

UNDERGROUND DISTRIBUTION STANDARDS

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In Process

**SECTION 1**

**USER GUIDE, CONSTRUCTION GUIDE  
&  
DEFINITIONS**

## Sub-Section 1-3 Definitions

### Definitions

Approved Standards – The latest published Hydro One Underground Distribution Standards and Interim Standards, including text and drawings, which are used Province-wide, for regular underground lines design, construction and modification of the Distribution System/Network owned and operated by Hydro One.

Bonding – Permanently connecting all non-current carrying metal components to maintain them at the same potential and to create a low impedance path using a bonding conductor and connectors.

Contractor/Constructor – A firm, company or the individual commissioned by the subdivision developer to install the Distribution System in the subdivision.

Designer – A Hydro One employee, typically an Engineer or Technician (ADET), responsible for applying the Hydro One Distribution Standards for creating or updating overhead or underground distribution lines. Usually multiple standards are combined to create design work packages.

Distribution Planner – A Hydro One employee responsible for the planning of the distribution system and specifying its associated facilities such as cables, transformers, kiosk, switchgear, etc.

Engineering – A Hydro One team responsible for developing, maintaining and supporting Hydro One Distribution Standards.

Engineering Material Catalog (EMC) – A standard material database containing Hydro One approved materials. Each material item is identified with a specific Material Master Number (MM#). For more information on the material referenced in the Underground Distribution Standards, see *Section 16*.

Field Personnel – A Hydro One employee working predominately outside the office environment who applies the standards through construction, this includes power line maintainers.

Ground – A direct connection to earth. For pad-mounted equipment, the connection to ground is usually made with a grounding conductor, forming a loop around the pad-mounted equipment, used in conjunction with four grounding electrodes. For an overhead line/pole, the connection to ground is usually made with a grounding conductor used in conjunction with a grounding electrode.

Grounding – A continuous and permanent conductive path to earth to carry any fault current and low enough impedance to limit ground potential rise. Hydro One usually grounds the neutral at multiple points in the system thus creating a multi-grounded neutral system.

Grounding Conductor – a conductor used to connect individual components or system to the grounding electrode. For pad-mounted equipment, the grounding conductor is typically a copper conductor that is part of the ground grid installed around the perimeter of the equipment. For an overhead line/pole, the grounding conductor (Down Ground / Pole Ground) is typically a copper-clad steel (CCS) conductor installed the length of the pole and connected from equipment to the ground electrode(s).

Grounding Electrode – a conductive object buried in, or driven into, the ground to which a grounding conductor is electrically and mechanically connects. For pad-mounted equipment and overhead line/pole, ground plates or ground rods are typical grounding electrodes.

Inspector – A Hydro One employee deemed competent and qualified for purposes of carrying out final inspections prior to energization according to Section 8 under Ontario Regulation 22/04 and under the Hydro One Construction Verification Program (CVP).

Interim Standard – An approved design/installation drawing or text section that was not previously included in the latest published Hydro One Distribution Standards. An Interim Standard can also be any new revision/update to the current approved Standards. All Interim Standards will be included in the next revision of the approved and published Hydro One Distribution Standards. The “Interim” reference in the document header will be removed, from the drawing or text, upon the entire section’s update.

Kiosk – A pad-mounted type enclosure (also known as Sectionalizing Enclosure) with insulated junction(s) for installing 200 A elbows, for up to 27.6 kV rated systems. A kiosk can be 1-phase or 3-phase, it can typically have three or more ways, and it is intended to sectionalize or tap a circuit. For circuits rated up to 25 kV, the Kiosk can be used as a loadbreak device, through the operation of loadbreak elbows. It does not contain any switches.

Non-Standard (N/S) – Any Hydro One approved design/installation drawing that is not an approved and published Hydro One Distribution Standard or an Interim Standard. Typical or common variations from the approved Distribution Standards are considered to be Non-Standard and require specific case-by-case approvals. A Non-Standard design or installation is typically project and location specific (one-off). The Non-Standard design may become an Interim Standard, if the circumstances warrant it (e.g. if the design/installation has the potential of being used repeatedly).

Ontario Electrical Safety Code (OESC) – The code that comprises the Canadian Electrical Code together with specific Ontario amendments to establish safety standards for the installation and maintenance of the electrical system.

Switchgear – A pad-mounted type enclosure with loadbreak switches rated up to 600 A and 27.6 kV. It may be 1-phase or 3-phase type and has typically three or more ways. The switches may also have fault interrupting capability. Switchgear is intended to sectionalize or tap a circuit. For circuits rated up to 27.6 kV, the switchgear can be used as a loadbreak device, through the operation of switches.

Tilde (~) – The approximate “~” sign is added next to a dimension in a drawing where an exact dimension is not strictly required.

Typical (TYP.) – The word “TYP.” is added to a dimension line in a drawing where a similar dimension occurs repeatedly but is only specified in one location.

In Process

UNDERGROUND DISTRIBUTION STANDARDS

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In Process

**SECTION 2**  
**SIGNS & MARKERS**

## Section 2

### Signs & Markers

#### **In This Section**

This section covers general sign and marker requirements for the underground distribution systems including pad-mounted equipment and submarine installations. Specific sign and marker requirements are covered as part of the installation drawings in other Underground Distribution Standards sections. For signs and markers related to overhead distribution systems, refer to *Overhead Distribution Standards, Section 2*.

#### **Marker Balls**

Marker balls are an electronic locating device used to facilitate the locating of buried plant. It works by having an electronic signal being sent and received by standard locating equipment. The ball has an effective signal range of approximately 150 cm and shall be installed with 60 to 120 cm of cover.

Marker balls are **not** required for identification of secondary cable splices installed in a split duct. Marker balls used with secondary junction pedestals and vaults are referenced in *Sub-Section 15-1* and DU2-102-0500.

- R01** ► Marker balls can also be used in other situations to facilitate locating secondary and primary cables where they may deviate from their expected route.

Marker balls are **not** required for identification of primary cable splices installed inside the pulling/splicing vault.

#### **Phase Identification Tape**

Phase identification tape is used to identify the phases for primary and subtransmission cables and should be installed on the cable jacketing in close proximity to the termination. Typically used colours are white (neutral or phase), red (phase), blue (phase) and black (phase).

Applications for phase identification tape include, but are not limited to, underground primary and subtransmission cables, see DU2-101-0500/0501, DU2-111-0500 and DU2-113-0500. Phase identification tape is covered as a part of the installation drawings in other Underground Distribution Standards sections.

The phase identification tape can also be used when coloured jackets are not provided, (e.g. customer equipment).

#### **Coloured Jackets**

Coloured jackets are used to identify the phases for secondary cable. Typically used colours are white (neutral), red (phase) and black (phase). In cases where a quadruplex cable is used by Hydro One, a blue jacket is used to identify the additional phase.

Applications for coloured jackets include, but are not limited to, underground secondary cables in 1-phase equipment/service, see DU2-101-0500/0501; secondary cables in 3-phase equipment/service, see DU2-101-0500/0501; secondary services, see DU2-102-0500.

Coloured jackets are covered as a part of the installation drawings in other Underground Distribution Standards sections.

### **Phase Identification Marker**

Phase identification markers are used on 1-phase pad-mounted equipment per DU2-101-0500/0501 and secondary junction kiosk per DU2-102-0500. They are used to easily identify which phase is present in the equipment along the roadside. Typically used colours are white (phase), red (phase) and blue (phase).

### **Caution Tape**

Power cable marking caution tape, covering all the cables/ducts in the trench, shall be buried approximately halfway between the uppermost cable/duct and the grade level. Tape is also recommended to be installed over concrete encased duct banks. See trench details in *Section 3* and *Section 11*.

### **Cable Route Identification**

Cable route identification is normally **not** required where buried cables are located along the right-of-way (ROW).

For buried cable route located in unusual locations, including parking lots, parks, and greenbelts, along or across railways and pipelines, or built into bridges or other structures identification is required. The identification is a warning to anyone digging within the vicinity of the area that below an underground cable exists. Cable route identification shall be installed at 20 m intervals, at changes in cable route directions and at all primary splice locations.

Cable route markers are one option for route identification. These markers are metal disks that are either concrete embedded or screw-in type that are gravel/compacted soil embedded. They can be placed in locations where they will be easily visible year-round without the concern of burial and help with aesthetic appearance. See DU2-121-0500.

Cable route posts are another option for route identification. The posts have manufacturer installed “Danger” signs. They can be used where more attention needs to be attracted to the cable route and where burial (e.g. snow, vegetation, dirt, soil, etc.) of the cable route marker is a concern. See DU2-121-0500.

On submarine cable crossing of watercourses used primarily by pleasure craft, these cable route posts shall be installed at each cable entry and exit point. They shall be clearly visible from the waterway and not obscured by vegetation, trees or manmade obstructions and no more than 3 m above the high water level. For submarine applications, additional “Warning” sign plates are required for identifying high voltage cable. See DU2-131-0500.

### **Ontario One Call**

In Ontario, it is the law to contact Ontario One Call to request an underground locate prior to commencing any residential or commercial excavation activities. Ontario One Call will notify any utilities such as electrical, gas, water/sewer and telecommunications that may be in or near the requested excavation area. Utility owners provide mapping of their underground assets to Ontario One Call and this mapping information is used to determine which utilities are notified on the locate request. The utility or their locate service provider representative will clearly

mark where the underground infrastructure runs through the excavator's dig area and will provide a locate sheet that includes a diagram of what has been located. If markings are not required, the excavator will receive a response from the utility to indicate that the work area is clear. Digging is **not** allowed until all responses have been received.

### **Identification for 1-Phase and 3-Phase Pad-Mounted Equipment**

Signs and markers, as outlined in DU2-101-0500/0501, shall be used to identify pad-mounted equipment. The signs and markers shall include the pad-mounted equipment location number, the phase(s) to which the equipment is connected (1-phase applications only), phase identification tape (3-phase applications only) and the relevant Caution/Danger signs.

In areas where the pad-mounted equipment, typically 1-phase applications, may be buried in snow, or hidden by grade, vegetation or other visual obstructions, a red warning marker (flag) may be installed on the equipment at local discretion.

Hydro One supplies and installs most signs and markers. The pad-mount equipment manufacturer may apply specific signs and markers when required by industry standards.

### **Identification for Primary Cables**

All primary cable ends shall be provided with temporary identification, by the subdivision constructor, showing the source and destination location number per DU2-111-0500.

A tag is used for identification; it is securely fastened using a cable tie to either the elbow or cable jacket and information is self-written or can accommodate printed self-adhesive plastic label. The phases (via colored phase identification tape) and normal direction of feed (via self-written or printed label) within pad-mounted equipment shall be clearly marked on all cables. Normally, within pad-mounted equipment, the number '1' is marked on incoming (source side) cable, numbers '2', '3', '4', etc. are marked on the outgoing/tap (load side) cables. See DU2-101-0500/0501 and DU2-111-0500.

Hydro One verifies, supplies, and permanently installs all final identification on cable terminations showing the source location (FROM) and the destination location (TO) stating the switch or equipment number per DU2-111-0500.

Cable phasing shall also be verified and identified with phase identification tape installed on the cable jacketing, in close proximity to the termination.

### **Identification for Primary Spare Cable Termination**

When a primary spare cable is terminated on a pole, a warning sign shall be applied per DU5-602-0500, DU5-603-0500, DU5-604-0500 and DU5-605-0500.

When a primary cable is terminated inside a pad-mounted equipment, an "Energized Spare Cable Inside" sign (MM# 30037455) shall be applied on front door or hood.

### **Identification for Secondary Service**

Signs and markers, as outlined in DU2-102-0500, shall be used for secondary services. The signs and markers shall include the phase(s) to which the equipment is connected (secondary junction kiosk applications only), marker ball (secondary vault and secondary pedestal applications only) and the relevant Caution/Danger signs.

**Identification for Secondary Cables**

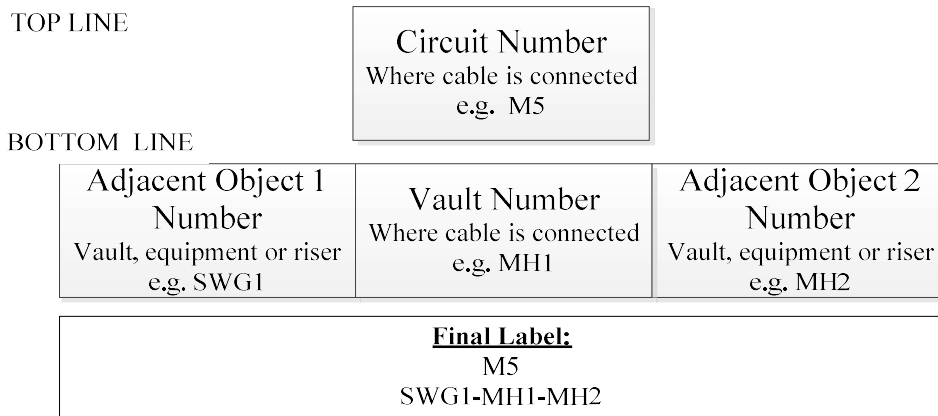
All secondary cables shall be provided with temporary identification at both ends, by the subdivision constructor per DU2-112-0500, when secondary cable run is between transformer/secondary vault/pedestal/junction kiosk. All secondary cables shall be provided with temporary identification only at equipment end (transformer/vault/pedestal/junction kiosk) by the subdivision constructor per DU2-112-0500 when secondary cable run is to the customer meter base.

A tag is used for identification; it is self-written (or can accommodate printed self-adhesive plastic label) and secured to the cable jacket using a cable tie. The tag is used to identify secondary cables at the transformer/vault/pedestal/junction kiosk end. If the municipal (911) address is available, then this shall also be marked on the secondary cables. Hydro One verifies, supplies, and permanently installs the final identification on cable end(s), as per DU2-112-0500.

**Identification for Cables in Vaults**

Vaults shall be labeled per DU2-113-0500. Markers shall be used to identify cables inside vaults. A tag is secured to the cable jacket using cable ties to ensure they stay intact, when exposed to excess water or temperature variations. All cable jackets shall have phase identification tape at both ends of the cables in the vaults. Markers shall be placed as far away as possible from the splice, if present.

Detailed cable information must be self-written on each tag. They shall identify feeder number, cable location and adjacent objects (e.g. vault, cable riser, equipment, etc.) where the cable goes. See *Figure 1* for typical marking on label of cable markers.



**Figure 1 - Cable Marker Labeling Scheme**

If the vault has the potential to be covered in the future (e.g. snow, farm, vegetation, dirt, etc.) and limited in visibility, a sign post can be installed. The sign post can also help bring attention to the vault especially if heavy machinery is used around it. The sign post base shall be located within 1 m of primary cables(s) and damage to cable conduit(s) must be avoided.

All vaults shall be identified with Hydro One logo or equivalent identification, on its covers.

**Identification for Submarine Installations**

For submarine installations, identification used for the underground system, cables and pad-mounted equipment all apply, in addition to submarine specific requirements.

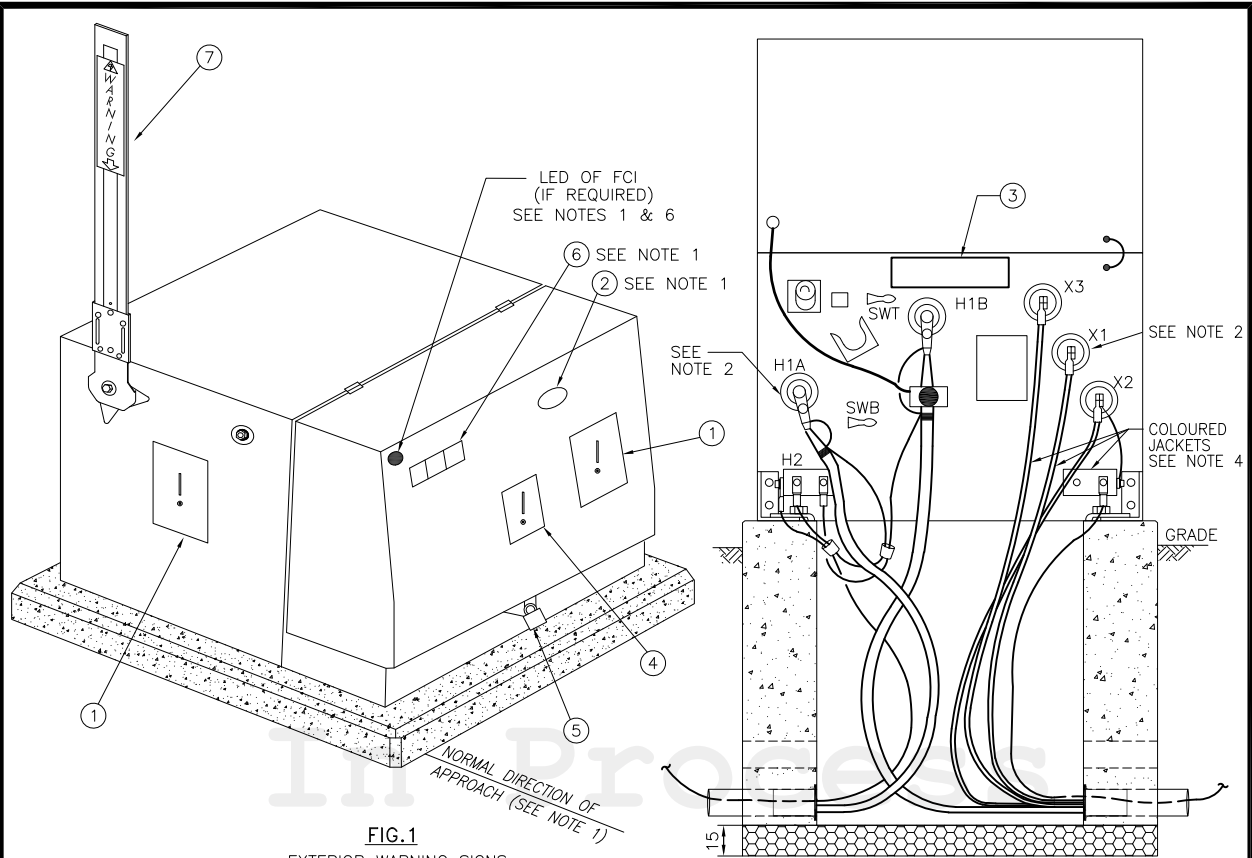
As mentioned in *Cable Route Identification* paragraph, cable route posts are required to identify submarine cable routes. See DU2-131-0500.

On submarine cable crossings of shipping channels used by larger commercial type vessels, the cable crossings shall also be marked per DU2-132-0500. It includes a customized high visibility “No Anchor” sign installed in a clearly visible location close to shore for identification from both land and water. The sign shall be sized accordingly to be clearly legible from the centre of the shipping channel and shall be mounted on a post, additional grout is required for rock surfaces. See DU2-132-0500.

**Temporary Measures**

All temporary measures shall be clearly indicated in the drawings, along with the expected duration of the need and shall be approved by Engineering. Clear signage and marking shall be placed on or in the equipment to identify a non-standard application. Primary cables shall be clearly marked with phase tape per DU2-101-0500/0501 and a destination tag. A warning tag (MM# 30019389) must be placed within the equipment, until the temporary configuration is removed. It is to easily identify the non-standard, temporary installation; it will be removed once a permanent condition is established. See *Sub-Section 8-1* and *Sub-Section 9-1* for specific temporary measures requirements.

Rev. No.	Issue Date	Description
01	June 2024	<ul style="list-style-type: none"> <li>Updated the “<i>Marker Balls</i>” paragraph to allow the usage of marker balls in locating secondary cables where they may deviate from their expected route.</li> </ul>



**FIG.1**  
EXTERIOR WARNING SIGNS AND MARKERS (HOOD CLOSED)

**FIG.2**  
INTERIOR WARNING SIGNS AND MARKERS FOR 1-PHASE EQUIPMENT (HOOD OPEN)

**NOTES:**

1. IF DIRECTION OF APPROACH IS DIFFERENT THAN INDICATED, ADD LOCATION NUMBER (PART#6) TO THAT SIDE, PHASE MARKER (PART#2) TO THAT SIDE AND A HOLE SHOULD BE ON EACH SIDE OF WALL OF THE HOOD/DOOR FOR 1-PHASE EQUIPMET.
2. FOR IDENTIFICATION OF PRIMARY AND SECONDARY CABLES SEE DU2-111-0500 AND DU2-112-0500.
3. UNLESS SPECIFIED OTHERWISE, ALL THE SIGNS & MARKERS ARE SUPPLIED AND INSTALLED BY HYDRO ONE.
4. SECONDARY CABLES ARRIVE WITH COLOURED JACKETS: WHITE (NEUTRAL), RED AND BLACK (PHASES).
5. TRANSFORMER SHOWN AS REFERENCE. SIGNS AND MARKERS SHOWN ALSO APPLY TO KIOSKS AND SWITCHGEAR.
6. 3-HOLES FOR 3 LEDS POSSIBLE FOR 3-PHASE EQUIPMENT.

PARTS LIST					
PART No.	MM No.	DESCRIPTION	QTY.	REMARKS	
1	30036463	SIGN, COMBO, DX, UG, DANGER, NO DIG/PLANT	1 MIN.	NORMALLY SUPPLIED BY TRANSFORMER MANUFACTURER. LOCATE ON ALL SIDES. REQUIRED ON ALL UNITS.	
2	20001694 20001695 20001696	MARKER, RED, PHASE MARKER, WHITE, PHASE MARKER, BLUE, PHASE	1 MIN.	LOCATE ON MOST NOTICEABLE SIDE(S). REQUIRED ON 1-PHASE UNITS ONLY.	
3	20001595	SIGN, "CAUTION LOOP FEED"	1	USE FOR LOOP FEED CONNECTED TRANSFORMERS ONLY.	
4	20002119	SIGN, "DANGER, DO NOT OPEN YOU CAN BE HURT"	1 MIN.	NORMALLY SUPPLIED BY TRANSFORMER MANUFACTURER. LOCATE ON MOST NOTICEABLE SIDE(S). REQUIRED ON ALL UNITS.	
5	30000346	PADLOCK	1	REQUIRED ON ALL UNITS.	
MM# = REFER TO SECTION 16 ONLY		A/R = AS REQUIRED	△ = SUPPLIED WITH EQUIPMENT		

02	NOV 2024	UPDATED MM#S AND DESCRIPTION FOR 1st, 3rd AND 4th ITEMS OF PART# 8. UPDATED DESCRIPTION ONLY FOR ITEM 2 OF PART #8.	PC	MM	AA	MM
01	SEPT 2023	ORIGINAL DU-03-302-0500-R3 AND DU-04-302-R1 ARE NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 2. GENERAL UPDATES. CHANGED DWG. NAME, 1-PH & 3-PH IN 1 DWG. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	SJ	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

FOR SHEET 2 OF THIS DRAWING SEE DU2-101-0501  
ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: S.JASSAL	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/05/20	Pole ID:	

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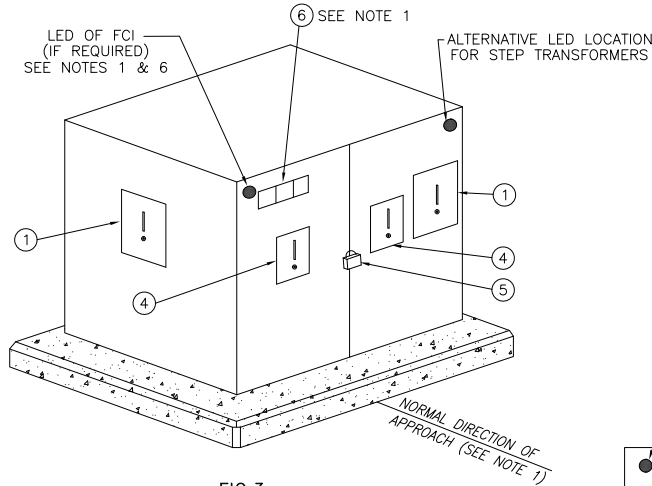
Information contained in this drawing is considered to be confidential. Recipients shall only use the drawing for its intended purpose and shall take necessary measures to prevent disclosure or transmittal to outside parties.

