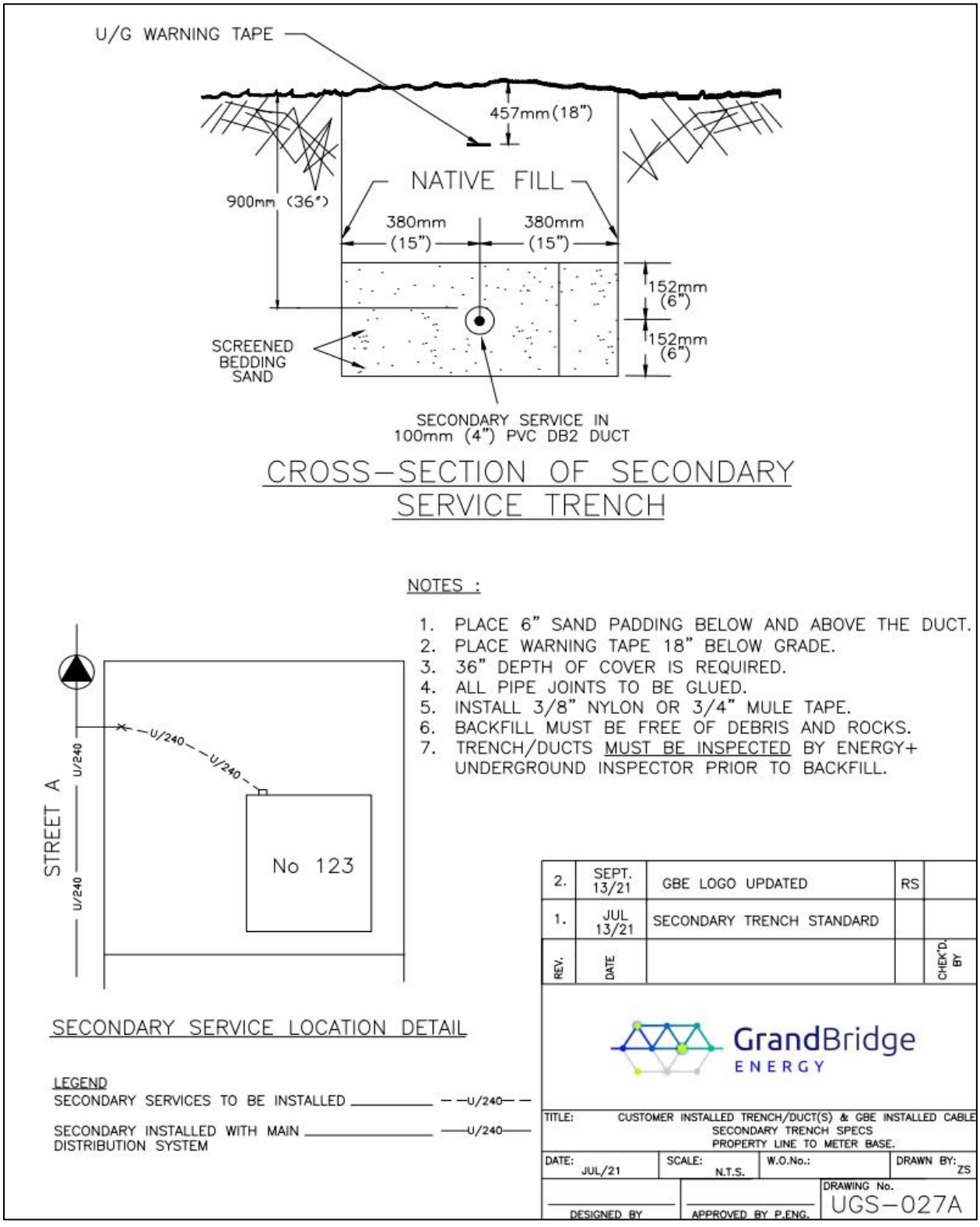
REV.	DATE			CHEK'D. BY
9.	SEPT. 21/23	GBE LOGO UPDATED, NOTES UPDATED	RS	
8.	OCT. 27/15	UPDATED METERBASE HEIGHT	SJ	
7.	Nov. 10/06	GENERAL UPDATE	P.G.	
6.	Nov. 26/03	ADDED OPTION RE:6" SAND BASE	E.V.	
5.	April 10/03	ADDED REFERENCE TO THE ELECTRICAL SAFETY CODE AND REFERENCE TO BUILDER INSTALLED 2" DOWNPIPE METER BASE TO 2' BELOW GRADE.	E.V.	
4.	JUNE 04/99	ADDED DETAIL ABOUT SEALING DUCT OPENING AROUND SECONDARY CABLES.	R.S.	
3.	MAR. 26/98	CHANGED HEIGHT OF METER BASE FROM 5'-8" +/-4" TO 5'-6" +/- 6". ADDED NOTE FOR BUILDER TO MARK GRADE ON FOUNDATION.	R.S.	
2.	OCT. 24/97	GENERAL UPDATE.	R.S.	
1.	OCT. 27/94	ADDED FROST LOOP.	S.W.	