Title:  
**SIGNS & MARKERS ON PAD-MOUNTED EQUIPMENT**

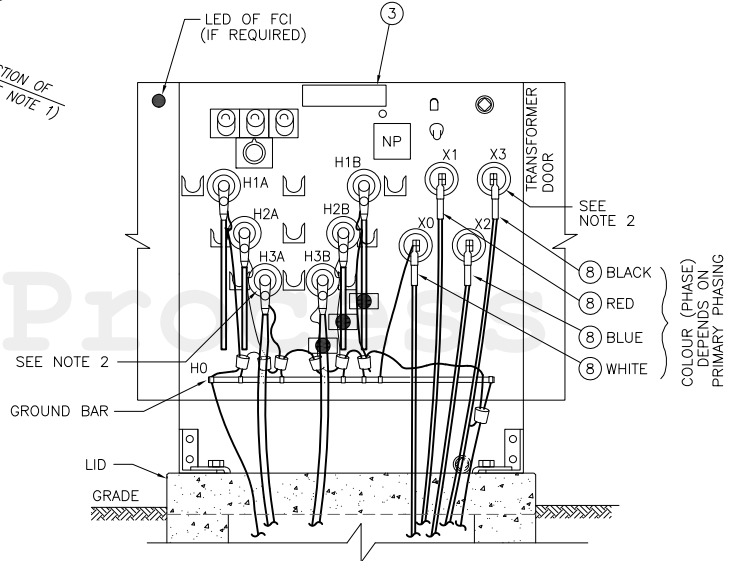
Drawing No.  
**DU2-101-0500**

Rev. No.  
**02**

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**FIG.3**  
EXTERIOR WARNING SIGNS  
AND MARKERS  
(DOOR CLOSED)



**FIG.4**  
INTERIOR WARNING SIGNS  
AND MARKERS FOR 3-PHASE EQUIPMENT  
SEE NOTE 5  
(DOOR OPEN)

PARTS LIST CONT.				
PART No.	MM No.	DESCRIPTION	QTY.	REMARKS
6	20001635 TO 20001644	SIGN, NUMBERS 0 TO 9, PRESSURE SENSITIVE ADHESIVE, REFLECTIVE, SILVER	A/R	LOCATE ON MOST NOTICEABLE SIDE(S). REQUIRED ON ALL UNITS.
7	30032641	MARKER, RED FLAG, W/BOLT AND WASHER	A/R	INSTALL AT LOCAL DISCRETION AS REQUIRED WHERE TRANSFORMER IS VISUALLY OBSTRUCTED. TYPICALLY INSTALLED IN HEAVY SNOW AREAS. ONLY APPLICABLE TO 1-PHASE UNITS.
8	30020815 30008340 30020816 30020814	TAPE, ELECTRICAL, VINYL, MARKING, 3/4" WIDE, RED TAPE, ELECTRICAL, PVC BLACK, 3/4" WIDE, FOR COLD TEMP. TAPE, ELECTRICAL, VINYL, MARKING, 3/4" WIDE, WHITE TAPE, ELECTRICAL, VINYL, MARKING, 3/4" WIDE, BLUE	1 MIN.	LOCATE APPROPRIATE COLOUR (PHASE) DEPENDING ON PRIMARY PHASING. REQUIRED ON ALL 3-PHASE TRANSFORMERS IF COLOURED JACKETS ARE NOT PROVIDED.
MM# = REFER TO SECTION 16 ONLY		A/R = AS REQUIRED	△ = SUPPLIED WITH EQUIPMENT	

FOR SHEET 1 OF THIS DRAWING SEE DU2-101-0500

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

02	NOV 2024	UPDATED MM#S AND DESCRIPTION FOR 1st, 3rd AND 4th ITEMS OF PART# 8. UPDATED DESCRIPTION ONLY FOR ITEM 2 OF PART #8.	PC	MM	AA	MM
01	SEPT 2023	ORIGINAL DU-03-302-0500-R3 AND DU-04-302-R1 ARE NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 2. GENERAL UPDATES. CHANGED DWG. NAME, 1-PH & 3-PH IN 1 DWG. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	SJ	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: S.JASSAL	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/05/20	Pole ID:	

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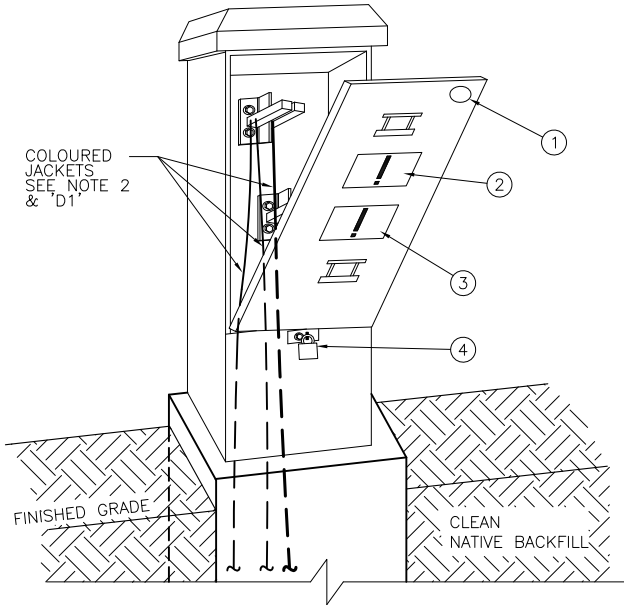
Information contained in this drawing is considered to be confidential. Recipients shall only use the drawing for its intended purpose and shall take necessary measures to prevent disclosure or transmittal to outside parties.

Title:  
SIGNS & MARKERS ON  
PAD-MOUNTED EQUIPMENT

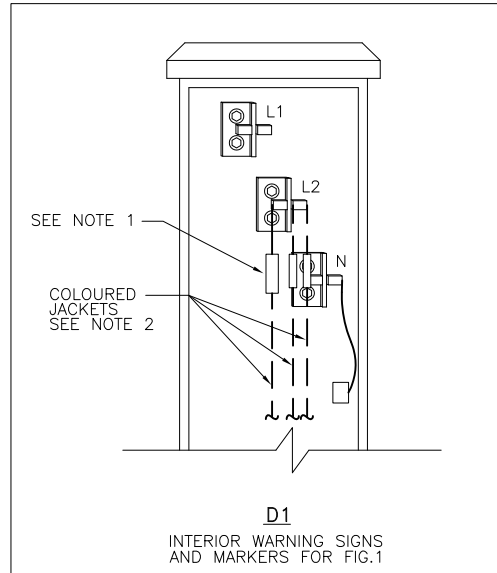
Drawing No.  
**DU2-101-0501**

Rev. No.  
**02**

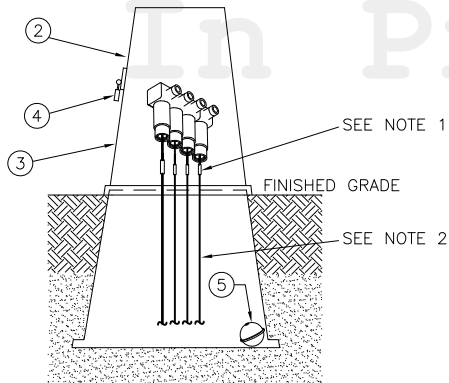
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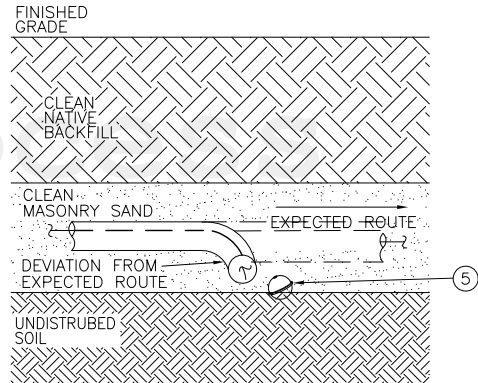
**FIG.1**  
EXTERIOR WARNING SIGNS  
FOR SECONDARY JUNCTION KIOSK



**D1**  
INTERIOR WARNING SIGNS  
AND MARKERS FOR FIG.1



**FIG.2**  
EXTERIOR WARNING SIGNS  
FOR SECONDARY PEDESTAL AND SECONDARY VAULT



**FIG.3**  
MARKER BALL  
TYPICAL INSTALLATION FOR LOCATING SECONDARY OR  
PRIMARY CABLES WHEN DEVIATING FROM EXPECTED ROUTE

**NOTES:**

1. FOR IDENTIFICATION OF CABLES SEE DU2-112-0500.
2. SECONDARY CABLES ARRIVE WITH COLOURED JACKETS: WHITE (NEUTRAL), RED AND BLACK (PHASES).

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.	REMARKS
1	20001694 20001695 20001696	MARKER, RED, PHASE MARKER, WHITE, PHASE MARKER, BLUE, PHASE	A/R	LOCATE ON MOST NOTICEABLE SIDES. ONLY APPLICABLE TO SECONDARY JUNCTION KIOSK.
2	20002119	SIGN, "DANGER, DO NOT OPEN YOU CAN BE HURT"	A/R	NORMALLY SUPPLIED BY MANUFACTURER. LOCATE ON MOST NOTICEABLE SIDE(S). ONLY APPLICABLE TO SECONDARY PEDESTAL AND SECONDARY JUNCTION KIOSK.
3	20002125	SIGN, "DO NOT DIG OR DRIVE STAKES"	A/R	LOCATE ON MOST NOTICEABLE SIDE(S). ONLY APPLICABLE TO SECONDARY PEDESTAL AND JUNCTION KIOSK.
4	30000346	PADLOCK	1	PLACE AT DESIGNATED LOCATION. REQUIRED ON ALL UNITS.
5	30015374	MARKER BALL, LOCATION, ORANGE	A/R	INSTALL FOR LOCATING SECONDARY OR PRIMARY CABLES, AS REQUIRED, WHERE PRIMARY CABLE IS DEVIATING FROM EXPECTED ROUTE. ALSO INSTALL AT LOCAL DISCRETION, AS REQUIRED, WHERE EQUIPMENT IS VISUALLY OBSTRUCTED. TYPICALLY INSTALLED IN HEAVY SNOW AREA. PLACE INSIDE EQUIPMENT. ONLY APPLICABLE TO SECONDARY VAULT AND SECONDARY PEDESTAL.
MM# = REFER TO SECTION 16 ONLY		A/R = AS REQUIRED		△ = SUPPLIED WITH EQUIPMENT

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	JUNE 2024	PROVIDED CLARIFICATION THAT MARKER BALL IS USED FOR LOCATING BOTH SECONDARY AND PRIMARY UNDERGROUND CABLES. RENAMED THE DRAWING TITLE TO BETTER SPECIFY THE APPLICATION OF THE CONTENT ON THIS DRAWING.	PC	DK	DK	DK	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: S.JASSAL	Design Approved By: M.MATEVSKI P.Eng.
							Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/05/21	Pole ID:	
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Title: SIGN & MARKERS SECONDARY KIOSKS, PEDESTALS AND VAULTS AND MARKER BALLS			



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Drawing No. <b>DU2-102-0500</b>	Rev. No. <b>01</b>
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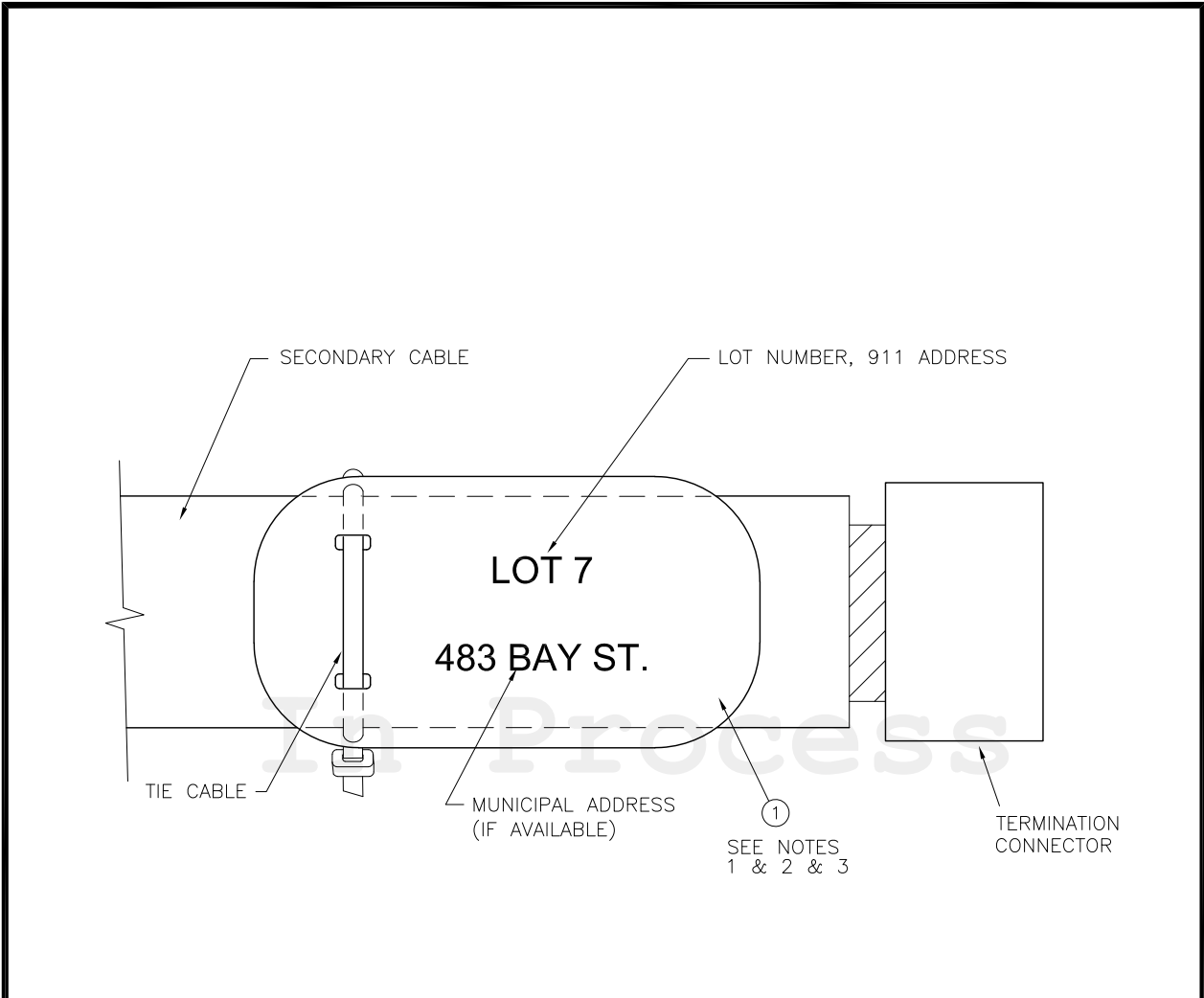
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A4 (210 x 297)

millimetres



Sheet Number:



**NOTES:**

1. TAGS ARE SELF-WRITTEN AND CAN ACCOMMODATE PRINTED SELF-ADHESIVE PLASTIC LABELS. TAGS ARE SUITED TO EACH APPLICATION.
2. ALL SECONDARY CABLES SHALL BE IDENTIFIED AT TRANSFORMER/VAULT/PEDESTAL/JUNCTION KIOSK END.
3. IDENTIFICATION OF SERVICE CABLES AT METER BASE LOCATIONS IS OPTIONAL. IF APPLIED, SHALL BE AS ABOVE AND ON NEUTRAL CABLE ONLY.
4. SEPARATE PLASTIC LABELS, IF APPLIED, ARE USED TO RECORD THE LOT NUMBER AND MUNICIPAL ADDRESS.
5. PLASTIC LABELS, IF APPLIED, ARE PLACED IN THE ENVELOPE OF THE TAG BEFORE SECURING THE TAG TO THE PRIMARY CABLE.

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.
1	30029961	TAG, WHITE, BLANK, 1" x 2.5", W/TIE CABLE	A/R
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-602-R4 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 2. GENERAL UPDATES. UPDATED & ADDED NOTES. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	SJ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: S.JASSAL	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/25	Pole ID:	



**Hydro One Networks Inc.**

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Information contained in this drawing is considered to be confidential. Recipients shall only use the drawing for its intended purpose and shall take necessary measures to prevent disclosure or transmittal to outside parties.

Title:  
**IDENTIFICATION MARKER FOR UNDERGROUND SECONDARY CABLE**

Drawing No.  
**DU2-112-0500**

Rev. No.  
**01**

TITLE BLOCK REV 02 - AUGUST 2014

UNDERGROUND DISTRIBUTION STANDARDS

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In Process

**SECTION 3**

**UNDERGROUND & SUBMARINE  
DISTRIBUTION SYSTEMS**

## Section 3

### Underground & Submarine Distribution Systems

#### **Introduction**

This section covers the design and construction standards for specifying and installing typical 1-phase and 3-phase underground and submarine distribution, operating at 1-phase voltages up to 16 kV, 3-phase primary voltages up to 16/27.6 kV and 3-phase subtransmission 44 kV used on Hydro One underground and submarine distribution systems.

#### **In This Section**

This section is divided into the following sub-sections:

Topic	Sub-Section #	Revision
1-Phase Distribution Systems	3-1	September 2023
3-Phase Distribution Systems	3-2	September 2023
Submarine Distribution Systems	3-3	September 2023

#### **Scope**

This scope covers the general underground and submarine distribution systems requirements. The specific requirements on 1-Phase and 3-Phase Distribution Systems and Submarine Distribution Systems are covered in the applicable sub-sections listed above. All other specific system or equipment requirements, referenced in this section, are covered in other applicable sections of the *Underground Distribution Standards*.

#### **Purpose**

The purpose of this section is to provide direction and support to subdivision planners and designers for the design and construction layout of residential underground subdivisions and underground industrial and commercial subdivisions.

The design and construction guide is prepared to ensure that:

- The underground distribution systems, owned by Hydro One, are designed on a consistent basis; and
- Only Hydro One approved materials are used in the construction of underground distribution systems.

In addition, the purpose of this section is to provide direction and support to:

- Subdivision Developers and Constructors for the construction of residential underground subdivisions; and
- Underground Industrial and Commercial Developers and Constructors for the construction of industrial and commercial subdivisions; and

- Subdivision Inspectors for the inspections conducted to ensure compliance with these Standards.

For general direction relevant to submarine distribution systems, refer to *Purpose* paragraph in *Sub-Section 3-3*.

### **General Rules**

Underground and Submarine distribution system, to be owned by Hydro One, shall be installed as per the Hydro One approved design and layout drawings, and shall comply with these Standards. Any deviation from these standards shall be submitted to, and be approved by, Hydro One prior to construction.

If the subdivision developer retains the services of a contractor to construct any portion of the power supply network, then Hydro One retains the right to provide an inspector, at developer's/contractor's cost, to inspect the work being performed.

All customer-owned equipment and installations shall comply with the Ontario Electrical Safety Code.

### **Safety**

All construction shall be carried out with adequate safeguards to minimize the risk to the public, the workers, and existing structures. All applicable construction safety rules of Hydro One, OH&SA, local Municipalities, and other concerned agencies shall be followed.

### **As Built Drawings and Documentation**

Upon completion of construction, signed and red-lined "as-built" drawings shall be submitted to Hydro One.

For submarine installations requirements, refer to *As Built Drawings and Documentation* paragraph in *Sub-Section 3-3*.

### **System Voltage and Short Circuit Level**

The primary electric supply to underground residential subdivisions is typically 1-phase, up to 16 kV. Depending on system configuration and subdivision loading requirements, 3-phase may be installed into a subdivision to accommodate the need for 3-phase equipment and/or to balance the 1-phase load evenly across the system.

The primary voltage for underground industrial/commercial subdivisions is 3-phase, up to 27.6 kV. Occasionally some loads such as streetlight or traffic light transformers may be supplied at 1-phase primary supply voltage of up to 16 kV.

The primary supply to residential customers from submarine cables is 1-phase up to 16 kV and the primary 3-phase supply to residential and/or small commercial customers from submarine cables is 3-phase up to 16/27.6 kV.

The standard secondary voltage supply is as following: 1-phase 120/240 V and 3-phase 120/208 V and 347/600 V.

The 200 A rated load-break elbows, bushing inserts, junction modules etc., which are used with primary voltage equipment, have a short time and fault close rating of 10 kA rms symmetrical current for 0.17 second. The 600 A rated dead-break elbows are rated for 25 kA. Therefore, the Distribution Planner must ensure that the system short circuit level, at the place of application of 200 A rated products, is less than 10 kA.

### **Primary System Configuration**

For detailed primary system configuration of 1-Phase and 3-Phase Distribution Systems, refer to applicable *Sub-Section 3-1* and *Sub-Section 3-2* respectively.

For detailed primary system configuration of 1-Phase and 3-Phase Submarine Installations, refer to *Sub-Section 3-3*.

### **Primary System Switching and Sectionalizing**

For general information on of 1-Phase and 3-Phase Primary Distribution Systems switching and sectionalizing equipment and methods, refer to *Section 8*.

For specific application of primary system switching and sectionalizing, refer to applicable *Sub-Section 8-1* and *Sub-Section 8-2* respectively.

### **Trenching**

Trenches shall be dug as true to line as possible, and the bottom of the trench shall be uniform and raked free of stones and all other foreign and sharp objects. A layer of clean masonry sand, as specified in drawings, shall be placed prior to installation of cables/ducts. In all cases, trenches shall be of adequate depth and width to accommodate cables/ducts with specified separations. For typical all-in-duct trench details refer to *100 Series* drawings in this section. For *Trench/Cable and Duct Locations* details, refer to *Sub-Section 6-1*. For *secondary service cable trench details*, refer to *Sub-Section 11-1-1*. All distances for trench locations shall be from the centerline of the trench to a property line or curb. For actual separation to the trench the nearest edge of the trench shall be the reference point.

Construction stepping and/or supporting of the trench wall to conform to the requirements of the Occupational Health and Safety Act (OH&SA).

### **Common (Joint) Utility Trenching**

Prior to starting any excavation, the common trenching installations shall be coordinated by the Subdivision Developer with all utilities, including Hydro One, telephone utility, gas utility, and the local CATV company.

Typical power, gas pipeline and communications cable relative locations and separations are shown in DU3-101-0500 and DU3-102-0500 for all-in-duct installations. Location of various utility cables and pipelines near foundations are shown in DU6-105-0500/0501.

Power cables shall **not** run in the same vertical plane as gas pipelines.

Gas pipelines must have a minimum horizontal separation of 30 cm (preferred 60 cm) from any part of a Hydro One equipment ground grid.

### **Express Feeders**

When designing the underground distribution system, the equipment phasing, cable positions in the trench and any requirement for express feeder/ducts and spare duct(s) shall be specified by the Distribution Planner.

Express feeder cables/ducts are 3-phase underground feeders connected directly between dip pole, pad-mounted kiosk/switchgear, or distribution station with no 1-phase taps. These feeders are typically 350 kcmil copper and are connected through 600 A dead-break elbows or terminations.

Feeder cables/ducts in a trench not servicing the pad-mounted equipment shall be by-passed from entering the foundation.

For location of by-pass and/or express feeder cables/ducts in trench refer to *100 Series* drawings in this section.

For typical by-pass or express feeder pad-mounted equipment foundation arrangement and clearances refer to DU6-105-0500/0501.

### **All-In-Duct Systems**

Urban underground subdivisions shall have all primary and secondary cables installed in ducts. Cables shall be installed in ducts, with maximum of one (1) primary cable or one (1) secondary bundle per duct.

Primary cables shall be continuously ducted between pad-mounted equipment and/or dip poles.

Secondary cables shall be continuously ducted, with the possibility of short lengths of flexible conduit at the trench ends to facilitate the transition. These cables will run from the pad-mounted supply transformer and/or dip pole to the service's wall mounted meter base. If an intermediate secondary junction point is required, a pad-mounted kiosk shall be used to maintain the continuously ducted system (no direct buried portion of cable).