GrandBridge ENERGY

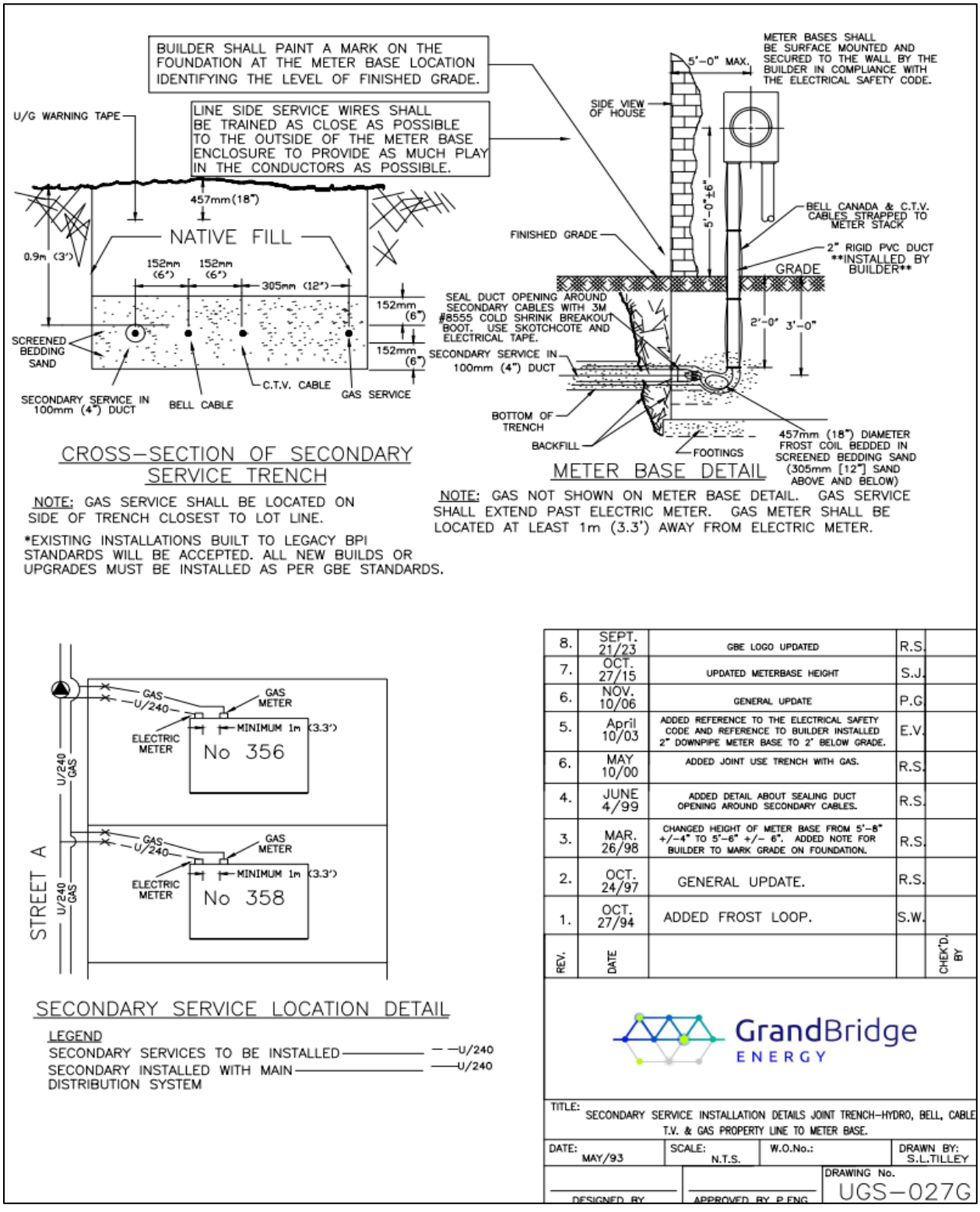
TITLE: SECONDARY SERVICE INSTALLATION DETAILS JOINT TRENCH-HYDRO, BELL, CABLE T.V. PROPERTY LINE TO METER BASE.

DATE: MAY/93	SCALE: N.T.S.	W.O.No.:	DRAWN BY: S.L.TILLEY
DESIGNED BY	APPROVED BY P.ENG	DRAWING No. UGS-027	

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



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



REV.	DATE		CHEK'D. BY
8.	SEPT. 21/23	GBE LOGO UPDATED	R.S.
7.	OCT. 27/15	UPDATED METERBASE HEIGHT	S.J.
6.	NOV. 10/06	GENERAL UPDATE	P.G.
5.	April 10/03	ADDED REFERENCE TO THE ELECTRICAL SAFETY CODE AND REFERENCE TO BUILDER INSTALLED 2" DOWNPIPE METER BASE TO 2' BELOW GRADE.	E.V.
6.	MAY 10/00	ADDED JOINT USE TRENCH WITH GAS.	R.S.
4.	JUNE 4/99	ADDED DETAIL ABOUT SEALING DUCT OPENING AROUND SECONDARY CABLES.	R.S.
3.	MAR. 26/98	CHANGED HEIGHT OF METER BASE FROM 5'-8" +/-4" TO 5'-6" +/- 6". ADDED NOTE FOR BUILDER TO MARK GRADE ON FOUNDATION.	R.S.
2.	OCT. 24/97	GENERAL UPDATE.	R.S.
1.	OCT. 27/94	ADDED FROST LOOP.	S.W.