Duct systems shall be designed and fabricated such that cables may be pulled in and out by hand or cable pulling equipment without incurring damage to the cable or duct. Factors affecting the ability to pull cables include, but are not limited to: cable size, cable jacket material, cable construction, duct size, total duct length, duct material/type, number of bends, angle of bends and bend radius. These parameters are to be selected such that maximum cable tensions and duct sidewall bearing pressures are **not** exceeded. For more information on allowable limits, design considerations and cable pulling calculation examples, refer to *Sub-Section 7-1-2 and 7-1-5*.

### **Laying Direct Buried Cables**

For new construction, all primary and secondary cables shall be installed in duct. For information on legacy direct buried cable installations, refer to *Section 15*.

**Duct Banks**

All ducts shall be set on undisturbed or well-compacted soil. Ducts shall be 100 mm diameter (unless specified otherwise) PVC type DB2. See DU3-101-0500, DU3-102-0500 and DU3-103-0500.

In the majority of instances for duct bends of 45° or greater, elbows of at least 61 cm radius must be utilized. However, all proposed duct bend design shall be checked against the cable pulling calculation procedure outlined in *Sub-Section 7-1-2* to ensure practical bending radius bends are selected for any possible future cable upgrading needs.

Reinforced concrete duct bank bending sections may be constructed per DU3-103-0500 (for standard 4" [100 mm] conduit only), if required for site specific structural loading conditions.

Ducts in concrete encased duct banks shall be supported by spacers and properly secured to prevent them from floating in liquid concrete. Concrete shall have a compressive strength of minimum 20 MPa at 28 days, and 5-8% air content. It should comply with all the latest CSA A23.1/A23.2 standards for quality, workmanship, storage, handling weather requirement mixtures, and testing.

All lengths of ducts shall be properly cemented together with a chemical bond type PVC adhesive.

**Cable and Duct Separation from Other Utilities**

For information on cable and duct separation from other utilities, refer to *Section 6*.

**Crossing Other Utilities**

For information on crossing other utilities, refer to *Section 6*.

**Street Crossing**

**R01** ▶ All primary and secondary cables in road crossings shall be installed, in 100 mm diameter Schedule 40 Polyvinyl Chloride (PVC) ducts, as per DU3-111-0500/0501 and DU3-112-0500 or in High-Density Polyethylene (HDPE) ducts as per DU3-113-0500.

The center line of primary and secondary cable street crossings at locations other than intersections shall extend, perpendicular to the curb, to the opposite side of the street and preferably be:

- Determined by a line starting 3 m to the right or left of the equipment foundation in order to service multiple pieces of equipment.

Or

- Located at the center of the equipment foundation.

All ducts shall extend a minimum of 1 m beyond the back of curb/ditch on both sides of the roadway and shall not extend into the longitudinal trench. Ducts located at the center of the equipment foundation shall connect to the knockouts in the foundation.

Cables shall be installed in ducts, with maximum of one (1) primary cable or one (1) secondary bundle per duct.

The spare ducts, pulling tape and wooden stake marking requirements are covered in *Trench/Cable and Duct Location Requirements* paragraph in *Sub-Section 6-1*. Spare ducts shall be called and sealed to prevent foreign material ingress.

- R01** ► Trench excavation and boring for road crossing ducts shall be of sufficient width to accommodate all ducts as per DU3-111-0500/0501. In rocky ground, ducts shall be placed within an envelope of crushed stone, extending 7.5 cm above, below and to the sides of the ducts, and then back-filled with clean native material as per DU3-111-0500/0501.

Street crossings in urban multi-utility road allowances, where sufficient depth or separation cannot be maintained or as required by municipal standards shall be concrete encased per DU3-112-0500.

The Municipality Standards will determine the requirements for backfill and patches required for street crossings. In some areas “unshrinkable fill” may be required.

Granular material used for road base backfill and native backfill shall be placed in layers of 15 cm maximum in depth and each layer compacted to a minimum of 95% of Standard Proctor Dry Density, unless otherwise specified by the Municipality.

#### **Horizontal Directional Drilling (HDD)**

At times, the Municipality or other authorities may not allow open cut trenching on major roads, highways, railways, and street crossings. At such times, Horizontal Directional Drilling (HDD) technique can be used in place of open cut trenching. HDD is a trenchless technology. HDD has several advantages such as faster installation and less construction time, lower cost of surface restoration, less disruption to traffic and public, etc.

DU3-113-0500 shows typical cable installation with HDD technique.

While carrying out HDD for cable installations, the following shall be observed:

- Approval of the respective authority must be obtained for the HDD and the material used therein.
- The ducts shall conform to NEMA TC-7 EPEC-B type. Ducts shall be minimum 100 mm (4”) diameter, HDPE. Minimum thickness shall correspond to Standard Dimension Ratio (SDR) of 13.5. The SDR is the ratio of the duct’s outside diameter to the duct’s wall thickness. SDR number selected must be such that the duct can withstand the expected pulling and other forces during the duct installation and also subsequent to its installation (other forces include but not limited to pressure of drilling slurry, external pressure due to earth pressure).

Note: Railways may require use of overall steel casing pipe over HDPE ducts.

- Duct colour is typically black, grey or red.
- At least one (1) spare duct shall be installed.
- Steel casing pipe must not be used to cross a 1-phase cable. It must contain 3-phase circuit(s).

- Sometimes HDPE ducts, fused together at site, are also used for longer crossings. Such ducts shall be fused using manufacturer's instructions and proper fusing equipment.
- Environmentally friendly Bentonite clay slurry shall be used as backfill and drilling mud during HDD operation. Sufficient slurry shall be used to fill all voids and prevent sinking of the road surface.
- The directional bore should be controllable and it should be possible to accurately steer the drill head in the desired direction. Damage to other utilities must be avoided.
- While pulling the cables through HDD ducts, the allowable cable pulling tensions shall **not** exceed the limits specified in *Sub-Section 7-1-2*. The cable or duct is usually pulled through from the side of the crossing opposite of the drill rig location.

#### **Minimum Cover Over Cables and Ducts**

For minimum earth cover that shall be maintained over cables and ducts, refer to *Sub-Section 6-2*.

#### **Clean Masonry Sand**

Clean masonry sand consists of clear screened washed sand, free of any pebbles, stone particles and stone dust with the same consistency throughout and not deriving from crushed stone.

#### **Backfill**

A bed of clean masonry sand, raked and lightly compacted, shall be placed in the trench bottom before installation of direct buried cables and ducts. Top and sides of ducts/cables shall also be surrounded by raked and compacted clean masonry sand. For trenching during frost, an additional 15 cm thick layer of clean masonry sand shall be provided above cable or duct, and the backfill shall be free of lumps of ice. The clean masonry sand as shown in drawings, that immediately surrounds the cable/duct shall be put in place using hand shovels.

For remaining backfill, clean native fill (clear of any stones and sharp objects) shall be used and may be applied with mechanical equipment. Alternatively, new clean fill may be introduced to the trench. Trenches shall be backfilled with clean native backfill in layers not exceeding 15 cm and each layer thoroughly compacted to a minimum of 95% Standard Proctor Dry Density.

#### **Caution Tape**

Power cable marking caution tape, covering all the cables/ducts in the trench, shall be buried approximately halfway between the uppermost cable/duct and the grade level. For reduced cover (amounts less than 40 cm), the caution tape can be laid on top of the concrete encased duct bank as shown on DU3-102-0500.

#### **Restoration of Surfaces**

All surfaces that are disturbed, due to digging and equipment foundation installation, shall be reinstated to their original condition or better, as determined by the Municipality. All grass and vegetation areas are to be restored by placing 10 cm of approved top soil, grass seeding or nursery sod, unless noted otherwise by the Municipality.

### **Mechanical Protection of Cables**

Reinforced concrete encased duct banks shall preferably be specified when mechanical protection of cable is considered desirable due to the expected deep excavations near the cable trench location, or due to reduced cover.

When concrete encased duct banks **cannot** be installed due to site constraints, then for short lengths of up to 20 m, patio slabs of at least 5 cm thickness or a field poured 7.5 cm minimum concrete layer can be specified over the ducted cables, to provide additional mechanical protection. The slabs/concrete layer shall form a continuous cover over the ducted cable and shall extend at least 60 cm beyond the affected portion of ducts in both directions. Patio slabs, when used for mechanical protection, shall extend at least 5 cm beyond the sides of cables or ducts, and shall be buffered from the cables or ducts by a 15 cm thick layer of compacted clean masonry sand.

Another acceptable means of mechanical protection is to install the cables in rigid PVC conduit (thick wall conduit, Schedule 40) or flexible conduit (thick wall corrugated conduit) wherever reduced cover/separation is encountered.

See *Sub-Section 6-2*, Table 3 for minimum cover requirements.

For mechanical protection for submarine cable installations, in the area of the shoreline, refer to *Sub-Section 3-3*.

### **Primary and Secondary Cables and Loading**

For general secondary, primary, and sub-transmission cable loading information as well as cable routing considerations for 1-phase and 3-phase distribution systems, refer to *Sub-Section 3-1* and *Sub-Section 3-2* respectively. For specific details related to cables, refer to *Section 7*.

### **Submarine Cables and Loading**

For general information on submarine cable variations and loading for 1-phase and 3-phase submarine distribution systems, refer to *Sub-Section 3-3*. For specific details related to cables, refer to *Section 7*.

### **Primary Cable Splices**

Splices in an all-in-duct application shall be eliminated by terminating cables in a switching kiosk or a switchgear. If splicing is unavoidable, pulling/splicing vaults are to be used to maintain the functionality of the duct system. For pulling/splicing vaults see *Section 4*.

For additional information on primary and submarine cable splices and installation drawings, refer to *Sub-Section 7-4-2*.

### **Submarine Cable Splices**

For submarine cable splices, refer to *Sub-Section 3-3* and *Sub-Section 7-4-2*.

### **Secondary Cable Splices**

Secondary splices are not preferred and may be avoided with the use of Secondary Vaults, Pedestals and Junction Kiosks. For details, see *Sub-Section 11-1*.

If they are unavoidable, splices shall **not** be located above grade on a structure (i.e. pole or wall) whether in conduit or free air. They shall always be located below grade in duct (non-preferred) or inside a dedicated splice vault.

In-duct installations require a split duct per DU7-422-0500. The installation also must be embedded in 50 mm of clean masonry sand on either side.

For additional information on secondary cable splices, refer to *Sub-Section 7-4-2* and *Section 11*.

### **Cable Pulling Tensions**

For information on cable pulling tensions, refer to *Section 7*.

### **Primary Cable Riser/Dip Poles**

For information on primary cable riser/dip poles, refer to *Section 5*.

### **Cable Route Markers and Marker Balls**

For information on cable route markers, refer to *Section 2*.

### **Equipment Primary Terminations and Labeling**

For information on equipment primary terminations and labeling, refer to *Section 2* and *Section 7*.

### **Transformers and Transformers Sizing**

For information on pad-mounted transformers, refer to *Section 9*.

### **Primary Switching Equipment**

For information on primary switching equipment, refer to *Section 8*.

### **Surge Protection of Primary Cables and Equipment**

For information on surge protection of primary cables and pad-mounted equipment, refer to *Sub-Section 8-3*.

### **Fault Indicators**

For information on fault indicators, refer to *Sub-Section 8-5*.

### **Pad-Mounted Equipment Foundation**

For information on pad-mounted equipment foundations, refer to *Section 4*.

### **Cable Pulling Splicing Vaults**

For information on cable pulling/splicing vaults, refer to *Section 4* and *Section 7*.

### **Bollards for Equipment Protection**

For information on bollards for equipment protection, refer to *Section 6*.

### **Streetlight and Communication Equipment**

For information on streetlight and communication equipment, refer to *Section 6*.

### **Secondary Services**

For information on secondary services, refer to *Section 11*.

**Metering Near Pad-Mounted Transformer and Central Metering**

For information on metering near pad-mounted transformer and central metering, refer to *Section 11*.

**Resolution of Stray Voltage**

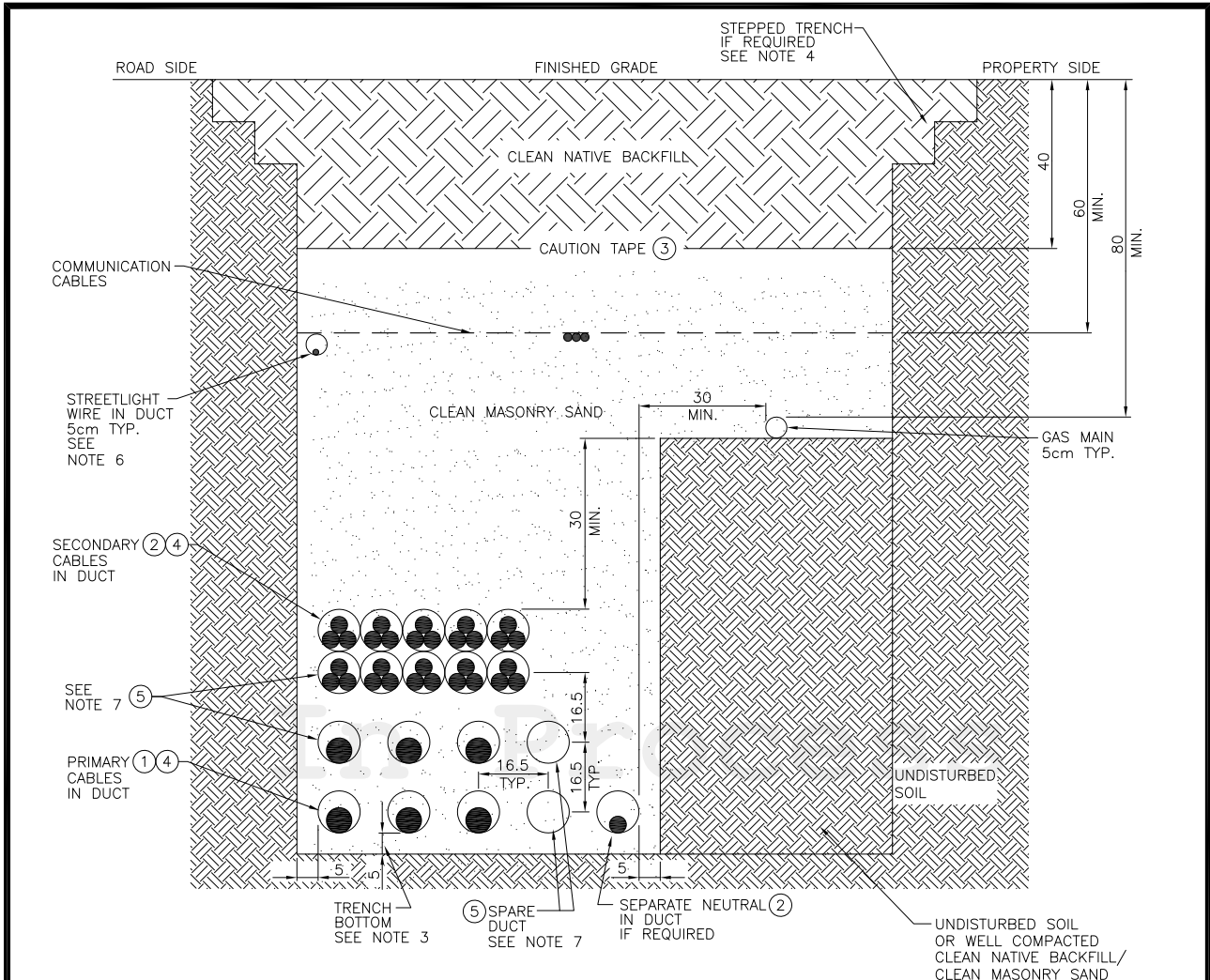
For information on resolution of stray voltage, refer to *Section 11*.

**Equipment and Concentric Neutral Grounding**

For information on equipment and concentric neutral grounding, refer to *Section 12*.

In Process

Rev. No.	Issue Date	Description
01	July 2025	<ul style="list-style-type: none"> <li>• Updated the “<i>Street Crossing</i>” paragraph:                             <ul style="list-style-type: none"> <li>○ To specify the Schedule 40 PVC ducts as new requirement for street crossings, replacing the previously permitted DB2 PVC ducts.</li> <li>○ To reference the new (second) sheet of drawing DU3-111-0500/0501.</li> <li>○ To remove the use of clean masonry sand as an envelope material for ducts in rocky ground conditions. Crushed stone or clean backfill are the only two materials that are allowed for these applications, in accordance with the applicable street crossing drawings.</li> </ul> </li> </ul>



**NOTES:**

- FOREIGN PLANT IS SHOWN FOR DIMENSIONAL REFERENCE ONLY. LOCATIONS/SEPARATIONS AND COVERAGE SHOWN MAY VARY PER THE OWNERS AND/OR MUNICIPAL STANDARDS. MINIMUM SEPARATIONS SHOWN TO HONI PLANT MUST BE MAINTAINED.
- ALL SEPARATIONS AND DEPTHS OF BURIAL ARE MINIMUM.
- IN THE PRESENCE OF SHARP ROCKS OR UNEVEN TERRAIN, INCREASE SAND PADDING TO 10cm.
- CONSTRUCTION, STEPPING AND/OR SUPPORTING OF THE TRENCH WALL TO CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT.
- NON-REQUIRED CIRCUITS OR JOINT USE COMPONENTS MAY BE OMITTED PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. EXPRESS PRIMARY CABLES (IF PRESENT) MUST OCCUPY LOWEST POSITION IN THE DUCT BANK. SECONDARY CABLES MAY BE INSTALLED IN THE LOWER (PRIMARY) POSITIONS IF REQUIRED. SUPPLY CABLES OF ALL VOLTAGES MUST HAVE 90cm MINIMUM COVER.
- STREETLIGHT WIRE MAY BE INSTALLED ADJACENT TO A SECONDARY CABLE DUCT SO LONG AS IT IS INSTALLED IN ITS OWN DISTINGUISHABLE DUCT (EXAMPLE: 50mm PVC/HDPE DUCT VERSUS 100mm DB2).
- ALL DUCTS TO BE MANDRELLED AND CLEANED AFTER INSTALLATION. ALL DUCTS TO HAVE 5/8" POLYESTER PULLING TAPE INSTALLED. SPARE DUCTS SHALL BE CAPPED AND SEALED TO PREVENT FOREIGN MATERIAL INGRESS.

MINIMUM COVER REQUIREMENTS	
COMPONENT	COVER
COMMUNICATION CABLES IN DUCT	60cm
STREETLIGHT WIRE IN DUCT	60cm
GAS MAIN	80cm
SECONDARY SUPPLY CABLES	90cm
PRIMARY SUPPLY CABLES	90cm

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	CABLE, PRIMARY, UNDERGROUND, 28kv OR CABLE, PRIMARY, UNDERGROUND, 46kv	A/R
2	MM#	CABLE, SECONDARY/NEUTRAL, UNDERGROUND, 0-600V	A/R
3	20002181	TAPE, CAUTION, RED	A/R
4	MM#	DUCT, PVC, DB2	A/R
5	20000007	TAPE, PULLING, 5/8" WIDE, POLYESTER	A/R
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

02	FEB 2026	UPDATED PART #5 DESCRIPTION, AND NOTE #7 TO CONFORM WITH ENGINEERING MATERIAL CATALOG.	PC	MM	MM	MM
01	SEPT 2023	ORIGINAL DU-03-206.2-0500-R1 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 3. GENERAL UPDATES.	PC	MM	XZ	MM
Rev. No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/11/11	Pole ID:	



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Information contained in this drawing is considered to be confidential. Recipients shall only use the drawing for its intended purpose and shall take necessary measures to prevent disclosure or transmission to outside parties.

Title:  
**4-PART TRENCH - POWER, COMMUNICATION, GAS & STREETLIGHT - ALL-IN-DUCT - TYPICAL UP TO 44kv**

Drawing No. **DU3-101-0500** Rev. No. **02**

TITLE BLOCK REV 02 - AUGUST 2014

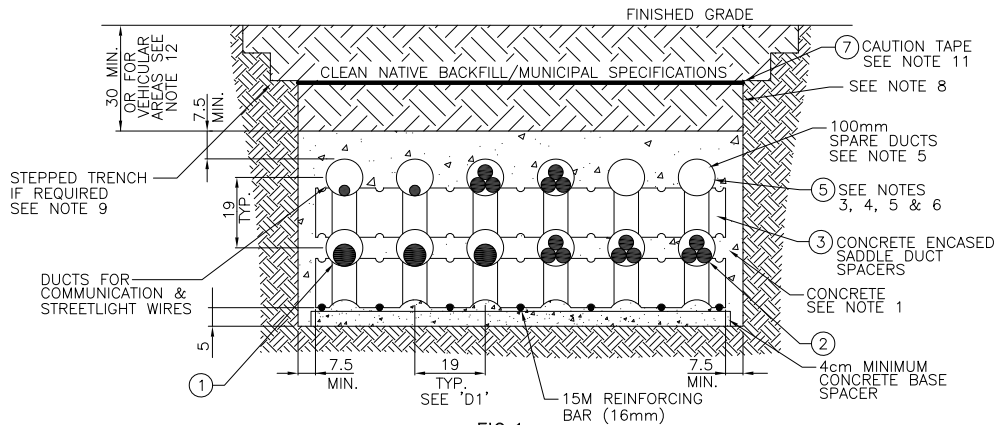


FIG.1  
SAMPLE TRENCH FRONT VIEW  
2 x 6 DUCTBANK

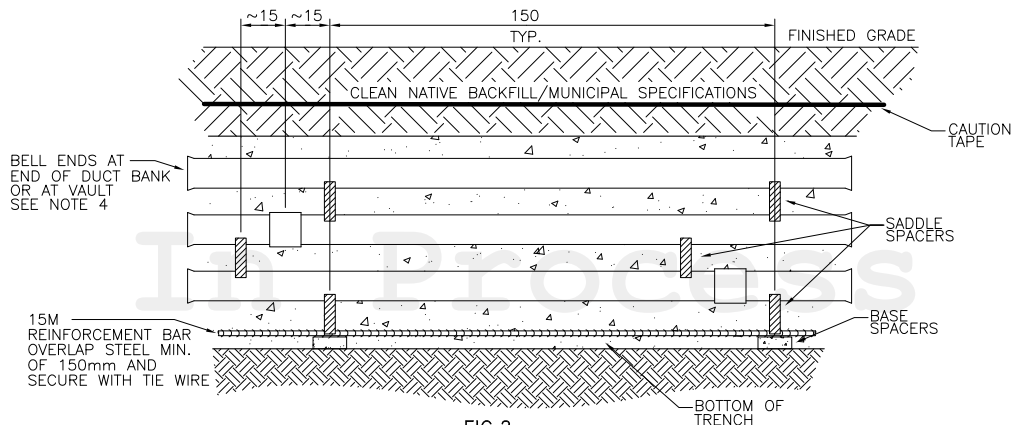
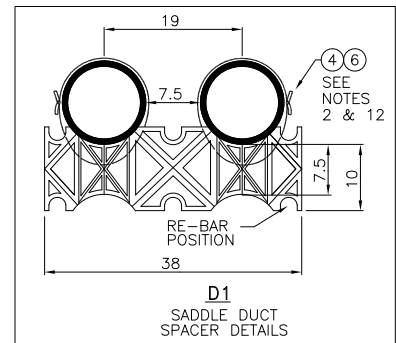


FIG.2  
SAMPLE TRENCH SIDE VIEW  
3 LAYERS OF DUCTBANK

NOTES:

1. CONCRETE TO HAVE A COMPRESSIVE STRENGTH OF MINIMUM 20MPa AT 28 DAYS AND BE VIBRATED AT TIME OF POURING TO REMOVE ENTRAPPED AIR.
2. SPACERS STAGGERED 15cm VERTICALLY AND BE SPACED AT EVERY 150cm LENGTH OF DUCT. DUCTS TO BE SECURELY FASTENED TO THE SPACER VIA THE WIRE AS SHOWN IN DETAIL 'D1'.
3. ALL JOINTS TO BE SOLVENT WELDED.
4. ALL DUCTS SHALL TERMINATE AT FACE OF DUCT BANK WITH BELL ENDS.
5. ALL DUCTS TO BE MANDRELLED AND CLEANED AFTER INSTALLATION. ALL DUCTS TO HAVE 5/8" POLYESTER PULLING TAPE INSTALLED. SPARE DUCTS SHALL BE CAPPED AND SEALED TO PREVENT FOREIGN MATERIAL INGRESS.
6. NUMBER OF CABLES/DUCTS AS WELL AS THEIR ARRANGEMENT WITHIN THE DUCT BANK AS SHOWN IS REPRESENTATIVE ONLY. DUCTS/CABLES MAY BE ADDED/OMITTED AND/OR RE-ARRANGED AS REQUIRED, PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. OVERALL TRENCH WIDTH TO CONFORM TO MUNICIPALITY REQUIREMENTS.
7. TRENCH BOTTOM MUST BE LEVEL AND FREE OF DEBRIS.
8. FORMS REQUIRED FOR BOTH SIDES OF THE FULL LENGTH OF THE CONCRETE ENCASED DUCT STRUCTURE.
9. CONSTRUCTION, STEPPING AND/OR SUPPORTING OF THE TRENCH WALL TO CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT.
10. REFER TO DU3-103-0500 FOR BEND DETAILS.
11. CAUTION TAPE TO BE INSTALLED APPROXIMATELY HALFWAY BETWEEN THE FINISHED GRADE AND THE TOP OF THE CONCRETE ENCASED DUCT BANK WHERE SUFFICIENT COVER IS PRESENT. FOR REDUCED COVER AMOUNTS (<40cm), THE CAUTION TAPE CAN BE LEFT ON TOP OF THE CONCRETE ENCASED DUCT BANK AS SHOWN.
12. DUCT BANKS ENCASED IN A 7.5cm ENVELOPE OF REINFORCED CONCRETE SHALL HAVE A MINIMUM BACKFILL COVER OF 30cm IN NON-VEHICULAR AREAS. IN ALL VEHICULAR AREAS, REFER TO DU3-112-0500 FOR MINIMUM BACKFILL REQUIREMENTS.



ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

02	FEB 2026	UPDATED BACKFILLING DIMENSIONS IN FIG.1. UPDATED PULLING TAPE SIZE/DESCRIPTION IN PART #5 AND NOTE 5. ADDED NOTE 12 TO CLARIFY MIN. DEPTH REQUIREMENTS FOR NON-VEHICULAR VS. VEHICULAR AREAS.	GJ	PC	DK	MM
01	SEPT 2023	ORIGINAL DU-03-206.3-0500-R3 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 3. GENERAL UPDATES. ADDED PART#7 AND NOTE 11.	PC	MM	XZ	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	CABLE, PRIMARY 0-46kV, UNDERGROUND	A/R
2	MM#	CABLE, SECONDARY/NEUTRAL, UNDERGROUND, 0-600V	A/R
3	MM#	SPACER, DUCT, SADDLE	A/R
4	MM#	DUCT, PVC, DB2, 100mm	A/R
5	20000007	TAPE, PULLING, 5/8" WIDE, POLYESTER	A/R
6	30002893	TIE WIRE, FOR REBAR, 16 GAUGE	A/R
7	20002181	TAPE, CAUTION, RED	A/R
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/11/11	Pole ID:	P.Eng.

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Title:  
**CONCRETE ENCASED DUCT BANK (4" CONDUIT) WITH PROVISION FOR REDUCED COVER UP TO 44kV**

Drawing No. **DU3-102-0500**

Rev. No. **02**

TITLE BLOCK REV 02 - AUGUST 2014

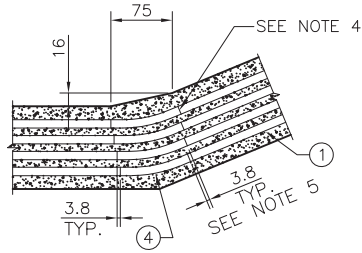


FIG.1  
DUCT BANK 22.5° BEND  
PLAN VIEW

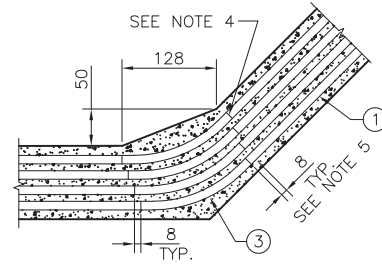
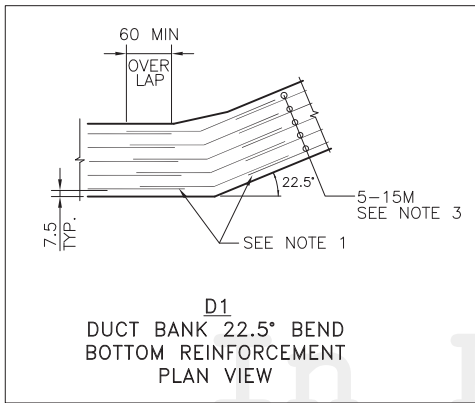
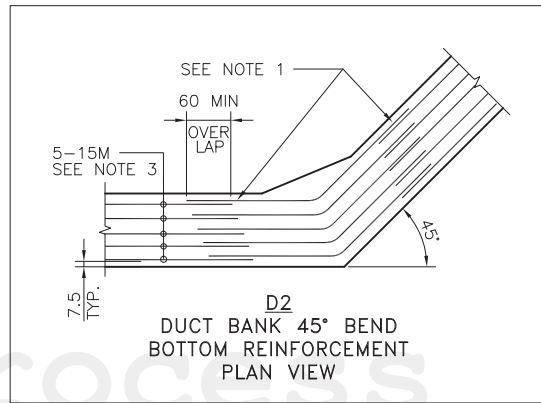


FIG.2  
DUCT BANK 45° BEND  
PLAN VIEW



D1  
DUCT BANK 22.5° BEND  
BOTTOM REINFORCEMENT  
PLAN VIEW



D2  
DUCT BANK 45° BEND  
BOTTOM REINFORCEMENT  
PLAN VIEW

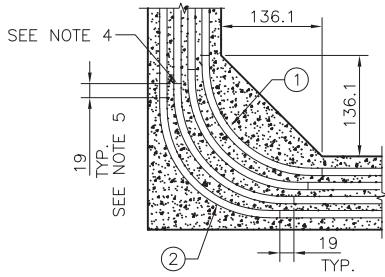
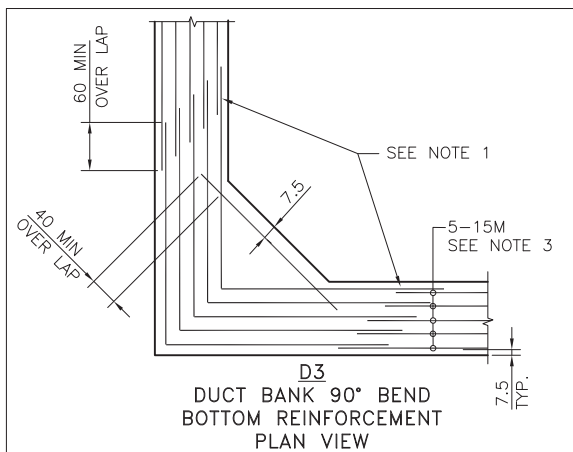


FIG.3  
DUCT BANK 90° BEND  
PLAN VIEW



D3  
DUCT BANK 90° BEND  
BOTTOM REINFORCEMENT  
PLAN VIEW

NOTES:

1. ALL BENDING SECTION REBAR AT OVERLAP SHALL MEET 60cm MIN.
2. CONCRETE TO BE 20MPa STRENGTH MIN, VIBRATED AT POURING TO REMOVE ENTRAPPED AIR.
3. INSTALL 15M REINFORCEMENT BAR AT DUCTBANK BOTTOM. REFER TO DRAWING DU3-102-0500 FOR SECTION AND PROFILE VIEWS.
4. DUCT PIPE & BENDS TO BE 10cm BELL END. ALL JOINTS TO BE SOLVENT WELDED.
5. ALL DUCTS SHALL BE EQUALLY SPACED UP TO AND AFTER EACH BEND PER THE TRENCH PROFILE. TO HELP MAINTAIN CONSISTENT SPACING THE BEND START AND END OF EACH COLUMN MUST BE OFFSET COMPARED TO THE ADJACENT COLUMN. FOR 22.5° BEND OFFSET BY 3.8cm, FOR 45° BEND OFFSET BY 8cm AND FOR 90° BEND OFFSET BY 19cm.
6. THE BENDING DESIGNS ARE FOR TYPICAL 4 COLUMNS DUCTS LAYOUT, FOR DIFFERENT DUCT BANK FORMATIONS REFER TO NOTE 5 OR CONTACT ENGINEERING.

PARTS LIST

PART No.	MM No.	DESCRIPTION	QTY.
1	30007710	DUCT, PVC, DB2, BELL ENDS	A/R
2	30031613	DUCT BEND, PVC, DB2, 60" RADIUS, 90°	A/R
3	30018079	DUCT BEND, PVC, DB2, 60" RADIUS, 45°	A/R
4	30018074	DUCT BEND, PVC, DB2, 36" RADIUS, 22.5°	A/R
5	30002893	TIE WIRE, FOR REBAR, 16 GAUGE	A/R
6	MM#	SPACER, DUCT, SADDLE	A/R

MM# = REFER TO SECTION 16 ONLY | A/R = AS REQUIRED

ALL DIMENSIONS IN CENTIMETRES UNLESS STATED OTHERWISE.

01	SEPT 2023	ORIGINAL DU-03-206.4-0500-R0 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 3. GENERAL UPDATES.	PC	MM	XZ	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: 2021/11/11	Pole ID:	

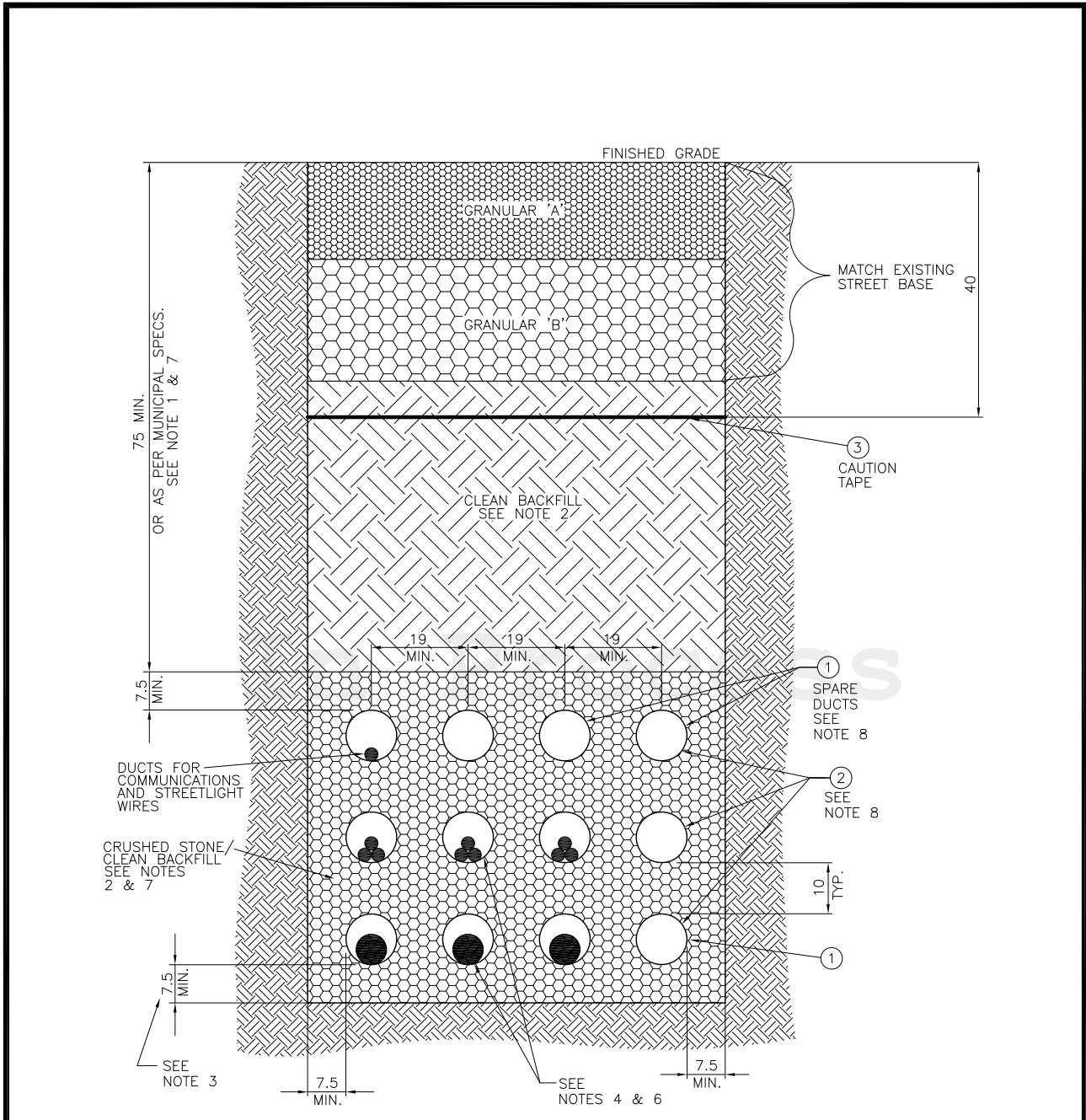


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Title:  
TYPICAL CONCRETE ENCASED  
DUCT BANK (4" CONDUIT) BEND DETAILS  
UP TO 44kV

Drawing No. DU3-103-0500	Rev. No. 01
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TITLE BLOCK REV 02 - AUGUST 2014



**MAIN**  
TYPICAL STREET CROSSING TRENCH

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	DUCT, PVC, SCHEDULE 40, 4"	A/R
2	20000007	TAPE, PULLING, 5/8" WIDE, POLYESTER	A/R
3	20002181	TAPE, CAUTION, RED	A/R
4	MM#	DUCT, PVC, DB2, 4"	A/R
5	MM#	DUCT, BEND, PVC, SCHEDULE 40, 4"	A/R
6	MM#	DUCT BEND PVC, DB2, 4"	A/R
7	30031626	DUCT, ADAPTER, PVC, SCHEDULE 40 TO DB2, 4"	A/R
MM# = REFER TO SECTION 16 ONLY		A/R = AS REQUIRED	

FOR SHEET 2 OF THIS DRAWING SEE DU3-111-0501

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

Rev No.	Date	Revision Particulars	dwn	ckd	des	app
03	FEB 2026	UPDATED PART #2 DESCRIPTION, AND NOTE #8 TO CONFORM WITH ENGINEERING MATERIAL CATALOG.	PC	MM	MM	MM
02	JULY 2025	UPDATED MAIN FIGURE TO SHOW 3X4 DUCT FORMAT. ADDED ALT.1 & 2 FOR TRANSITION TO FOUNDATION OR TRENCH. CHANGED STREET CROSSING DUCT MATERIAL FROM DB2 TO SCHEDULE 40. UPDATED NOTES 1 & 3. ADDED NOTES 10 TO 12. ADDED PARTS#S 4 TO 7.	IP	MM	DK	MM

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/11/11	Pole ID:	

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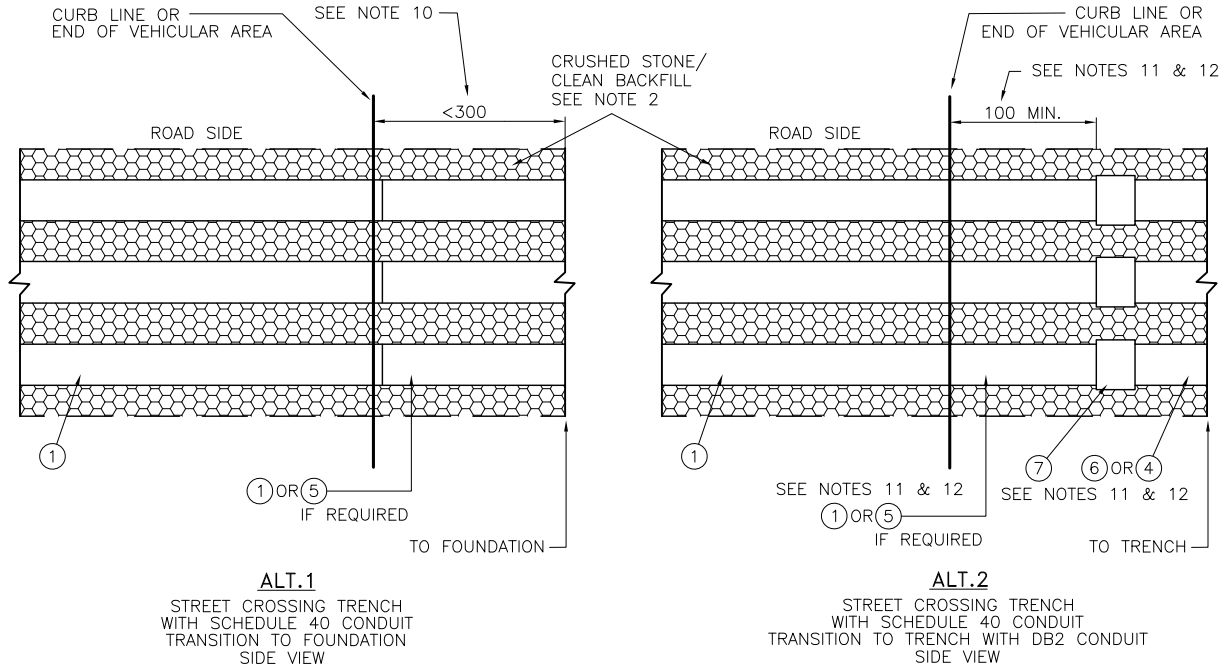
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Title:  
**TRENCH STREET CROSSING - TYPICAL**

Drawing No. **DU3-111-0500** Rev. No. **03**

TITLE BLOCK REV 02 - AUGUST 2014



**NOTES:**

1. STREET CROSSING DUCTS TO BE INSTALLED AS PER MUNICIPAL SPECIFICATIONS TO A 75cm MINIMUM DEPTH FROM FINAL GRADE. CENTER POINT TO BE ELEVATED TO PROVIDE 3% SLOPE TO EXTREMITIES.
2. BACKFILLING & COMPACTION SHALL BE AS PER MUNICIPAL SPECIFICATIONS. COMPACTION SHALL BE A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
3. A 7.5cm THICK LAYER OF COMPACTED, CLEAN BACKFILL OR CRUSHED STONE SHALL BE PLACED IN THE TRENCH BOTTOM BEFORE INSTALLING DUCTS.
4. PRIMARY CABLES SHALL BE IN THE LOWER DUCTS AND SECONDARY CABLES IN THE UPPER DUCTS.
5. THIS DRAWING ALSO APPLIES TO CABLES INSTALLED ACROSS DRIVEWAYS IN INDUSTRIAL & COMMERCIAL SUBDIVISIONS AND UNDER PAVED PARKING AREAS.
6. DUCT/CABLE ARRANGEMENT SHOWN IS AN EXAMPLE. IN CASE OF ABSENCE OF SECONDARY CABLES IN THE TRENCH, THE PRIMARY CABLES CAN BE PLACED IN THE MIDDLE LEVEL DUCTS.
7. CONCRETE ENCASEMENT REQUIRED FOR REDUCED COVER, CLOSE PROXIMITY TO OTHER URBAN UTILITIES/INFRASTRUCTURE OR PER MUNICIPAL SPECIFICATIONS. SEE DU3-112-0500.
8. ALL DUCTS TO BE MANDRELLED AND CLEANED AFTER INSTALLATION. ALL DUCTS TO HAVE 5/8" POLYESTER PULLING TAPE INSTALLED. SPARE DUCTS SHALL BE CAPPED AND SEALED TO PREVENT FOREIGN MATERIAL INGRESS.
9. NUMBER OF CABLES/DUCTS AS WELL AS THEIR ARRANGEMENT WITHIN THE DUCT BANK AS SHOWN IS REPRESENTATIVE ONLY. DUCTS/CABLES MAY BE ADDED/OMITTED AND/OR RE-ARRANGED AS REQUIRED, PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. OVERALL TRENCH WIDTH TO CONFORM TO MUNICIPALITY REQUIREMENTS.
10. IF THE DUCT SECTION AFTER THE CURB LINE OR THE END OF VEHICULAR AREA IS LEADING INTO AN EQUIPMENT FOUNDATION WITHIN 3m (WITH OR WITHOUT USING OF BENDS) THEN THE DUCT MUST BE COMPLETED WITH SCHEDULE 40 DUCT TO MATCH ROAD CROSSING SPECIFICATIONS.
11. IF THE SECTION OF THE DUCT AFTER THE CURB LINE OR THE END OF VEHICULAR AREA IS LEADING INTO A TRENCH WITH DB2 DUCT THEN THE SCHEDULE 40 TO DB2 ADAPTER IS REQUIRED. THE ADAPTER MUST BE INSTALLED AT LEAST 1m BEYOND THE CURB LINE OR THE END OF VEHICULAR AREA.
12. IF THE SECTION OF DUCT BEYOND THE CURB LINE OR THE END OF VEHICULAR AREA TRANSITIONS INTO A DB2 DUCT THROUGH A BEND, FOLLOW THE INSTALLATION GUIDELINES BELOW:
  - IF THE BEND OCCURS WITHIN 1m FROM THE CURB LINE OR THE END OF VEHICULAR AREA, A SCHEDULE 40 BEND MUST BE USED, WITH SCHEDULE 40 TO DB2 ADAPTER INSTALLED IMMEDIATELY AFTER THE END OF THE BEND, WHEN BEND EXTENDS BEYOND 1m FROM THE CURB LINE OR THE END OF VEHICULAR AREA.
  - IF THE BEND OCCURS BEYOND 1m FROM THE CURB LINE OR THE VEHICULAR AREA, DB2 BEND MAY BE USED, WHERE SCHEDULE 40 TO DB2 ADAPTER MAY BE INSTALLED PRIOR TO THE BEND.