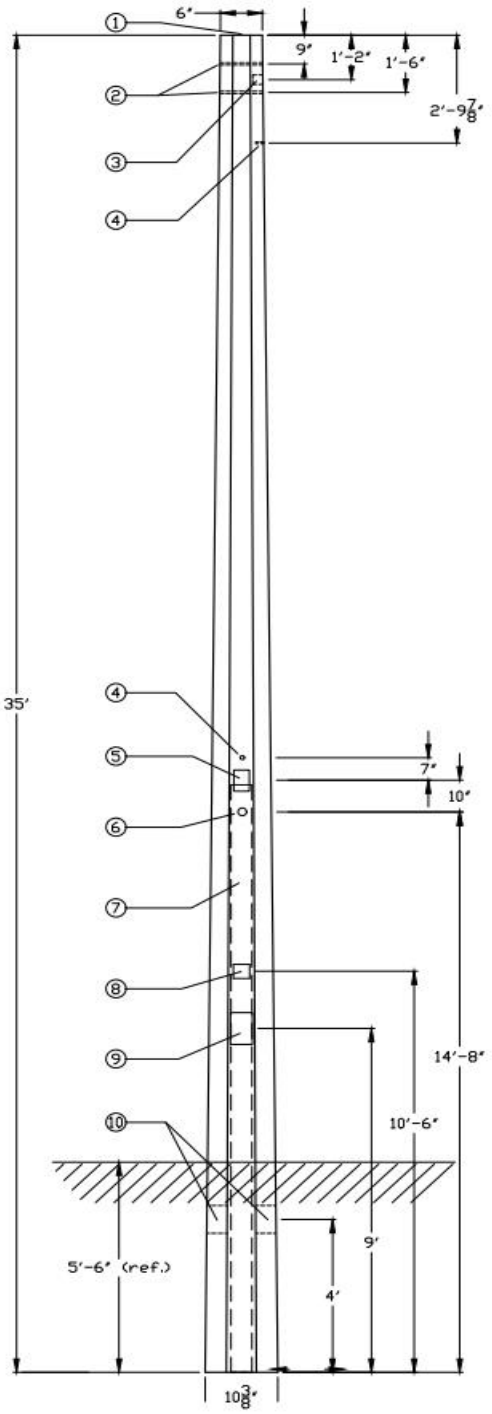
GrandBridge ENERGY

TITLE: SECONDARY SERVICE INSTALLATION DETAILS JOINT TRENCH-HYDRO, BELL, CABLE T.V. & GAS PROPERTY LINE TO METER BASE.

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

DESIGNED BY | APPROVED BY P.ENG | DRAWING No. UGS-027G

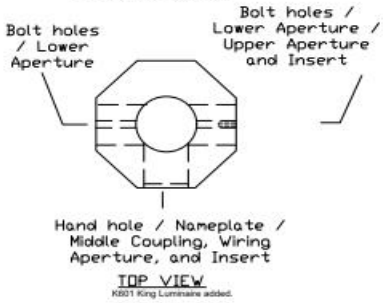
4.28 UGS-028A: 35’ Octagonal Decorative Spun Concrete Streetlight Pole for use with Victorian style fixture, Rev.3



ITEM	QTY	Description
1	1 ea.	Pole top Plastic Cap
2	2 ea.	¾" Dia. Hole (Typ.)
3	1 ea.	1 ½" x 3" Upper Wiring Aperture
4	2 ea.	3/8" –16 Insert x 1" deep
5	1 ea.	2" x 3" Middle Wiring Aperture
6	1 ea.	1" NPT Coupling
7	1 ea.	3" Dia. Minimum Raceway from Butt to Middle 2" x 3" Aperture
8	1 ea.	Nameplate
9	1 ea.	3 ½" x 10" Handhole c/w Tamperproof Cover Plate and Ground Wire
10	2 ea.	2 ½" x 5" Lower Wiring Aperture (Both Sides)

NOTES:

1. Poles shall be pre-stressed, reinforced, spun concrete and manufactured to meet CSA specification A-14-00 (latest revision), Class 'B'. [Stresscrete E-350-BPO-G-S11-S/F120]
2. Bracket shall be 6' Victorian style finished black aluminum [Aluminum Lighting Standards AL281004RD or equivalent]
3. 100W luminaires shall be Springdale Coach Style. [Cooper SDL10S12RH2RBK]Or K601 (King Luminaire)
4. 150W luminaires shall be Springdale Coach Style. [Cooper SDL15S12RH2RBK] Or K601 (King Luminaire)
5. See specific project drawings for more details.
6. Photo Metric Files
   - C-4717 II-M-SCO
   - C-4731 III-M-SCO

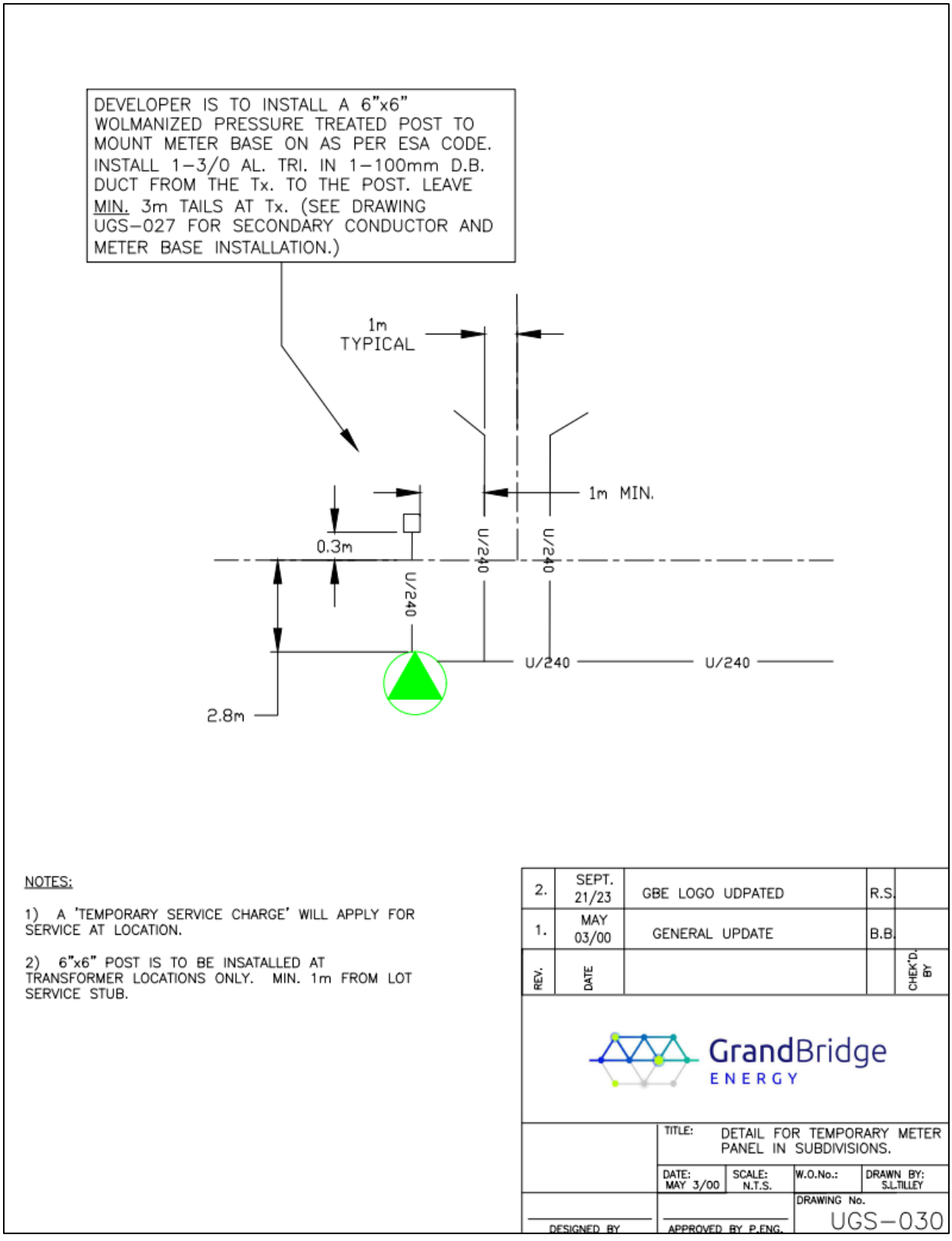


REV.	DATE			CHEK'D. BY
4.	SEPT. 21/23	GBE LOGO UPDATED	RS	
3.	NOV. 27/06	CHANGED LUMINAIRE FROM GEORGIAN TO SPRINGDALE.	RS	
2.	MAR. 26/03	ADDED BRACKET PART # REFERENCE.	EV	
1.	MAR. 20/03	ROTATED LOWER APERTURES AND MIDDLE APERTURE/INSERT/COUPLING 90 DEG., ADDED NOTES REGARDING LUMINAIRES, FIXTURES.	EV	