FOR SHEET 1 OF THIS DRAWING SEE DU3-111-0500

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

03	FEB 2026	UPDATED PART #2 DESCRIPTION, AND NOTE #8 TO CONFORM WITH ENGINEERING MATERIAL CATALOG.	PC	MM	MM	MM	
02	JULY 2025	UPDATED MAIN FIGURE TO SHOW 3X4 DUCT FORMAT. ADDED ALT.1 & 2 FOR TRANSITION TO FOUNDATION OR TRENCH. CHANGED STREET CROSSING DUCT MATERIAL FROM DB2 TO SCHEDULE 40. UPDATED NOTES 1 & 3. ADDED NOTES 10 TO 12. ADDED PART#S 4 TO 7.	IP	MM	DK	MM	
Rev. No.	Date	Revision Particulars	dwn	ckd	des	app	

Drawn By: IP	Checked By: M.MATEVSKI	Designed By: D.KIRYANOV	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2025/01/07	Pole ID:	



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Title:  
TRENCH  
STREET CROSSING - TYPICAL

Drawing No.  
DU3-111-0501

Rev. No.  
03

TITLE BLOCK REV 02 - AUGUST 2014

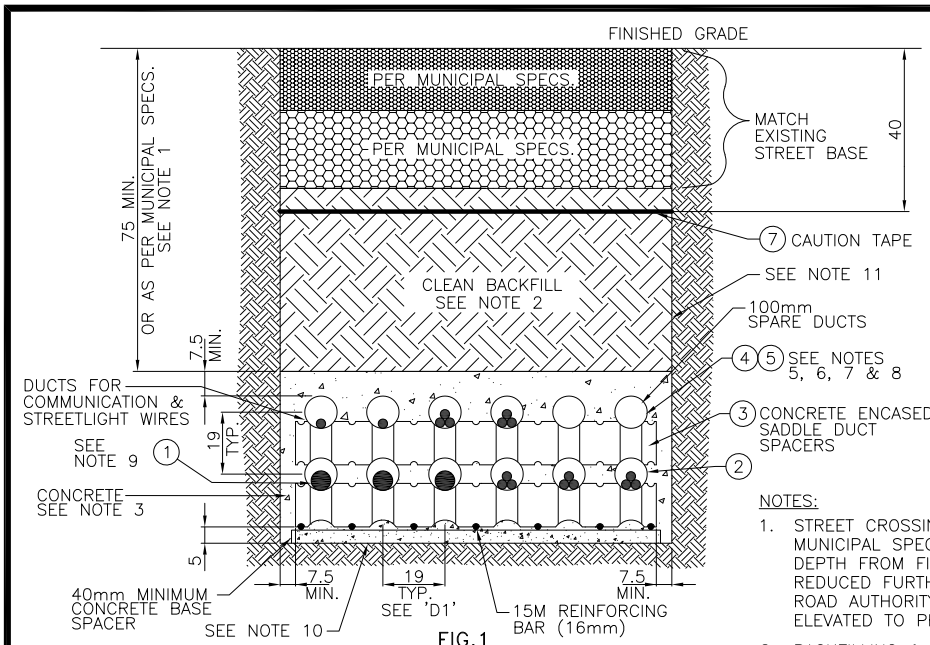


FIG.1  
SAMPLE STREET CROSSING TRENCH  
FRONT VIEW (2 x 6 DUCTBANK)

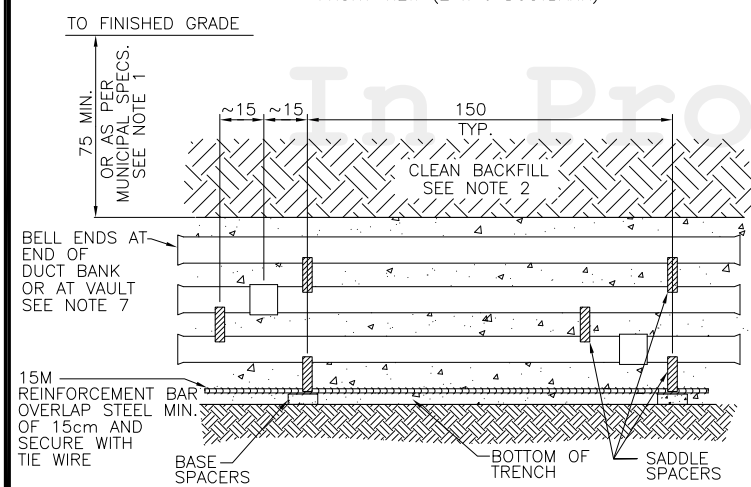
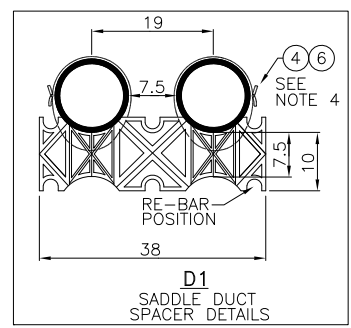


FIG.2  
SAMPLE STREET CROSSING TRENCH  
SIDE VIEW (3 LAYERS OF DUCTBANK)



ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

NOTES:

1. STREET CROSSING DUCTS TO BE INSTALLED AS PER MUNICIPAL SPECIFICATIONS TO A 75cm MINIMUM DEPTH FROM FINAL GRADE. THE DEPTH MAY BE REDUCED FURTHER TO 60cm MINIMUM WITH THE ROAD AUTHORITY APPROVAL. CENTER POINT TO BE ELEVATED TO PROVIDE 3% SLOPE TO EXTREMITIES.
2. BACKFILLING & COMPACTION SHALL BE AS PER MUNICIPAL SPECIFICATIONS. COMPACTION SHALL BE A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
3. CONCRETE TO HAVE A COMPRESSIVE STRENGTH OF MINIMUM 20MPa AT 28 DAYS AND BE VIBRATED AT TIME OF POURING TO REMOVE ENTRAPPED AIR.
4. SPACERS STAGGERED 15cm VERTICALLY AND BE SPACED AT EVERY 150cm LENGTH OF DUCT. DUCTS TO BE SECURELY FASTENED TO THE SPACER VIA TIE WIRE AS SHOWN IN DETAIL 'D1'.
5. ALL JOINTS TO BE SOLVENT WELDED.
6. ALL DUCTS SHALL TERMINATE AT FACE OF DUCT BANK WITH BELL ENDS.
7. ALL DUCTS TO BE MANDRELLED AND CLEANED AFTER INSTALLATION. ALL DUCTS TO HAVE 5/8" POLYESTER PULLING TAPE INSTALLED. SPARE DUCTS SHALL BE CAPPED AND SEALED TO PREVENT FOREIGN MATERIAL INGRESS.
8. NUMBER OF CABLES/DUCTS AS WELL AS THEIR ARRANGEMENT WITHIN THE DUCT BANK AS SHOWN IS REPRESENTATIVE ONLY. DUCTS/CABLES MAY BE ADDED/OMITTED AND/OR RE-ARRANGED AS REQUIRED, PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. OVERALL TRENCH WIDTH TO CONFORM TO MUNICIPALITY REQUIREMENTS.
9. PRIMARY CABLES SHALL BE IN THE LOWER DUCTS AND SECONDARY CABLES IN THE UPPER DUCTS. IN CASE OF ABSENCE OF SECONDARY CABLES IN THE TRENCH, THE PRIMARY CABLES CAN BE PLACED IN THE UPPER LEVEL DUCTS.
10. TRENCH BOTTOM MUST BE LEVEL AND FREE OF DEBRIS.
11. FORMS REQUIRED FOR BOTH SIDES OF THE FULL LENGTH OF THE CONCRETE ENCASED DUCT STRUCTURE.

PARTS LIST

PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	CABLE, PRIMARY 0-46kv, UNDERGROUND	A/R
2	MM#	CABLE, SECONDARY/NEUTRAL, UNDERGROUND, 0-600V	A/R
3	MM#	SPACER, DUCT, SADDLE	A/R
4	MM#	DUCT, PVC, SCHEDULE 40, 4"	A/R
5	20000007	TAPE, PULLING, 5/8" WIDE, POLYESTER	A/R
6	30002893	TIE WIRE, FOR REBAR, 16 GAUGE	A/R
7	20002181	TAPE, CAUTION, RED	A/R
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED

03	FEB 2026	UPDATED PART #5 DESCRIPTION, AND NOTE #7 TO CONFORM WITH ENGINEERING MATERIAL CATALOG.	PC	MM	MM	MM
02	JULY 2025	UPDATED THE MINIMUM BACKFILL REQUIREMENT TO FINISHED GRADE, AND FINISHED GRADE TO CAUTION TAPE CLEARANCE. UPDATED NOTE 1. CHANGED PART #4 FROM DB2 TO SCHEDULE 40.	PC	MM	DK	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/11/11	Pole ID:	

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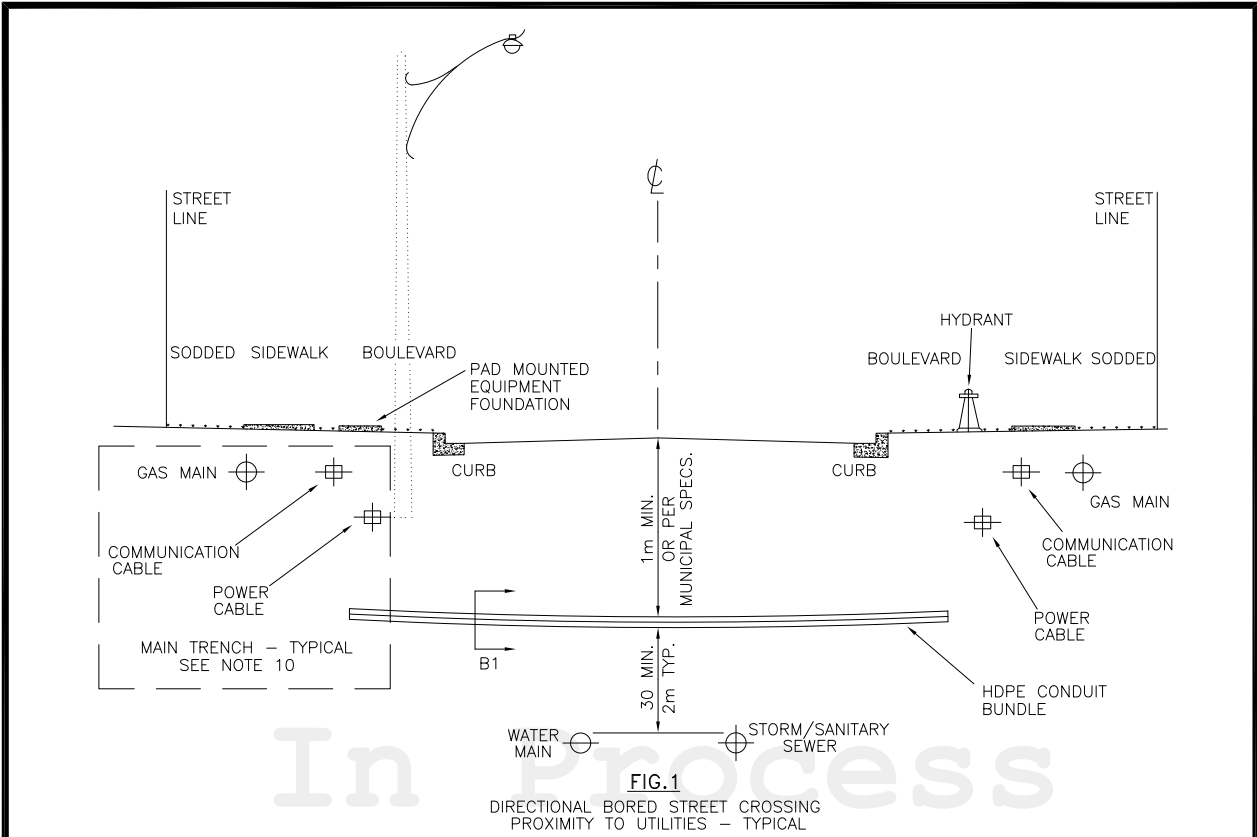
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Title:  
**TRENCH STREET CROSSING - CONCRETE ENCASED DUCT BANK**

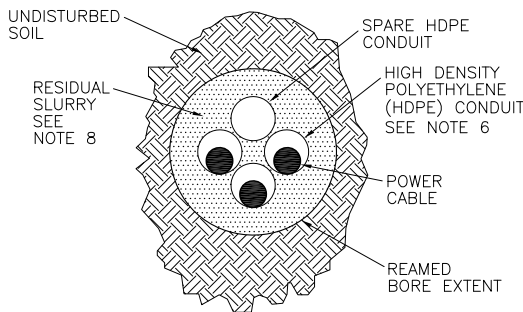
Drawing No.  
**DU3-112-0500**

Rev. No.  
**03**

TITLE BLOCK REV 02 - AUGUST 2014



**FIG. 1**  
DIRECTIONAL BORED STREET CROSSING  
PROXIMITY TO UTILITIES - TYPICAL



**FIG. 2**  
SECTIONAL VIEW - B1  
CABLES IN HDPE CONDUIT

TABLE 1 - RECOMMENDED BORE DIAMETER	
TOTAL CONDUIT DIA. *	REAMED BORE DIAMETER
< 20cm	TOTAL CONDUIT DIA. +10cm
20cm - 60cm	TOTAL CONDUIT DIA. x 1.5
> 60cm	TOTAL CONDUIT DIA. +30cm
* TOTAL CIRCUMSCRIBED DIAMETER OF MULTIPLEXED CONDUIT BUNDLE	

**NOTES:**

- CONDUIT SHALL BE INSTALLED VIA HORIZONTAL DIRECTIONAL DRILLING (HDD) IN ACCORDANCE WITH LATEST VERSIONS OF ONTARIO PROVINCIAL STANDARD DOCUMENTS OPSS 450, OPSS 2103.6 AND OPSS 2103.5.
- HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT TO BE SELECTED AND INSTALLED TO MANUFACTURERS SAFE MINIMUM BEND RADIUS, WORKING TENSION AND ULTIMATE OPERATIONAL LOAD ON A SITE SPECIFIC BASIS. HDPE CONDUIT SHALL MEET THE REQUIREMENTS EPEC-B TYPE AS SPECIFIED IN NEMA STANDARD TC-7.
- CONTINUOUS LENGTHS OF FLEXIBLE HDPE CONDUIT MINIMUM 4" (100mm) DIAMETER NOMINAL WITH A SDR OF 13.5 ARE PREFERRED. SECTIONAL LENGTHS WELDED TO MANUFACTURERS SPECIFICATIONS ARE ALLOWED IF REQUIRED.
- MAXIMUM BORE DIAMETER OF 60cm (9x4" CONDUIT TYP.) AND PER TABLE 1. MAXIMUM BORE LENGTH OF 500m UNLESS SPECIFIED BY DESIGN.
- INSTALL ONE SPARE CONDUIT MINIMUM PER BORE OR AS PER DESIGN.
- EACH CONDUIT TO BE FURNISHED WITH 1/2" POLYESTER PULLING TAPE AND SEALED WITH HDPE TAPERED CAPS.
- DRILLING FLUID CHARACTERISTICS (TYPICALLY A SOLUTION OF POTABLE WATER, BENTONITE, POLYMERS AND SURFACTANTS) TO BE DETERMINED BY INSTALLER PER LOCAL GEOLOGY AND DRILLING EQUIPMENT REQUIREMENTS.
- RESIDUAL SLURRY (SOLUTION OF DRILLING FLUID AND BORE CUTTINGS) TO BE RETAINED IN THE FINISHED BORE AS MUCH AS PRACTICABLE.
- BORE PATH TO BE AS STRAIGHT AS PRACTICABLE. AS BUILT DRAWINGS TO DOCUMENT FINAL BORE PATH TO BE SUBMITTED TO HYDRO ONE.
- SPACING AND BURIAL DEPTHS WITHIN THE MAIN TRENCH PER APPLICABLE APPROVED STANDARDS TRENCH DETAIL DRAWING(S).

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-207.1-0500-R2 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 3. GENERAL UPDATES.	PC	MM	XZ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/11/11	Pole ID:	

**hydro one** **Hydro One Networks Inc.**

Title:  
**POWER CABLES IN BUNDLED HDPE CONDUIT  
DIRECTIONAL BORE INSTALLATION - TYPICAL**

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Drawing No. <b>DU3-113-0500</b>	Rev. No. <b>01</b>
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TITLE BLOCK REV 02 - AUGUST 2014

UNDERGROUND DISTRIBUTION STANDARDS

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In Process

**SECTION 4**  
**EQUIPMENT FOUNDATIONS**

## Section 4

### Equipment Foundations

#### **General**

This section covers typical precast concrete and aluminum foundations to be used with a variety of pad-mounted equipment and precast concrete pulling/splicing vaults.

#### **Foundation Specifications**

The equipment foundations and pulling/splicing vaults specification is summarized in Precast Concrete Foundations for Pad-mounted Equipment DS-36-004 and Aluminum Foundations for Pad-mounted Equipment DS-36-003. Specification drawings shall be used as a guideline by manufacturers to create concrete and aluminum foundations for pad-mounted equipment.

#### **Precast Concrete Foundations**

Drawings from DU4-101-0500 to DU4-601-0500 specify the current precast concrete foundations and accessories suitable for use in the underground system. These drawings are to be used for referencing the approved foundations.

There are two 1-phase pad-mounted transformers foundations. DU4-101-0500 - 48” deep with 48 duct ports, and DU4-105-0500, 42” deep with 40 duct ports. Use the 48” foundation with extra ports to accommodate all-in-duct design when more connections are required or at deep crossing locations.

There is typically one Material Master Number (MM#) for each two-piece foundation assembly (foundation and lid). An optional base can be added to the assembly for soils with poor bearing capacity. The base increases the bearing area of the foundation thus reducing the potential of the foundation settling, tilting, or punching through the soil. Soils with poor bearing capacity can be assumed to be:

- a) Class 6 (Soft Plastic Clay; Loose Coarse Sand; Clay; Silt; Compact Fine Sand),
- b) Class 7 (Fill; Loose Fine Sand; Wet Clays Alluvium; Silt), or
- c) Class 8 (Swamp; Marsh; Saturated Silt and Clay; Quick Sand; Humus).

Precast concrete foundations for distribution work per *Table 1* and *Table 3* below typically weigh 1,500 to 10,000 kilograms depending on the configuration and size of the supported equipment. A location with good truck access must always be a primary consideration at the design stage. Where possible, installation of equipment foundation should be avoided at high water table locations for construction and maintenance purpose.

Foundations shall be level, placed on a minimum 150 mm or 200 mm base of compacted granular “A” (compacted to a minimum of 95% of Standard Proctor Dry Density) as specified on the applicable installation drawing, and totally supported by undisturbed earth. Should the foundation installation require placement on sloping ground, Hydro One shall be contacted for specific remedial measures. Foundations listed in *Table 1* below shall be used in conjunction

with *Section 3* trenching drawings. Precast concrete foundation for all in duct installations shall be installed in accordance with DU4-901-0500.

Installations on bald rock may utilize aluminum bases per *Table 2* below.

*Table 1* and *Table 2* below provide the MM#s of foundations, lids, and bases for different pad-mounted equipment. Three-Phase Switchgear (5-way) or Resettable Fault Interrupter (RFI) (4-way) shall use DU4-304-0500 due to the configurations.

All foundation bases shall be supplied with drain knockout(s).

Cable openings in foundations shall be sealed by polyethylene seals (Poly Seals). Lifting holes in foundations shall be sealed using duct seal compound.

For foundation location and installation requirements refer to *Section 6*.

**R01 ► Table 1**

**PRECAST CONCRETE FOUNDATIONS**

<b>Equipment</b>	<b>Foundation and Lid MM#</b>	<b>Base MM# (if required)</b>
Conventional 1-PH Pad-Mounted Transformer (48 Duct Ports)	30031403	30031405
Conventional 1-PH Pad-Mounted Transformer (40 Duct Ports)	30037362	30031405
3-PH Pad-Mounted Transformer (150 - 500kVA)	30031406	30031407
3-PH Pad-Mounted Transformer (501 - 1000kVA)	30031408	30031407*
3-PH Pad-Mounted Transformer (1500 - 3000kVA) or Step Transformer (2500kVA)	30034875	30031421*
1-PH Switching Kiosk	30031412	30031413
3-PH Switching Kiosk	30031410	30031411
1-PH Switchgear	30031414	30031415
3-PH Switchgear (3-way)	30031416	30031417
3-PH Switchgear (4-way without 1-Ph RFIs)	30031418	30031419
3-PH Switchgear (5-way) or extended 4-way (with 1-PH RFI's or switches)	30031420	30031421
1-PH Metering Unit	30031631	30038596
3-PH Metering Unit	30031631	30038594
Concrete Foundation 1-PH Secondary Junction Kiosk	30033083	N/A

**Notes:**

\*Because of the weight of this equipment, the base must always be used.

**Aluminum Bases**

Drawings from DU4-801-0500 to DU4-805-0500 specify the current approved aluminum base and accessories suitable for use in the underground system. These lightweight bases were designed primarily for island/submarine cable work, where installation by a boom truck is not always accessible. Bases listed in *Table 2* below may also be used in conjunction with *Section 3* trenching drawings if the installation is on rock with insufficient native overburden.

Each aluminum base drawing includes the minimum dimensions for concrete leveling pads. The use of these leveling pads is covered in DU4-904-0500 and additional information for 1-phase kiosk and 1-phase (micropad & low profile) transformer installations on aluminum bases can be found in *Section 8* & *Section 9* respectively. For submarine installation and location requirements refer to *Section 6*.

**Table 2**  
**ALUMINUM BASES**

Equipment	MM#
Micropad 1-PH Transformer	30011213
Conventional 1-PH Transformer	30011214
1-PH Switching Kiosk	30030442
3-PH Switching Kiosk	30030443
1-PH Pad-Mounted Switchgear	30032806

**Cable Pulling/Splicing Vaults**

Drawings from DU4-701-0500 to DU4-702-0500 specify the current approved cable pulling/splicing vaults for use in the underground system. These vaults shall be used to relieve tension on the cables or for splicing purposes when cables **CANNOT** be pulled in one continuous pull. This can occur if the maximum pulling tensions values in *Table 1* in *Sub-Section 7-1-2* are exceeded due to the length of the cable run, and/or the number of bends in the cable run as well as limitations on the cable length due to the reel size.

Vaults shall be supplied with a sump box knockout for drainage purposes.

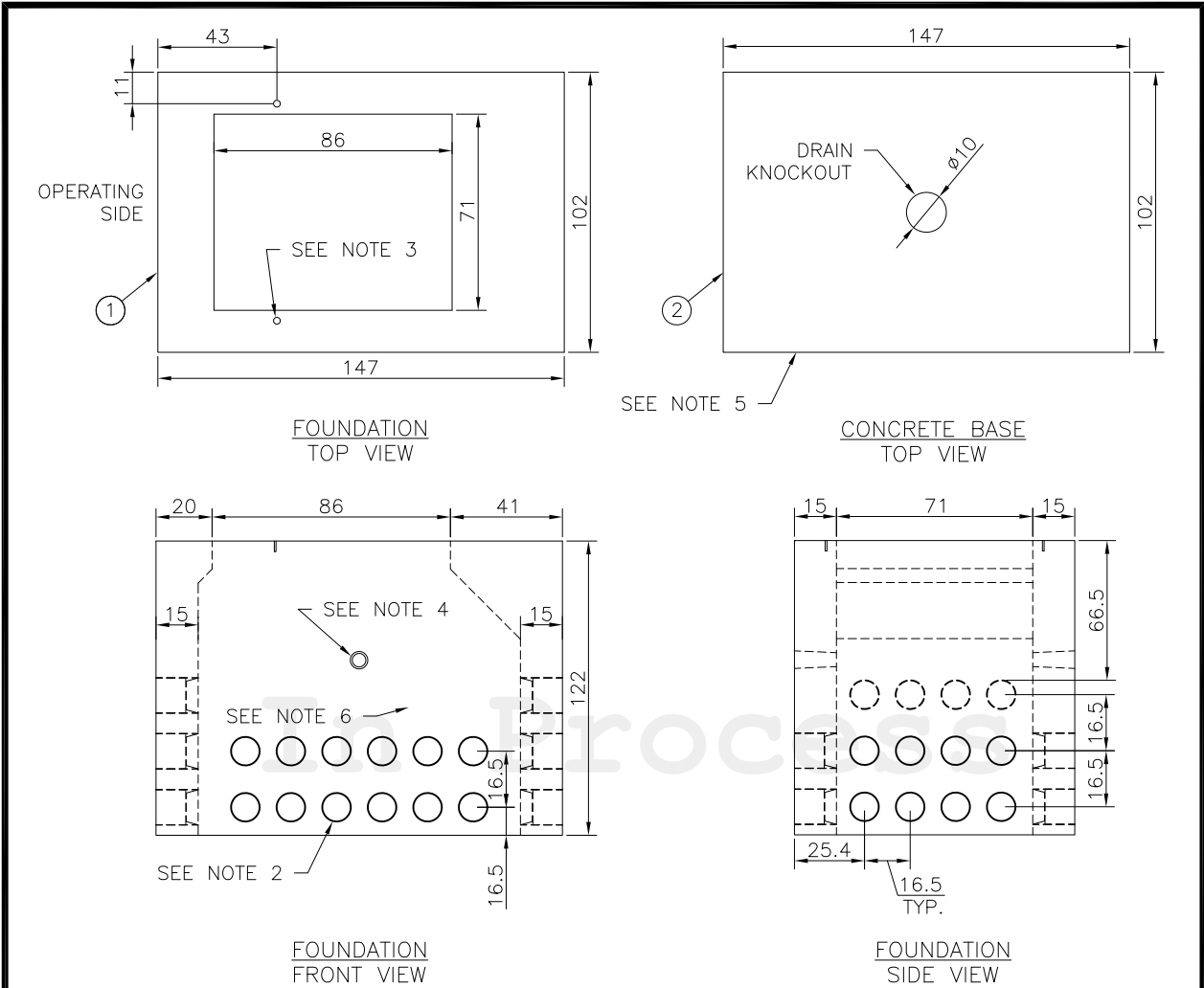
Foundations shall be level, placed on a minimum 200 mm base of compacted granular “A”, and totally supported by undisturbed earth. Should the foundation installation require placement on sloping ground, Hydro One shall be contacted for specific remedial measures. Foundations listed in *Table 3* below shall be used in conjunction with *Section 3* trenching drawings. Refer to drawings DU4-902-0500 and DU4-903-0500 for installation details of the pulling/splicing vault. Where possible, installation of these vaults should be avoided at high water table locations for construction and maintenance purpose. For additional, cable pulling/splicing vault location and installation, requirements refer to *Section 6*.