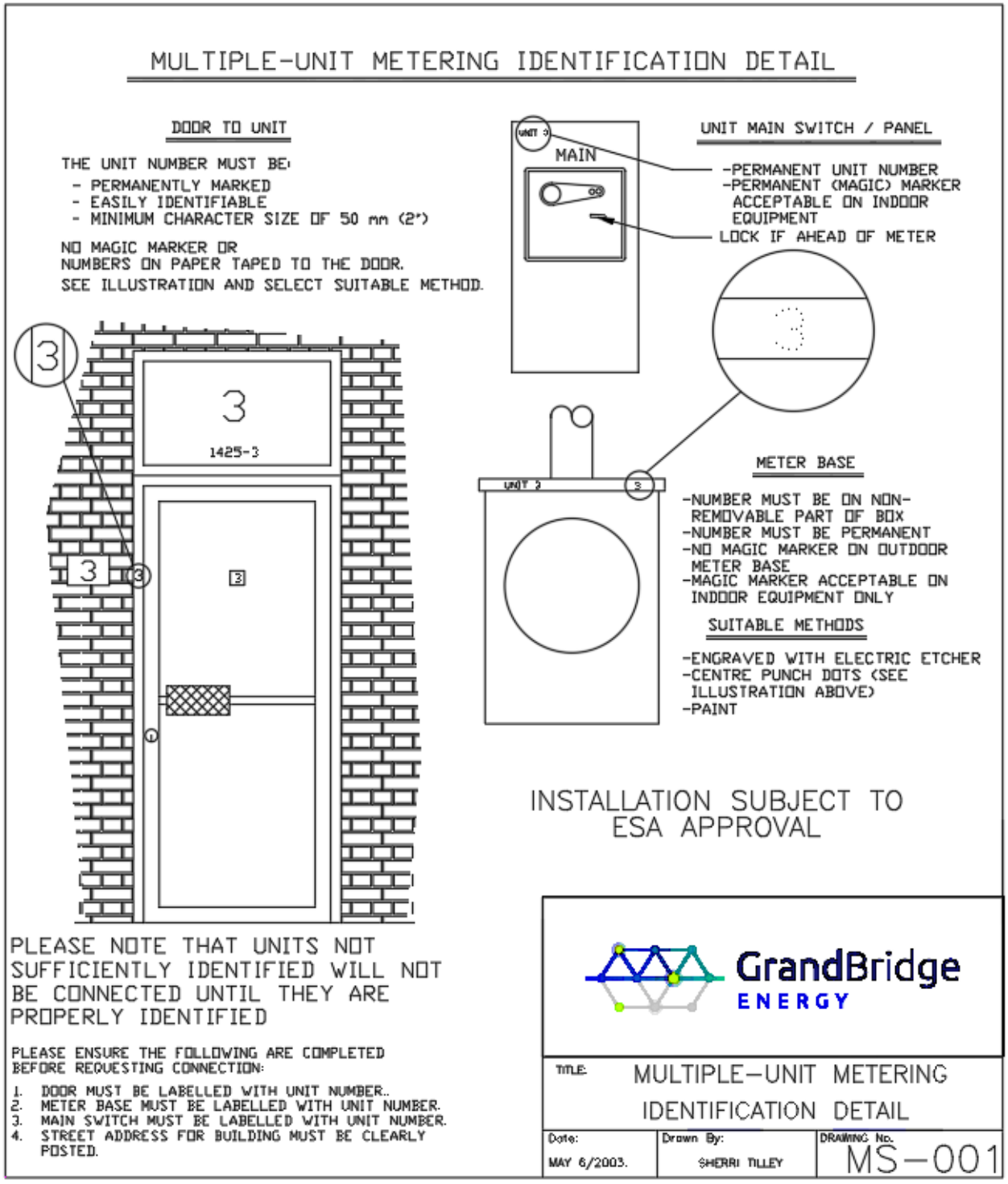
GrandBridge ENERGY

TITLE: 35' Octagonal Decorative Spun Concrete Streetlight Pole			
DATE: MAR. 18/03	SCALE: N.T.S.	W.O.No.:	DRAWN BY: EV
DESIGNED BY	APPROVED BY P.ENG.	DRAWING No. UGS-028A	

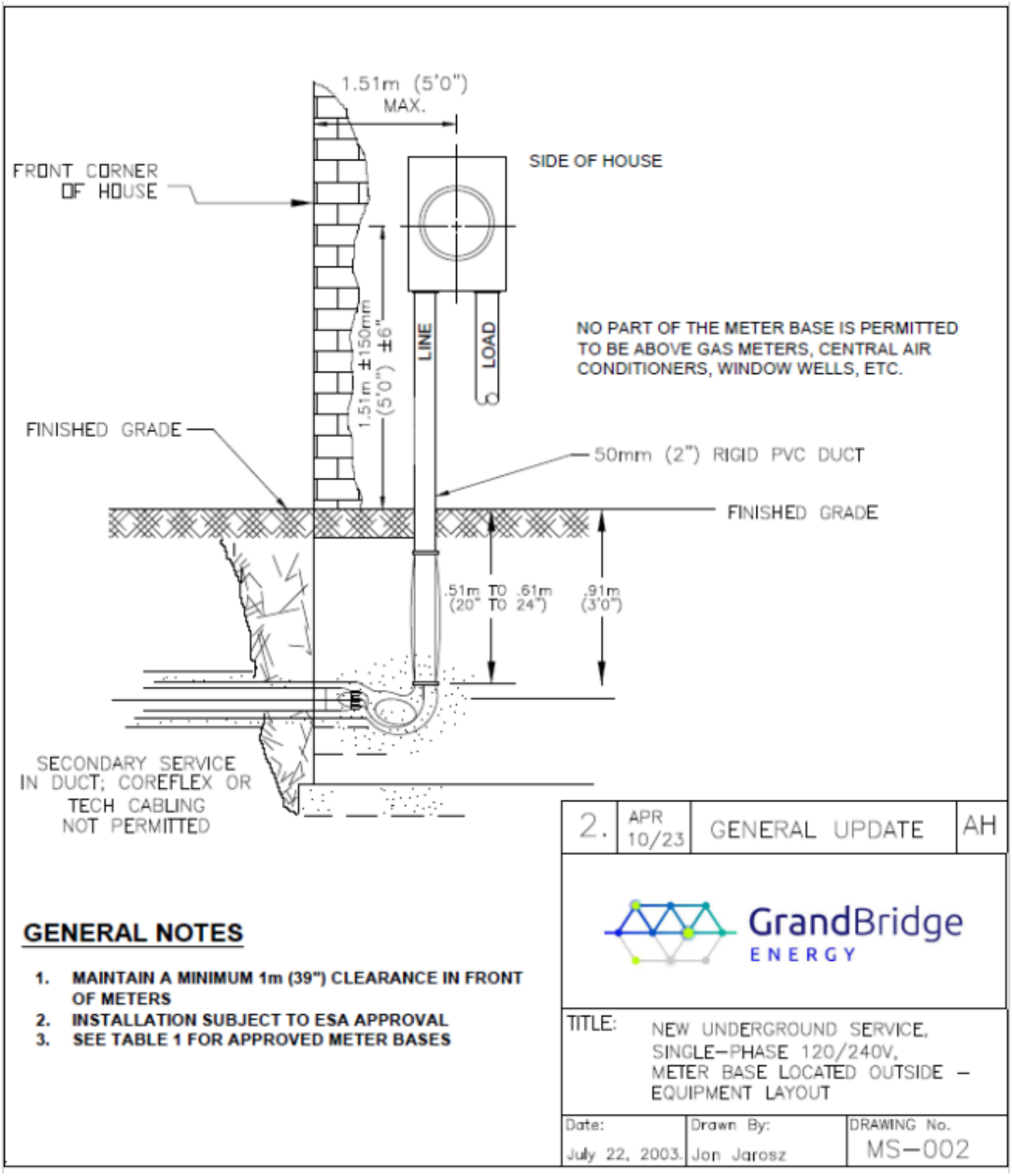
4.29 UGS-030: Detail for Temporary Meter Panel in Subdivisions