**Table 3**  
**CABLE PULLING/SPLICING VAULTS**

Equipment	MM#
Precast Concrete Pulling/Splicing Vault 399cm x 274cm x 240cm	30033407
Precast Concrete Pulling/Splicing Vault with Access Lid 183cm x 183cm x 160cm	30033979

# In Process

Rev. No.	Issue Date	Description
01	June 2024	<ul style="list-style-type: none"> <li>• Reorganized Table 1 order and updated material description of 3-PH Pad-Mounted Transformer Foundations to align with the applicable drawings and updated drawing DU4-104-0500:                             <ul style="list-style-type: none"> <li>○ 3-PH Pad-Mounted Transformer (150 - 500kVA);</li> <li>○ 3-PH Pad-Mounted Transformer (501 - 1000kVA);</li> <li>○ 3-PH Pad-Mounted Transformer (1500 - 3000kVA) or Step Transformer (2500kVA).</li> </ul> </li> <li>• Updated drawing DU4-104-0500 to apply for 3-PH Pad-Mounted Transformers (1500 - 3000 kVA) in addition to Step Transformers (2500 kVA), and updated the foundation base requirement.</li> <li>• Reintroduced drawing DU-09-502-R1 from the Underground Distribution Standards - 2014 Edition - Section 9 as new drawing DU4-402-0500 (Temporary Steel Cover For Single Phase Transformer Foundation ) in the New Underground Distribution Standards - 2023 Edition - Section 4.</li> </ul>



**NOTES:**

1. APPROXIMATE MASS OF FOUNDATION IS 1640 KG.
2. CABLE ENTRY OPENINGS: PVC SEALS FOR 10cm (4") DUCTS.
3. 1/2" x 2" UNC PLASTIC THREADED INSERT.
4. 5cm (2") LIFTING HOLE OR SWIFT LIFT SYSTEM.
5. A CONCRETE BASE (PART #2) IS AVAILABLE FOR INSTALLATIONS IN SOIL WITH POOR BEARING CAPACITY.
6. IF ADDITIONAL PORTS ARE SUPPLIED, IT IS PERMITTED, BUT NOT REQUIRED. USE THE APPRICATED PORTS BASED ON THE MINIMUM COVERING REQUIREMENT.

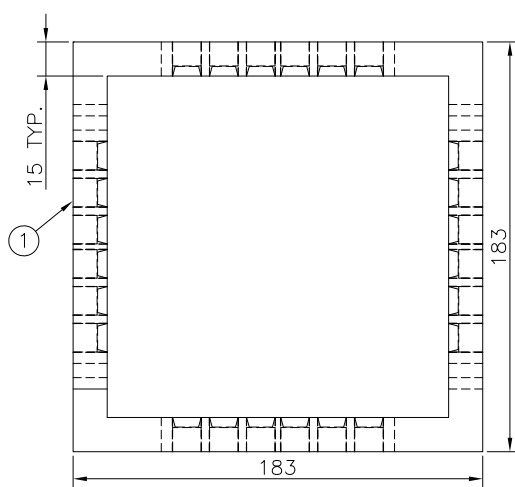
**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.
1	30031403	CONCRETE FOUNDATION – FOR CONVENTIONAL SINGLE PHASE TRANSF. – 48" DEEP, 48 PORTS OR	1
2	30031405	CONCRETE BASE – FOR CONVENTIONAL SINGLE PHASE TRANSFORMER	A/R
MM# = REFER TO SECTION 16 ONLY		A/R = AS REQUIRED	

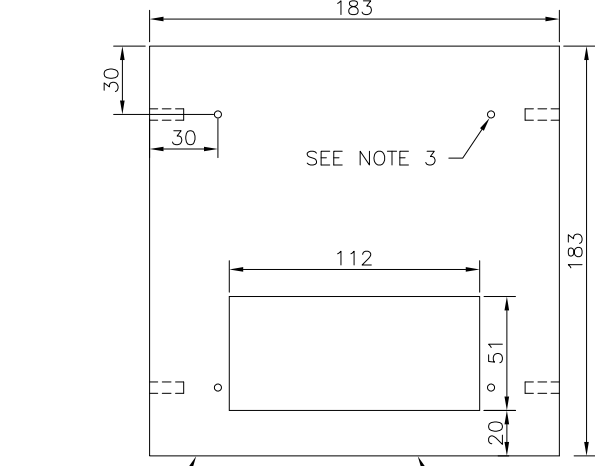
ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-09-201.1-0500-RO COMBINED WITH DU-09-101.1-0500-RO ARE NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. CHANGED TO NEW DWG. & NUMBERING FORMAT. ADDED NOTE 6 AND PARTS LIST.	PC	MM	XZ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
			Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.
							Title: TYPICAL CONCRETE FOUNDATION CONVENTIONAL 1-PH PAD-MOUNTED TRANSFORMER 48" DEEP FOUNDATION			
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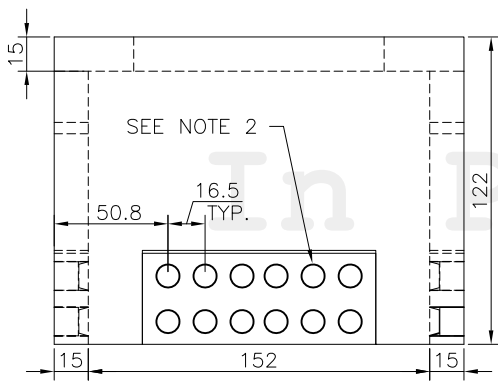
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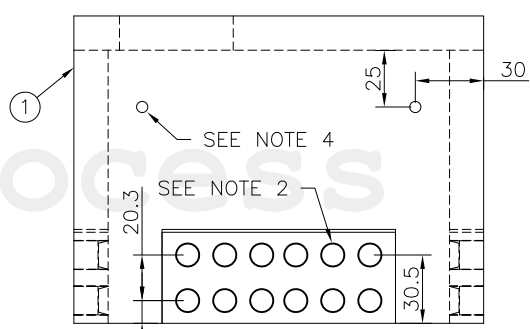
FOUNDATION TOP VIEW



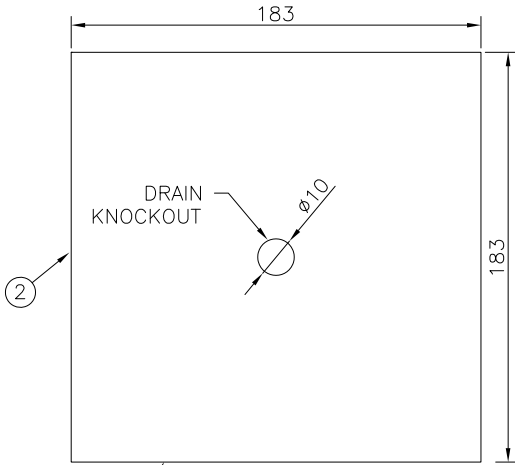
SEE NOTE 5 LID TOP VIEW OPERATING SIDE



FOUNDATION FRONT VIEW



FOUNDATION SIDE VIEW



CONCRETE BASE TOP VIEW

NOTES:

1. APPROXIMATE MASS OF FOUNDATION IS 2730 KG.
2. CABLE ENTRY OPENINGS: PVC SEALS FOR 10cm (4") DUCTS.
3. 1/2" x 2" UNC PLASTIC THREADED INSERT.
4. 5cm (2") LIFTING HOLE OR SWIFT LIFT SYSTEM.
5. LID THICKNESS = 15cm, LID MASS = 1000 KG.
6. A CONCRETE BASE (PART #2) IS AVAILABLE FOR INSTALLATIONS IN SOIL WITH POOR BEARING CAPACITY.

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30031406	CONCRETE FOUNDATION WITH LID (TWO-PIECES)- FOR THREE PHASE TRANSFORMER (150-500kVA)	1
2	30031407	CONCRETE BASE - FOR THREE PHASE TRANSFORMER	A/R

MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-09-202-R1 COMBINED WITH DU-09-102-R1 ARE NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	XZ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/02/28	Pole ID:	

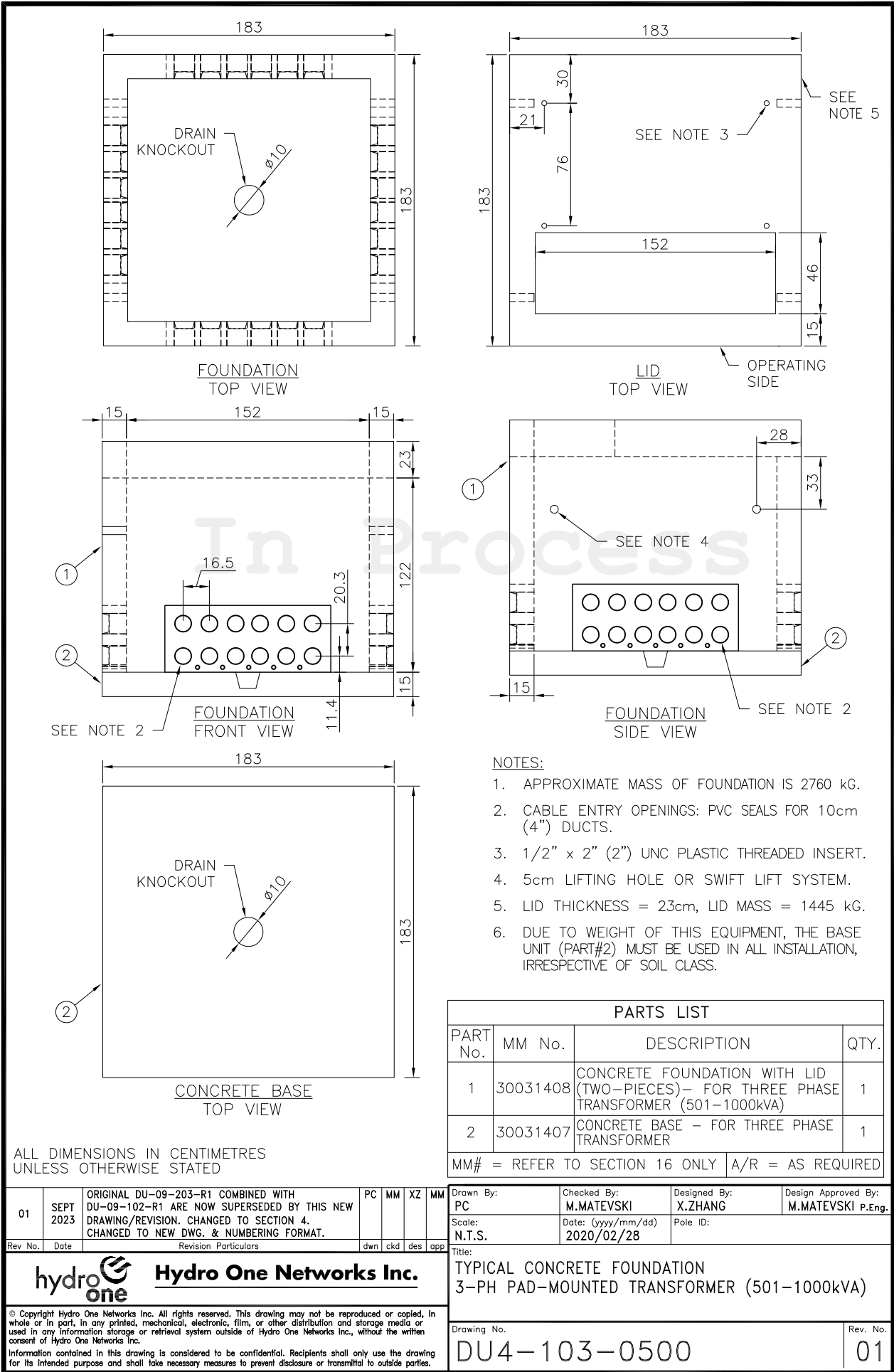


TYPICAL CONCRETE FOUNDATION  
3-PH PAD-MOUNTED TRANSFORMER (150-500kVA)

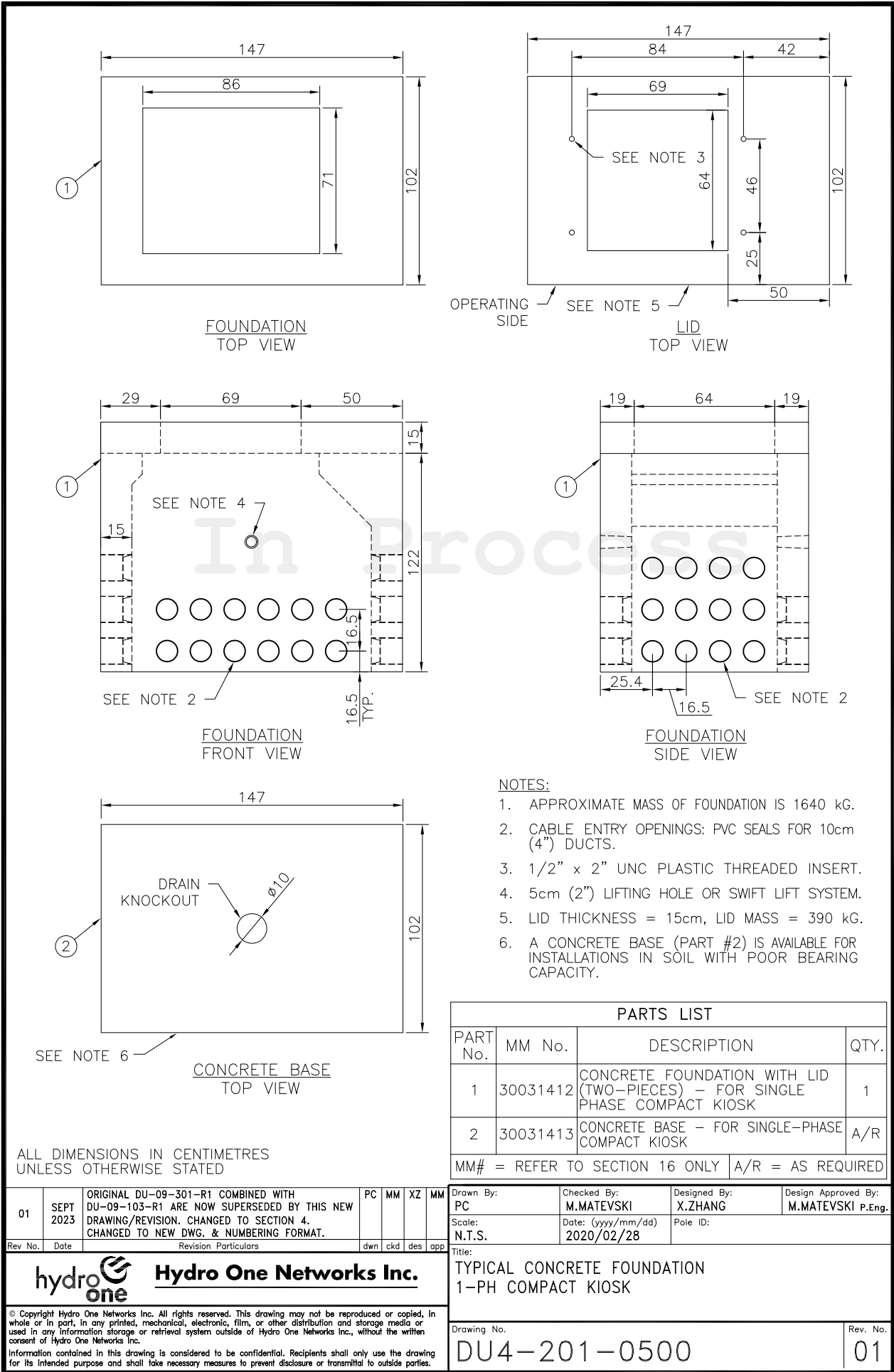
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Drawing No.	Rev. No.
DU4-102-0500	01

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**NOTES:**

1. APPROXIMATE MASS OF FOUNDATION IS 1640 kg.
2. CABLE ENTRY OPENINGS: PVC SEALS FOR 10cm (4") DUCTS.
3. 1/2" x 2" UNC PLASTIC THREADED INSERT.
4. 5cm (2") LIFTING HOLE OR SWIFT LIFT SYSTEM.
5. LID THICKNESS = 15cm, LID MASS = 390 kg.
6. A CONCRETE BASE (PART #2) IS AVAILABLE FOR INSTALLATIONS IN SOIL WITH POOR BEARING CAPACITY.

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.
1	30031412	CONCRETE FOUNDATION WITH LID (TWO-PIECES) – FOR SINGLE PHASE COMPACT KIOSK	1
2	30031413	CONCRETE BASE – FOR SINGLE-PHASE COMPACT KIOSK	A/R

MM# = REFER TO SECTION 16 ONLY | A/R = AS REQUIRED

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-09-301-R1 COMBINED WITH DU-09-103-R1 ARE NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	XZ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
			Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.

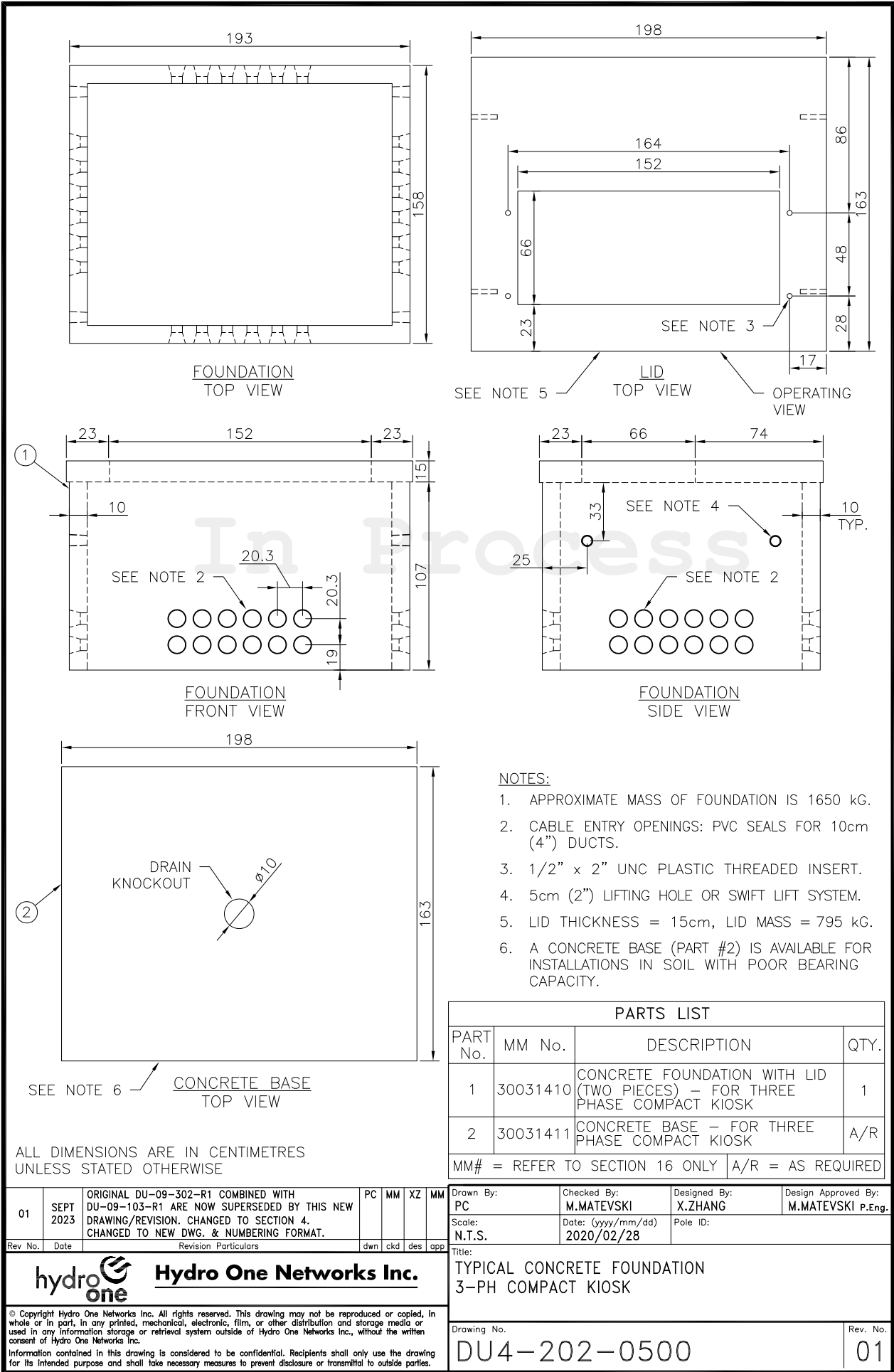
**hydro one** **Hydro One Networks Inc.**

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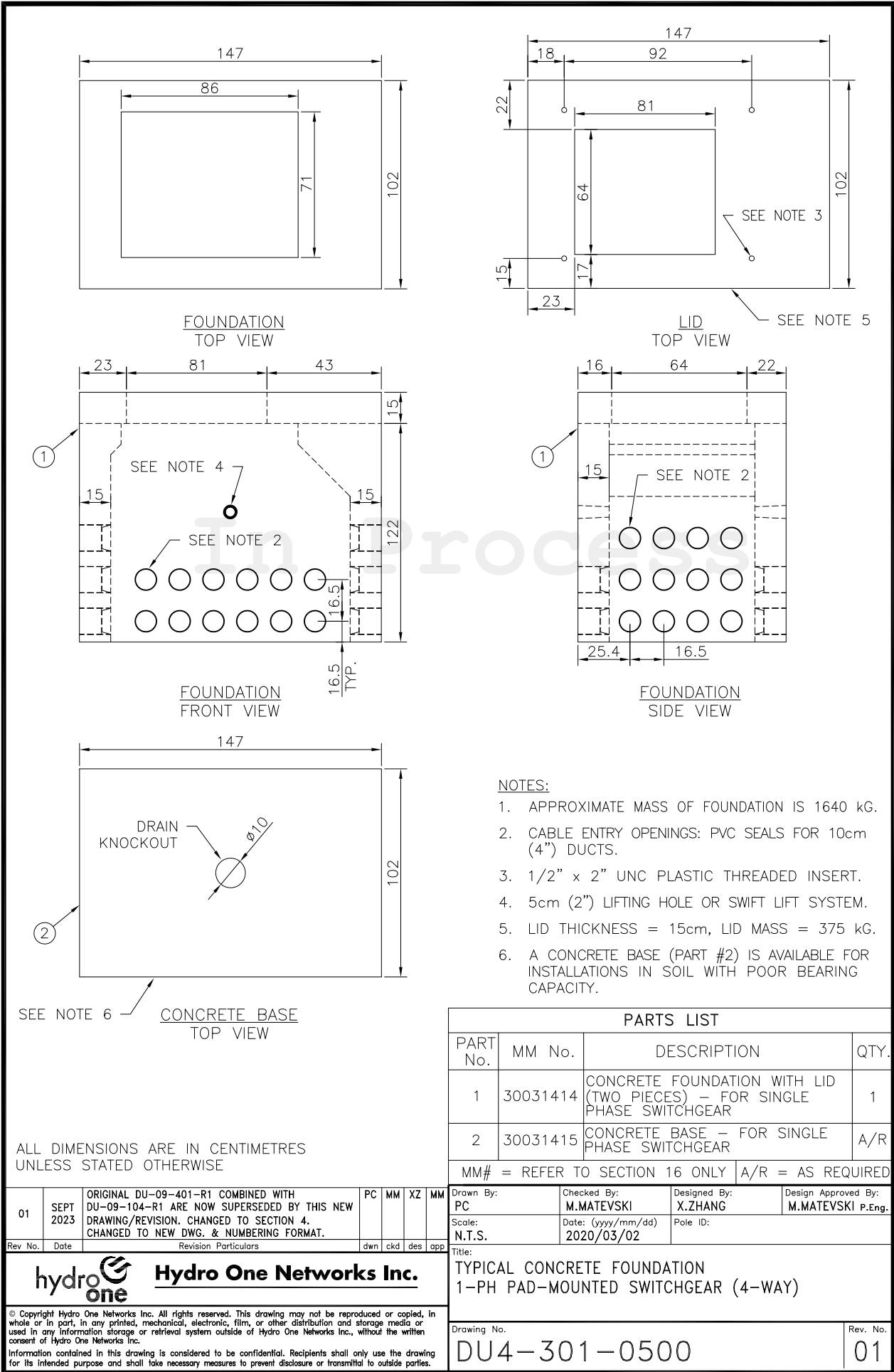
Title: TYPICAL CONCRETE FOUNDATION 1-PH COMPACT KIOSK