4.30 MS-001 Multiple Unit Metering Identification Detail



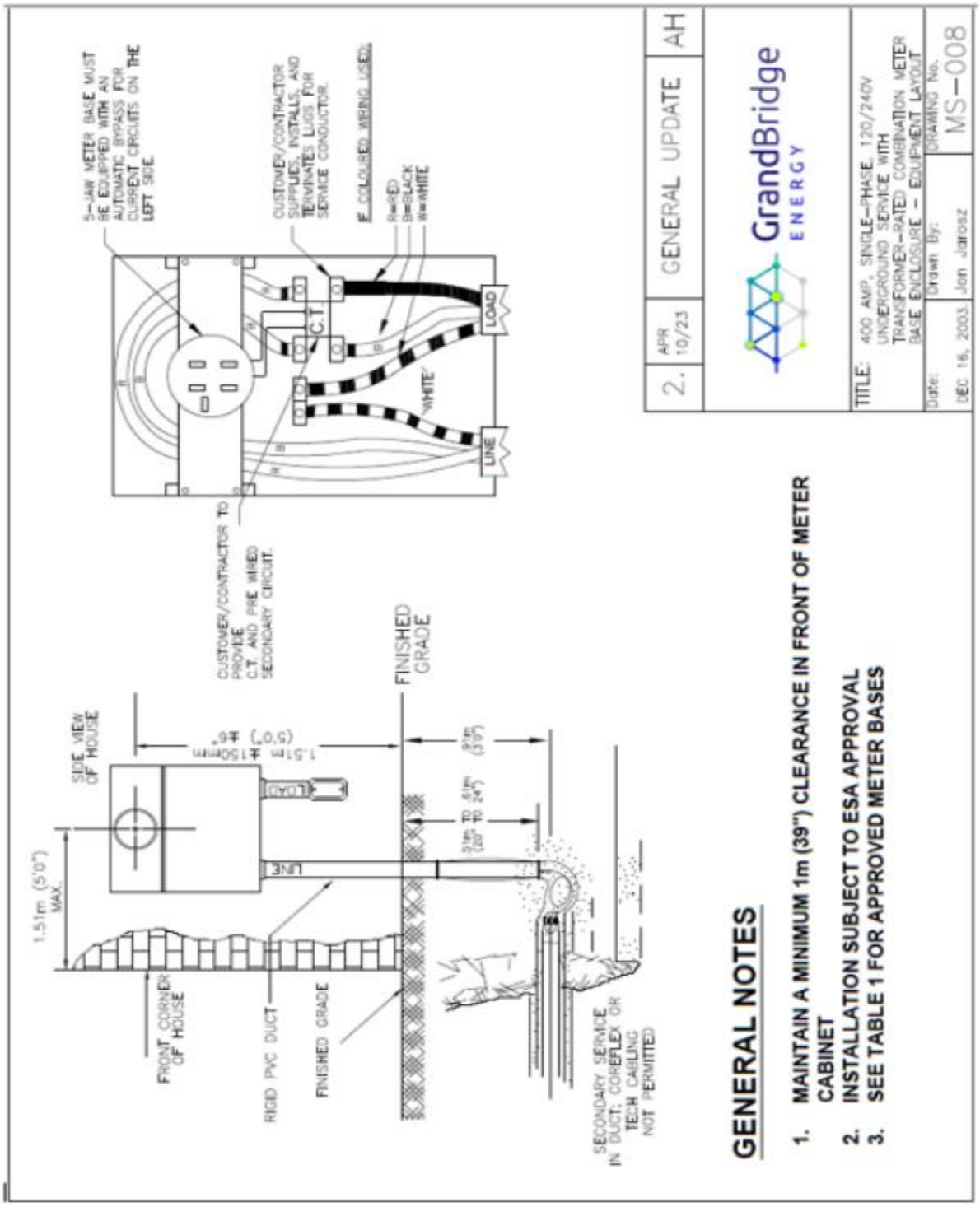
4.31 MS-002 New Underground Service, Single-Phase 120/240V, Meter Base Located Outside – Equipment Layout