Drawing No. **DU4-201-0500** Rev. No. **01**

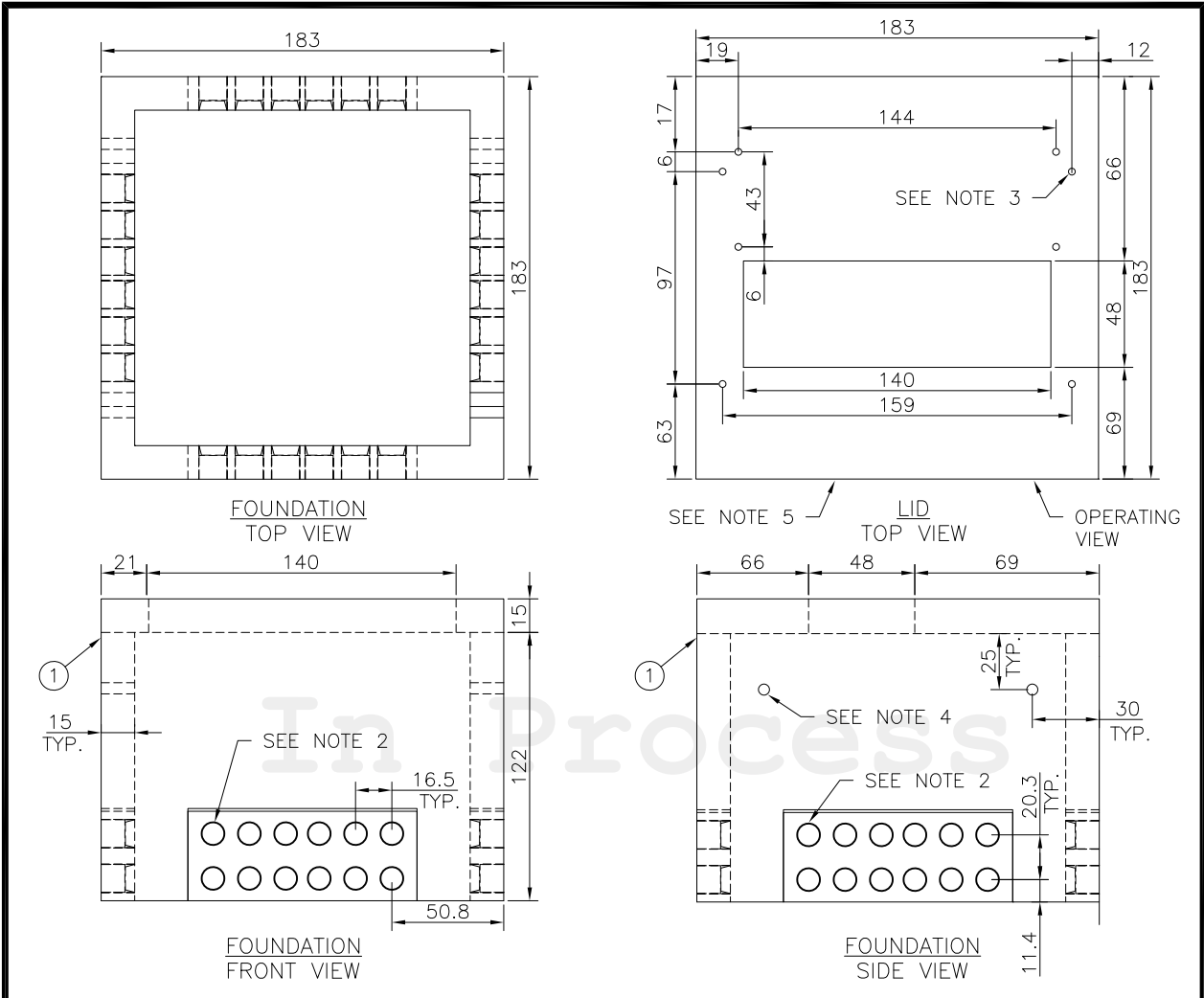
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- NOTES:**
1. APPROXIMATE MASS OF FOUNDATION IS 2730 KG.
  2. CABLE ENTRY OPENINGS: PVC SEALS FOR 10cm (4") DUCTS.
  3. 1/2" x 2" UNC PLASTIC THREADED INSERT.
  4. 5cm (2") LIFTING HOLE OR SWIFT LIFT SYSTEM.
  5. LID THICKNESS = 15cm, LID MASS = 975 kG.
  6. A CONCRETE BASE (PART #2) IS AVAILABLE FOR INSTALLATIONS IN SOIL WITH POOR BEARING CAPACITY.

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30031416	CONCRETE FOUNDATION WITH LID (TWO PIECES) - FOR THREE PHASE SWITCHGEAR (3-WAY)	1
2	30031417	CONCRETE BASE - FOR THREE PHASE SWITCHGEAR (3-WAY)	A/R

MM# = REFER TO SECTION 16 ONLY | A/R = AS REQUIRED

ALL DIMENSIONS ARE IN CENTIMETRES UNLESS STATED OTHERWISE

01	SEPT 2023	ORIGINAL DU-09-402-0500-R1 COMBINED WITH DU-09-105-R1 ARE NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	XZ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/02	Pole ID:	

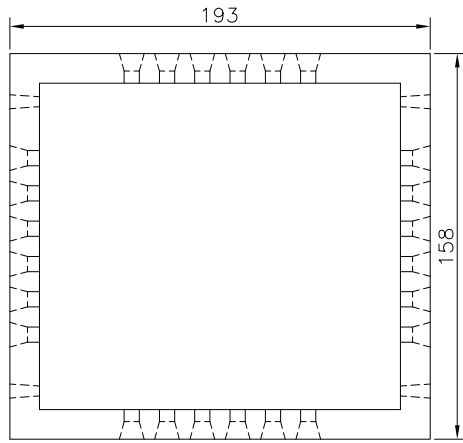


Title:  
TYPICAL CONCRETE FOUNDATION  
3-PH PAD-MOUNTED SWITCHGEAR (3-WAY)

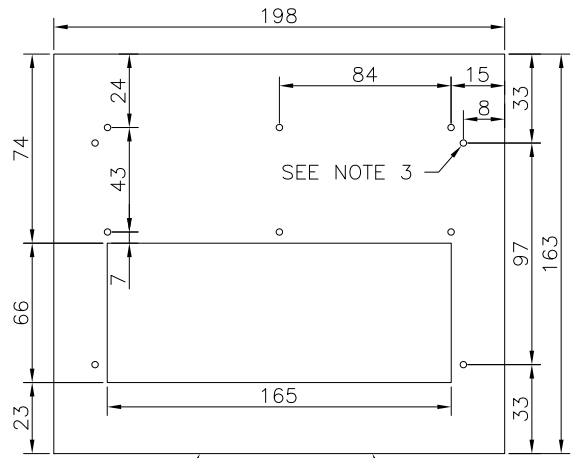
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Drawing No. DU4-302-0500	Rev. No. 01
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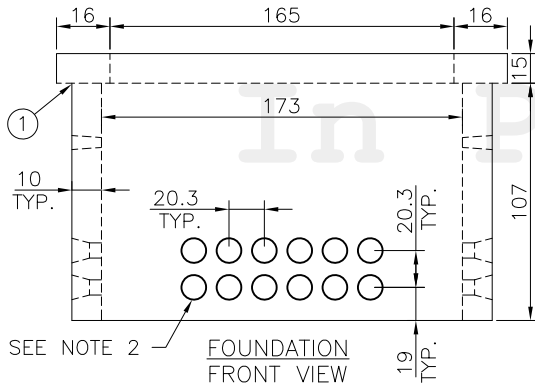
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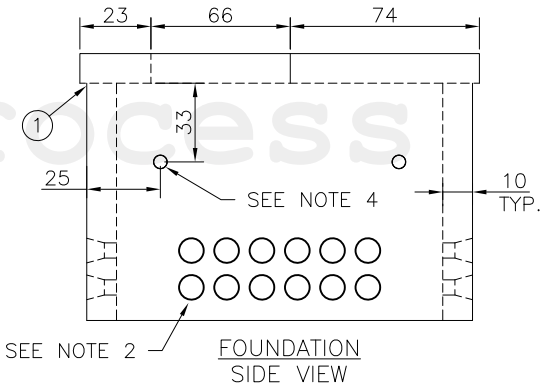
FOUNDATION  
TOP VIEW



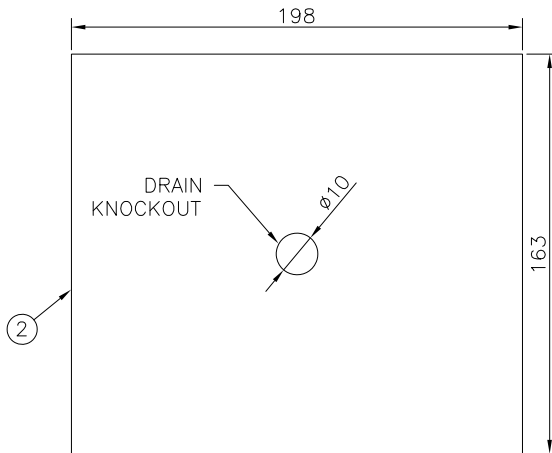
SEE NOTE 5 LID  
TOP VIEW OPERATING VIEW



SEE NOTE 2 FOUNDATION  
FRONT VIEW



SEE NOTE 2 FOUNDATION  
SIDE VIEW



SEE NOTE 6 CONCRETE BASE  
TOP VIEW

NOTES:

1. APPROXIMATE MASS OF FOUNDATION IS 1650 KG.
2. CABLE ENTRY OPENINGS: PVC SEALS FOR 10cm (4") DUCTS.
3. 1/2" x 2" UNC PLASTIC THREADED INSERT.
4. 5cm (2") LIFTING HOLE OR SWIFT LIFT SYSTEM.
5. LID THICKNESS = 15cm, LID MASS = 810 KG.
6. A CONCRETE BASE (PART #2) IS AVAILABLE FOR INSTALLATIONS IN SOIL WITH POOR BEARING CAPACITY.

PARTS LIST

PART No.	MM No.	DESCRIPTION	QTY.
1	30031418	CONCRETE FOUNDATION WITH LID (TWO PIECES) - FOR THREE PHASE SWITCHGEAR (4-WAY)	1
2	30031419	CONCRETE BASE - FOR THREE PHASE SWITCHGEAR (4-WAY)	A/R

MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED

ALL DIMENSIONS ARE IN CENTIMETRES UNLESS STATED OTHERWISE

01	SEPT 2023	ORIGINAL DU-09-403-R1 COMBINED WITH DU-09-105-R1 ARE NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	XZ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/02	Pole ID:	



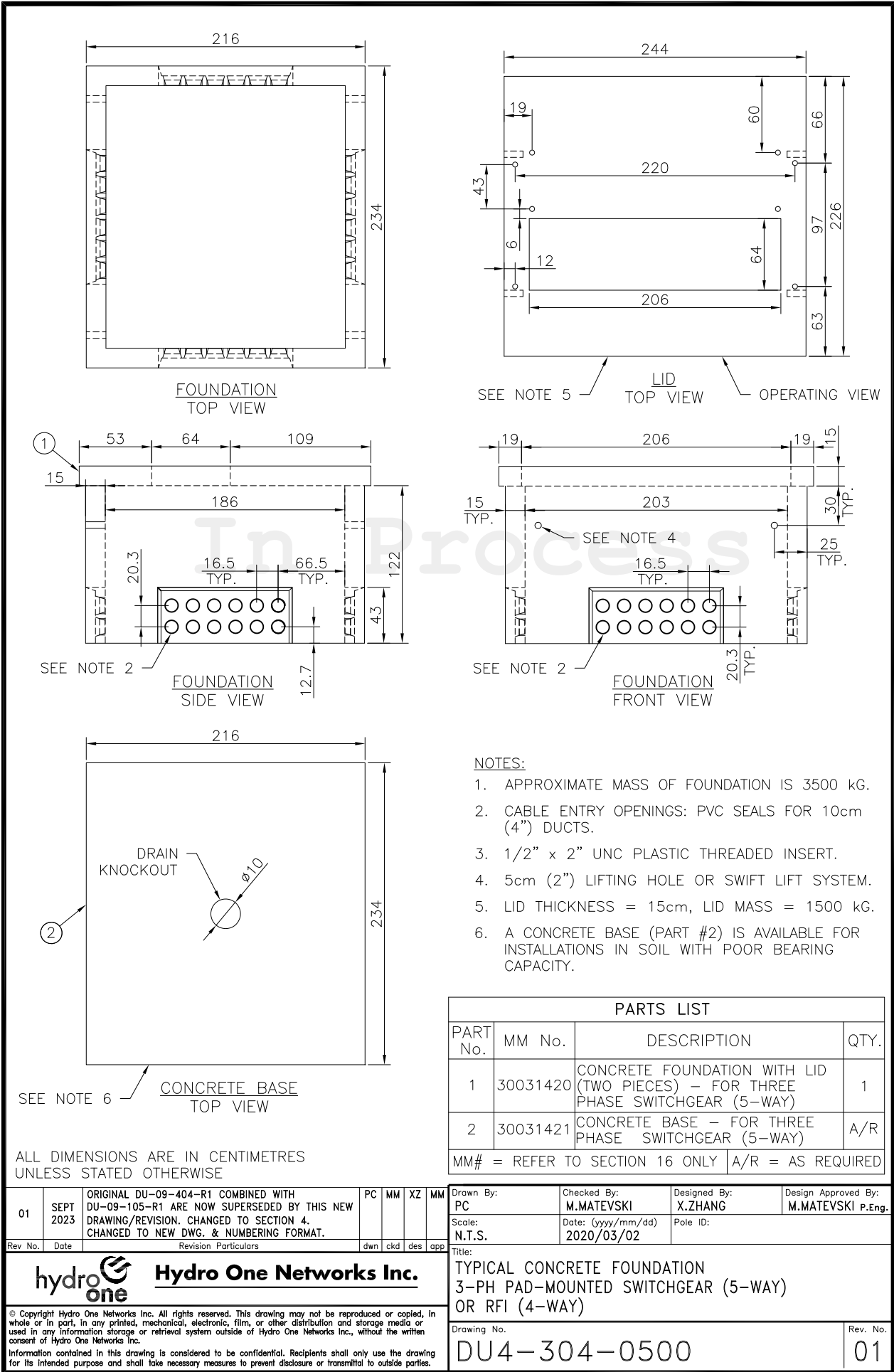
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Title:  
TYPICAL CONCRETE FOUNDATION  
3-PH PAD-MOUNTED SWITCHGEAR (4-WAY)

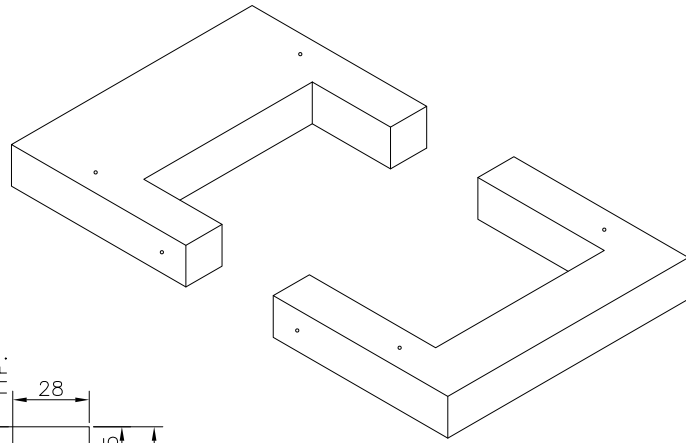
Drawing No.  
DU4-303-0500

Rev. No.  
01

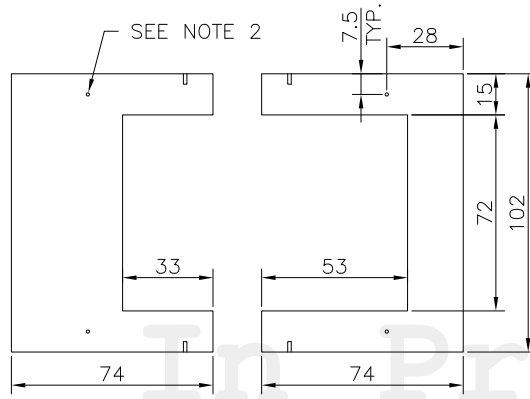
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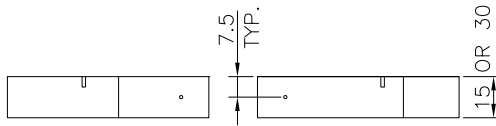
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ISOMETRIC VIEW



FOUNDATION  
TOP VIEW



FOUNDATION  
FRONT VIEW



FOUNDATION  
SIDE VIEW

NOTES:

1. APPROXIMATE MASS OF FOUNDATION IS 320 kG & 645 kG.
2. 1/2" x 2" UNC PLASTIC THREADED INSERT.
3. TO BE USED WITH INSERVICE SINGLE-PHASE PAD-MOUNTED TRANSFORMERS WHEN 10cm GRADE SEPARATION HAS BEEN COMPROMISED.
4. PRECAST COLLAR CAN ALSO BE USED FOR 1-PH COMPACT KIOSK AND 1-PH PAD-MOUNTED SWITCHGEAR INSTALLATIONS.

PARTS LIST

PART No.	MM No.	DESCRIPTION	QTY.
1	10008614	PRECAST COLLAR FOR SINGLE PHASE TRANSFORMER FOUNDATION, 15cm	A/R
2	10009051	PRECAST COLLAR FOR SINGLE PHASE TRANSFORMER FOUNDATION, 30cm	A/R

MM# = REFER TO SECTION 16 ONLY | A/R = AS REQUIRED

ALL DIMENSIONS ARE IN CENTIMETRES UNLESS STATED OTHERWISE

01	SEPT 2023	ORIGINAL DU-09-501-R1 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. GENERAL UPDATES. CHANGED TO NEW DWG. & NUMBERING FORMAT. ADDED NEW NOTE 4.	PC	MM	XZ	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/05	Pole ID:	



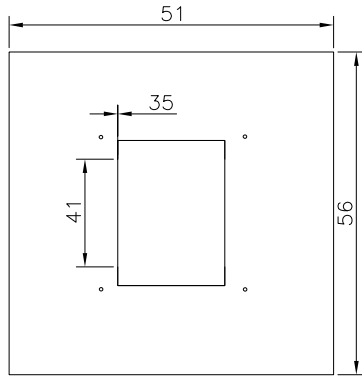
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Title:  
PRECAST COLLAR FOR PAD-MOUNT GRADE ADJUSTMENT

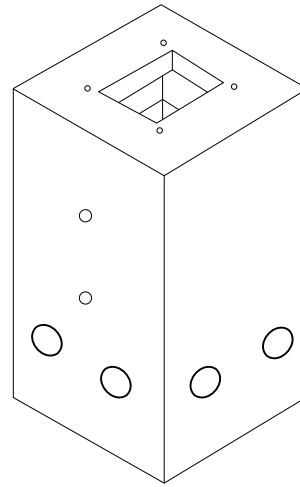
Drawing No.  
DU4-401-0500

Rev. No.  
01

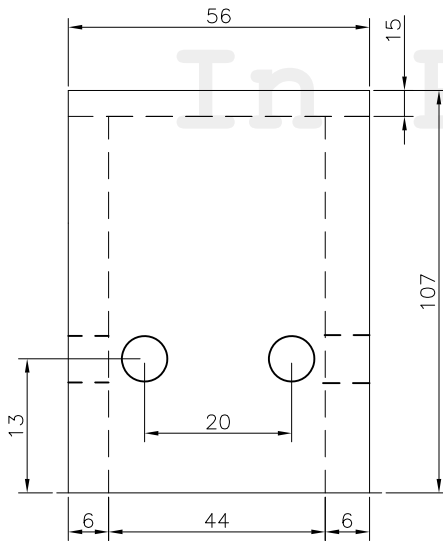
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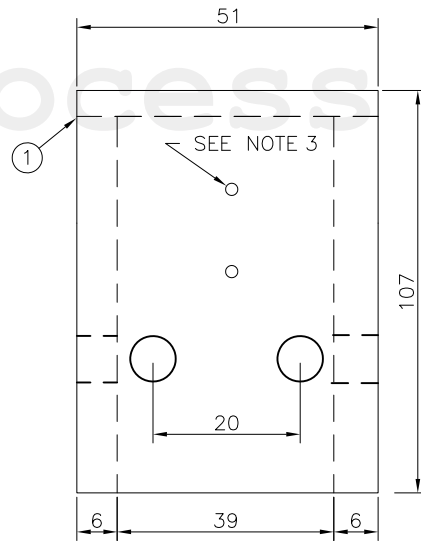
FOUNDATION  
TOP VIEW



FOUNDATION  
ISOMETRIC VIEW



FOUNDATION  
FRONT VIEW



FOUNDATION  
SIDE VIEW

NOTES:

1. APPROXIMATE MASS OF FOUNDATION IS 315 KG.
2. CABLE ENTRY OPENING: 12cm PVC SEALS.
3. 3/4" THROUGH HOLES.

PARTS LIST

PART No.	MM No.	DESCRIPTION	QTY.
1	30033083	CONCRETE FOUNDATION SINGLE PHASE SECONDARY JUNCTION KIOSK	1
MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED			

ALL DIMENSIONS ARE IN CENTIMETRES  
UNLESS STATED OTHERWISE

Rev No.	Date	Revision Particulars	dwn	ckd	des	app
* * *						

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/03	Pole ID:	

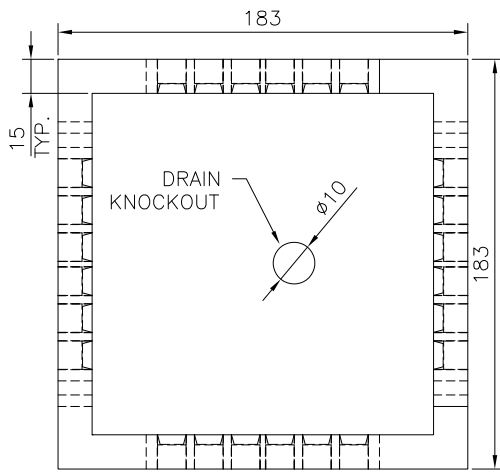


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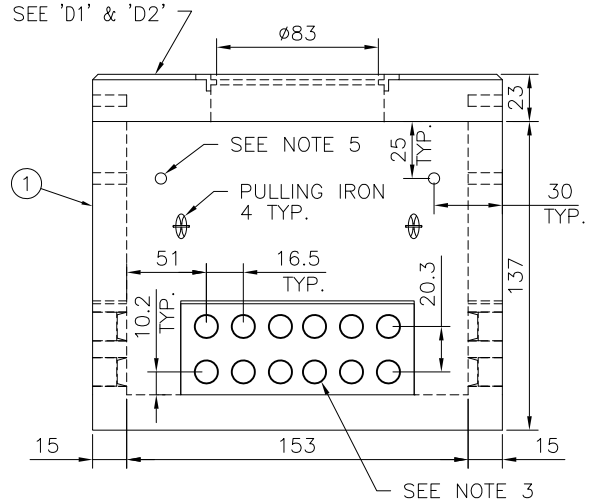
Title:  
TYPICAL CONCRETE FOUNDATION  
1-PH SECONDARY JUNCTION KIOSK

Drawing No. DU4-601-0500	Rev. No. 00
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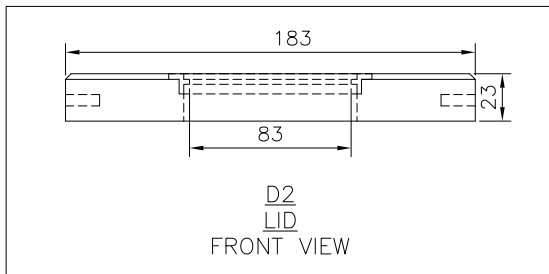
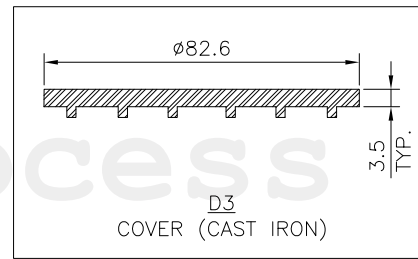
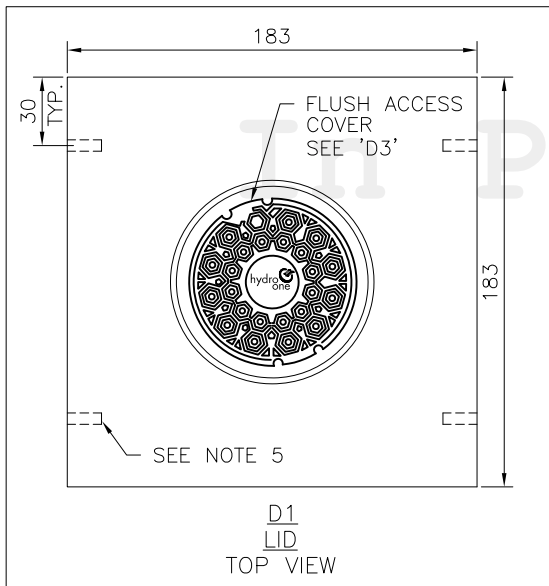
TITLE BLOCK REV 02 - AUGUST 2014



VAULT  
TOP VIEW



VAULT  
FRONT VIEW



NOTES:

1. APPROXIMATE MASS OF FOUNDATION IS 3945kG.
2. APPROXIMATE MASS OF LID IS 1600kG.
3. CABLE ENTRY OPENINGS: PVC SEALS FOR 10cm (4") DUCTS.
4. VAULT IS DESIGN TO MEET CL-625 ONTARIO TRACK LIVE LOADING, AS PER CSA-S6 RATED FOR TRAFFIC AND SIDEWALK APPLICATIONS.
5. 5cm (2") LIFTING HOLE OR SWIFT LIFT SYSTEM.