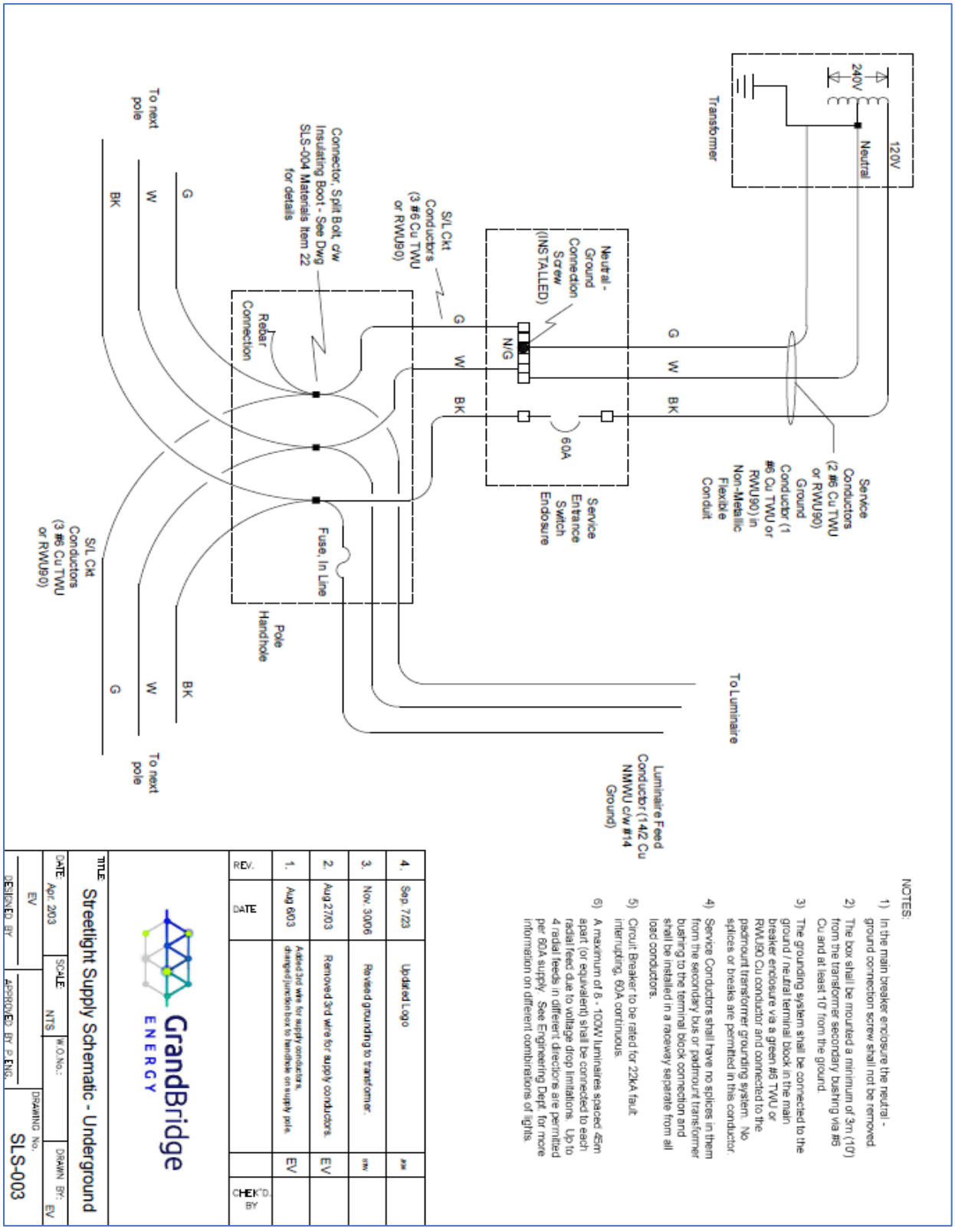
GENERAL NOTES

1. **MAINTAIN A MINIMUM 1m (39") CLEARANCE IN FRONT OF METERS**
2. **INSTALLATION SUBJECT TO ESA APPROVAL**
3. **SEE TABLE 1 FOR APPROVED METER BASES**

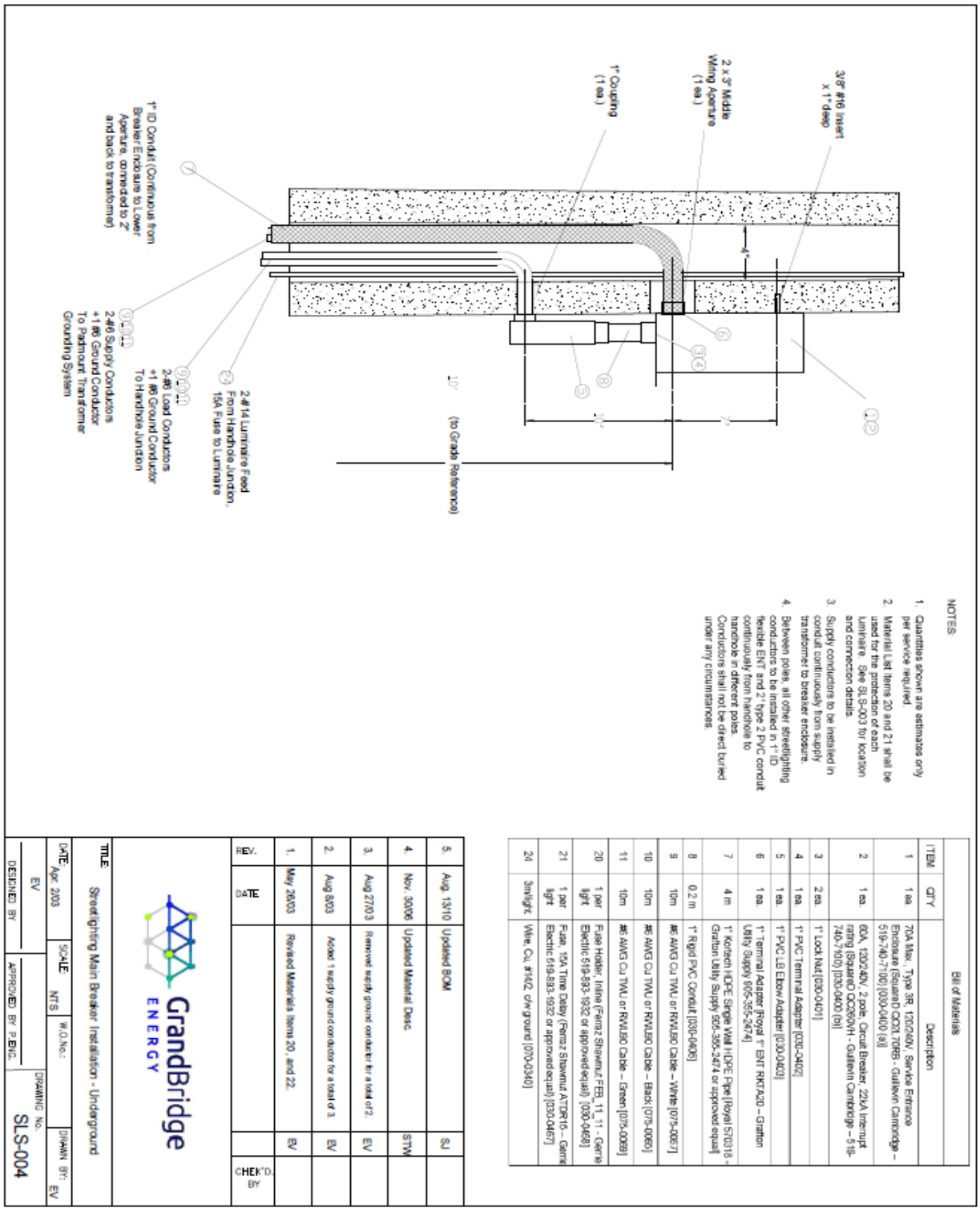
4.32 MS-008 400 Amp, Single-Phase, 120/240V Underground Service with Transformer–Rated Combination Meter Base Enclosure - Equipment Layout



4.33 SLS-003 Streetlight Supply Schematic – Underground



4.34 SLS-004 Streetlighting Main Breaker Installation – Underground



NOTES:

1. Quantities shown are estimates only per service required.
2. Material List Items 20 and 21 shall be used for the protection of each Luminaire. See SLS-003 for location and connection details.
3. Supply conductors to be installed in conduit continuously from supply transformer to breaker enclosure.
4. 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.

Bill of Materials

ITEM	QTY	Description
1	1 ea.	70A Max., Type 3R, 120/240V, Service Entrance Enclosure (Square D QO3L70RS - Guillevin Cambridge – 519-740-7100) [030-0400] [a]
2	1 ea.	60A, 120/240V, 2 pole, Circuit Breaker, 22kA interrupt rating (Square D QO260NH - Guillevin Cambridge – 519-740-7100) [030-0400 [bl]
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 Royal 1" ENT RKTA20 – Grafton Utility Supply 905-355-2474]
7	4 m	1" Kontech HDPE Single Wall HDPE Pipe (Royal 570318 - Grafton Utility Supply 905-355-2474 or approved equal]
8	0.2 m	1" Rigid PVC Conduit [030-0406]
9	10m	#6 AWG Cu TWU or RWU90 Cable – White [075-0067]
10	10m	#6 AWG Cu TWU or RWU90 Cable – Black [075-0065]
11	10m	#6 AWG Cu TWU or RWU90 Cable – Green [075-0068]
20	1 per light	Fuse Holder, Inline (Farmaz Shawmut FEB_11_11 - Gerrie Electric 519-893-1932 or approved equal) [030-0458]
21	1 per light	Fuse, 15A Time Delay (Farmaz Shawmut ATDR15 – Gerrie Electric 519-893-1932 or approved equal) [030-0457]
24	3m/light	White, Cu, #14/2, c/w ground [070-0340]

REV.	DATE		CHEK'D BY
5.	Aug. 13/10	Updated BOM	SJ
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	SCALE	W.O.No.:	DRAWN BY:
Apr. 2003	NTS		EV
DESIGNED BY: EV	APPROVED BY: P.ENG.	DRAWING No.	SLS-004