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30033979	CONCRETE PULLING/SPLICING VAULT, WITH LID (2 PC.) 183cm x 183cm x 160cm	1

MM# = REFER TO SECTION 16 ONLY | A/R = AS REQUIRED

ALL DIMENSIONS ARE IN CENTIMETRES UNLESS STATED OTHERWISE

01	SEPT 2023	ORIGINAL DU-09-504-0500-RO IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. GENERAL UPDATES. CHANGED TO NEW DWG. & NUMBERING FORMAT. REMOVED NOTES 6,7 & 8.	PC	MM	XZ	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/05	Pole ID:	

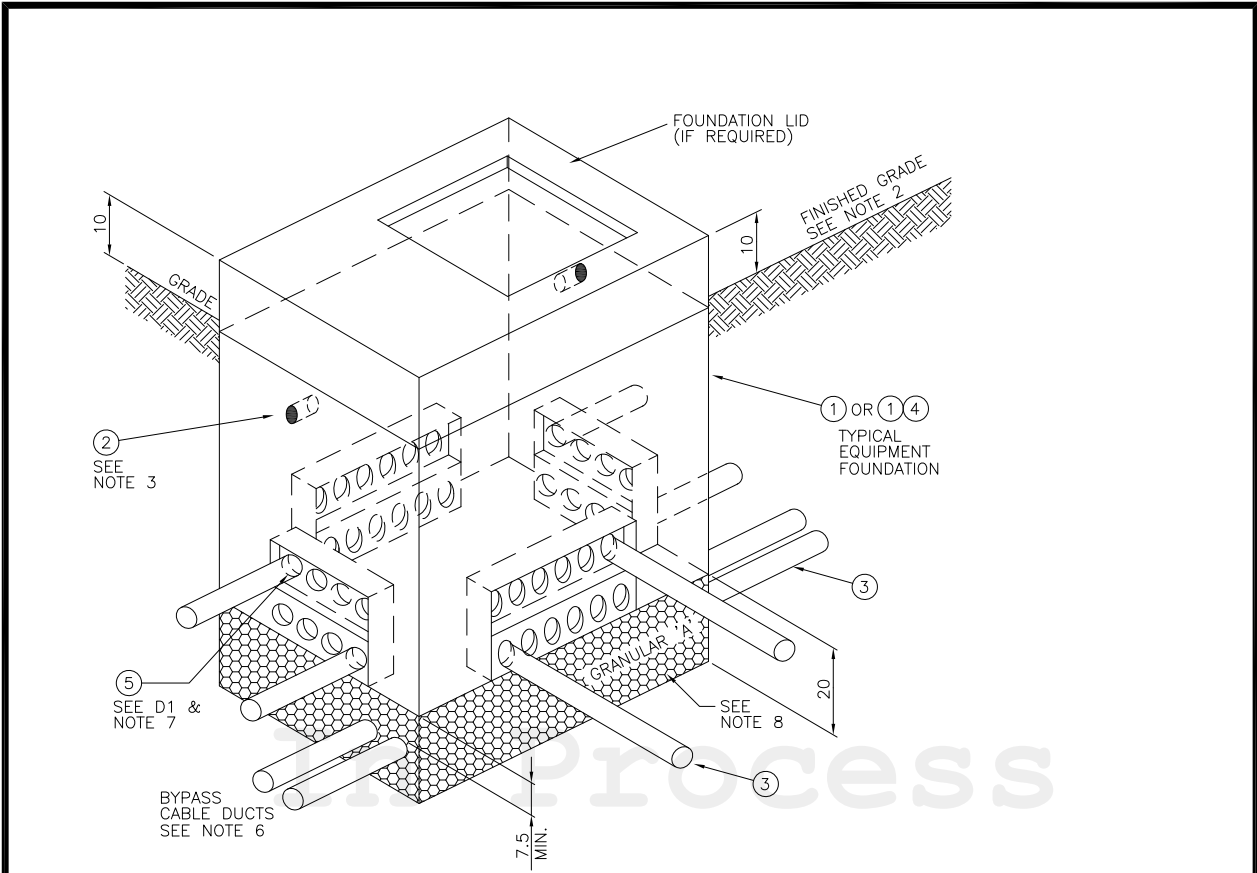


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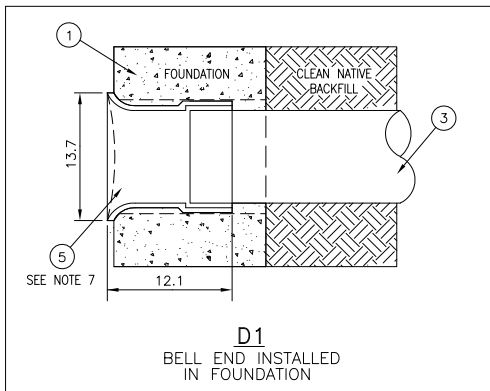
Title:  
TYPICAL CONCRETE PULLING/SPLICING VAULT WITH ACCESS LID; 183cm x 183cm x 160cm CL-625 RATED

Drawing No. DU4-701-0500	Rev. No. 01
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TITLE BLOCK REV 02 - AUGUST 2014



**FOUNDATION**  
ISOMETRIC VIEW



**NOTES:**

1. PRIMARY CABLES SHALL BE PLACED THRU THE LOWER OPENINGS.
2. AFTER INSTALLATION OF CABLES AND GROUNDING, BACKFILL AND LEVEL THE SPACE, AS BELOW, TO THE PROPOSED FINISHED GRADE LEVEL.
  - 3.0 m SPACE IN FRONT OF FOUNDATION EDGE(S) ON OPERATION SIDE(S) OF EQUIPMENT.
  - 1.0 m IN FRONT OF FOUNDATION EDGES FOR OTHER SIDES.
3. PLUG LIFTING HOLES WITH DUCT SEALING COMPOUND.
4. SOME HIDDEN LINES ARE NOT SHOWN FOR CLARITY.
5. SOME DUCTS ARE NOT SHOWN FOR CLARITY.
6. EXPRESS CIRCUITS OR PRIMARY PHASES NOT REQUIRED IN FOUNDATION TO BE BYPASSED AS SHOWN IN DU6-105-0500 & 0501.
7. INSTALL A BELL END ON ALL DUCTS INSIDE THE FOUNDATIONS, FLUSH WITH INTERIOR WALL.
8. COMPACT AND LEVEL A 20cm THICK LAYER OF CLASS 'A' GRANULAR MATERIAL BEFORE INSTALLATION OF FOUNDATION. BACKFILL AROUND THE FOUNDATION USING CLEAN NATIVE SOIL OR MASONRY SAND.

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	DISTRIBUTION EQUIPMENT FOUNDATION, CONCRETE, PRECAST	1
2	30009051	SEALANT, COMPOUND, DUCT SEALING	A/R
3	MM#	DUCT, DB2	A/R
4	MM#	CONCRETE BASE	A/R
5	30037980	BELL END, PVC, 4", DB2	A/R

MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

02	NOV 2024	ADDED 'D1' AND UPDATED NOTE 7 STATING THAT THE DUCT FITTING BELL END WILL BE USED ON ALL DUCTS INSIDE THE FOUNDATION. UPDATED MM# OF PART# 5.	GJ	PC	DK	MM
01	SEPT 2023	ORIGINAL DU-03-210.1-0500-R1 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. GENERAL UPDATES. CHANGED TO NEW DWG. & NUMBERING FORMAT. ADDED NOTES 7 & 8. ADDED PART LIST ITEMS 4 & 5.	PC	MM	XZ	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/10	Pole ID:	

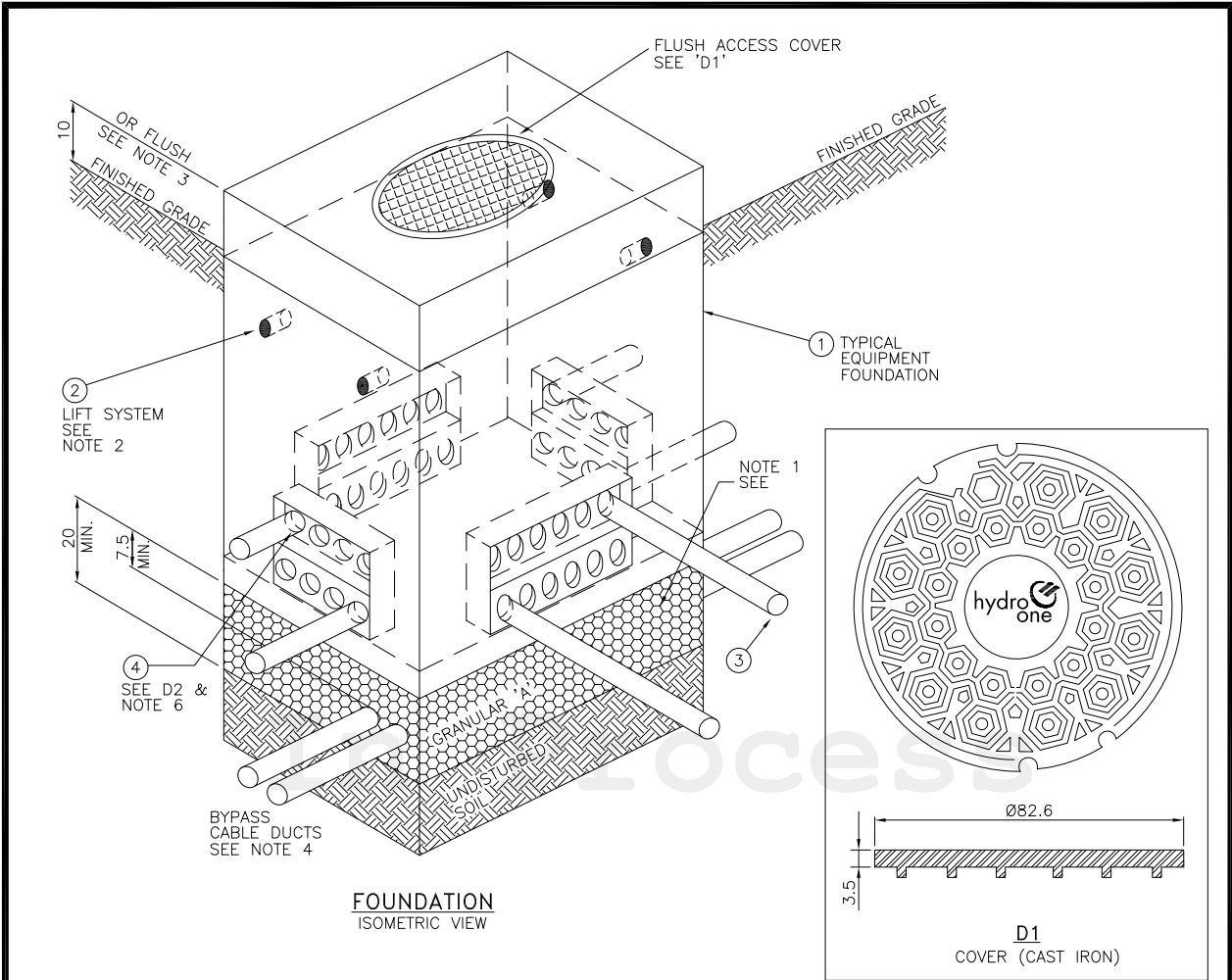


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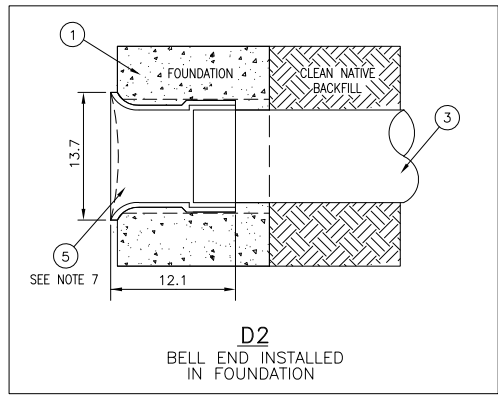
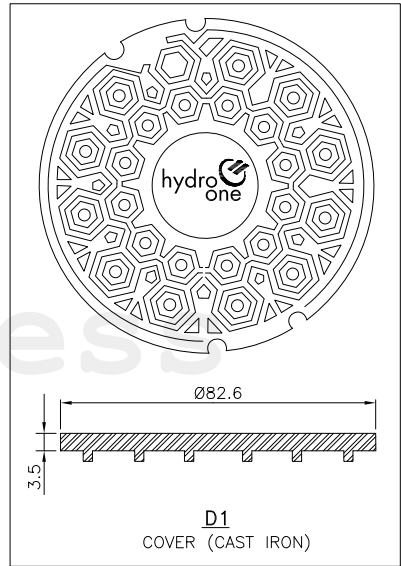
**ALL-IN-DUCT  
EQUIPMENT FOUNDATION INSTALLATION  
CONCRETE FOUNDATION**

Drawing No. <b>DU4-901-0500</b>	Rev. No. <b>02</b>
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TITLE BLOCK REV 02 - AUGUST 2014



FOUNDATION ISOMETRIC VIEW



- NOTES:**
1. COMPACT AND LEVEL A 20cm THICK LAYER OF CLASS 'A' GRANULAR MATERIAL BEFORE INSTALLATION OF FOUNDATION. BACKFILL AROUND THE VAULTS USING CLEAN NATIVE SOIL OR MASONRY SAND.
  2. PLUG LIFTING HOLES WITH DUCT SEALING COMPOUND.
  3. VAULT IS RATED FOR TRAFFIC LOADS AND MAY BE INSTALLED FLUSH WITH FINISHED AND/OR HARD SURFACES AS REQUIRED.
  4. EXPRESS CIRCUITS OR PRIMARY PHASES NOT REQUIRED IN FOUNDATION TO BE BYPASSED AS SHOWN IN DU6-105-0500 & 0501.
  5. LIMIT OF 3 CABLES/SPLICE ALLOWED IN THE VAULT.
  6. INSTALL A BELL END ON ALL DUCTS INSIDE THE FOUNDATIONS, FLUSH WITH INTERIOR WALL.
  7. SOME HIDDEN LINES ARE NOT SHOWN FOR CLARITY.
  8. SOME DUCTS ARE NOT SHOWN FOR CLARITY.

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30033979	DISTRIBUTION EQUIPMENT FOUNDATION, CONCRETE, PRECAST	1
2	30009051	SEALANT, COMPOUND, DUCT SEALING	A/R
3	MM#	DUCT, DB2	A/R
4	30037980	BELL END, PVC, 4", DB2	A/R
MM# = REFER TO SECTION 16 ONLY   A/R = AS REQUIRED			

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

Rev No.	Date	Revision Particulars	dwn	ckd	des	app
02	NOV 2024	ADDED 'D1' AND UPDATED NOTE 6 STATING THAT THE DUCT FITTING BELL END WILL BE USED ON ALL DUCTS INSIDE THE FOUNDATION. UPDATED MM# OF PART# 4. UPDATED NOTE 1. ADDED NOTES 7 & 8.	GJ	PC	DK	MM
01	SEPT 2023	ORIGINAL DU-03-210.2-0500-R1 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 4. GENERAL UPDATES. CHANGED TO NEW DWG. & NUMBERING FORMAT. ADDED NOTE 6. ADDED PART LIST ITEM 4.	PC	MM	XZ	MM

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: X.ZHANG	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/10	Pole ID:	

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Title:  
CONCRETE PULLING/SPLICING VAULT INSTALLATION WITH ACCESS LID; 183cm x 183cm x 160cm CL-625 RATED

Drawing No.  
**DU4-902-0500**

Rev. No.  
**02**

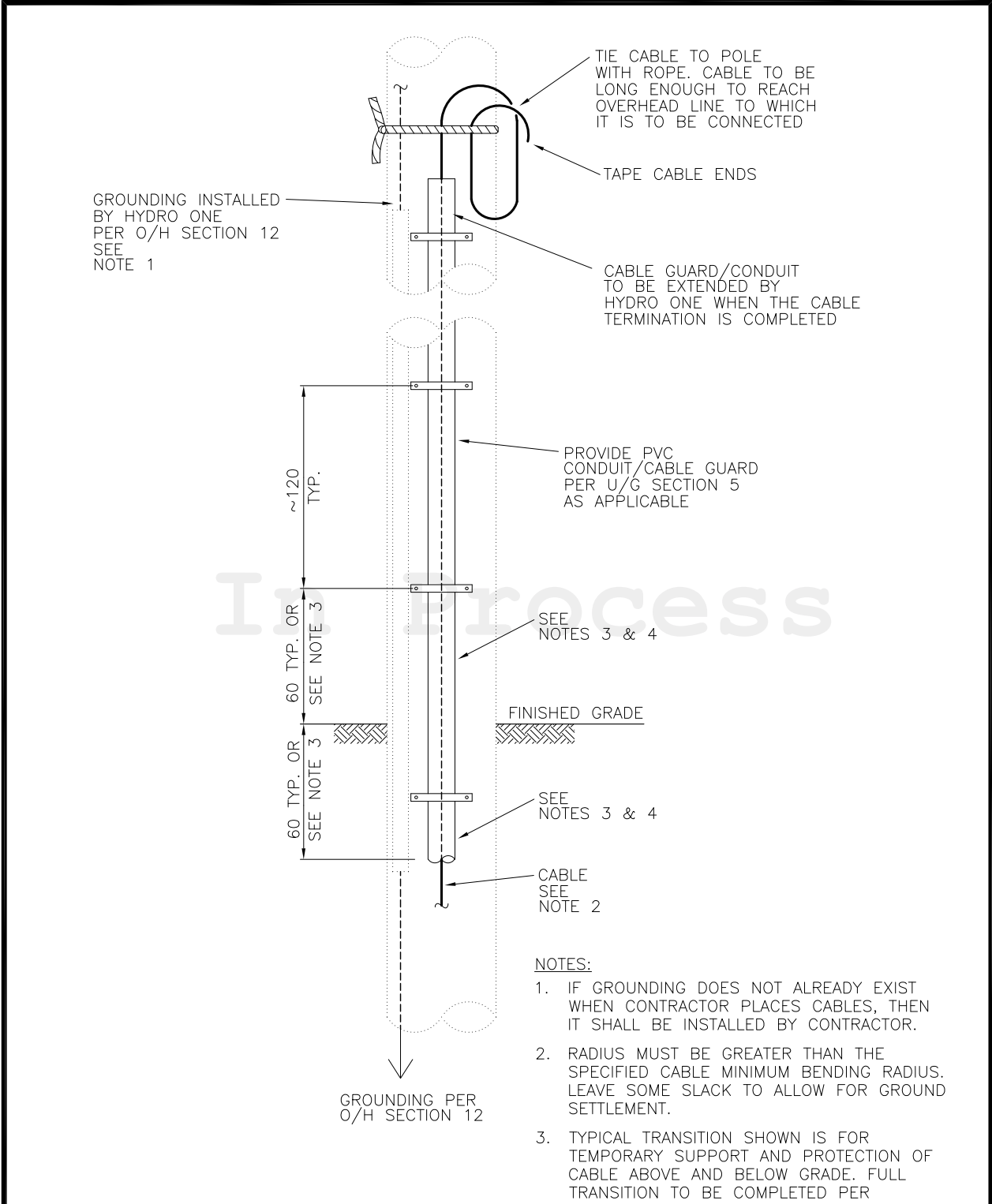
TITLE BLOCK REV 02 - AUGUST 2014

UNDERGROUND DISTRIBUTION STANDARDS

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In Process

**SECTION 5**  
**O/H TO U/G TRANSITIONS**



- NOTES:**
1. IF GROUNDING DOES NOT ALREADY EXIST WHEN CONTRACTOR PLACES CABLES, THEN IT SHALL BE INSTALLED BY CONTRACTOR.
  2. RADIUS MUST BE GREATER THAN THE SPECIFIED CABLE MINIMUM BENDING RADIUS. LEAVE SOME SLACK TO ALLOW FOR GROUND SETTLEMENT.
  3. TYPICAL TRANSITION SHOWN IS FOR TEMPORARY SUPPORT AND PROTECTION OF CABLE ABOVE AND BELOW GRADE. FULL TRANSITION TO BE COMPLETED PER APPLICABLE SECTION 5 TRANSITION DRAWING.
  4. FOR APPLICABLE CONDUIT (STRAIGHT OR FLEXIBLE), STRAP, GUARD, SWEEP, CAP, AND COUPLE KIT (IF REQUIRED) SEE APPLICABLE TRANSITION DRAWING IN SECTION 5.

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-213-0500-R3 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 5. GENERAL UPDATES TO ALIGN WITH CONTINUOUS CONDUIT SYSTEM & DIRECT BURIED TRANSITION PIT. ADDED NOTES 3 & 4. CHANGED TO NEW DWG. & NUMBERING FORMAT. DIRECT BURIED CONTENT WAS MOVED TO NEW SECTION 15 - DU-146-0500 R01.	PC	MM	MM	MM
		Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/10/05	Pole ID:	

**hydro one** Hydro One Networks Inc.

Title: TEMPORARY TERMINATION OF UNDERGROUND CABLE BY CONTRACTOR FOR FUTURE CONNECTION TO HYDRO ONE OVERHEAD LINE

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Drawing No. <b>DU5-310-0500</b>	Rev. No. <b>01</b>
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TITLE BLOCK REV 02 - AUGUST 2014

UNDERGROUND DISTRIBUTION STANDARDS

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In Process

**SECTION 6**

**VOLTAGES, LINE LOCATIONS & SEPARATIONS**

## Sub-Section 6-1 Line Locations

### **Introduction**

This sub-section covers the general standards for the locations of underground distribution systems, operating at voltages of 44 kV or lower.

### **In This Section**

This sub-section is sub-divided into the following sub-sections:

Topic	Sub-Section #	Revision
Considerations for Submarine Cable Installations	6-1-1	September 2023
Line Locations Requiring Special Consideration	6-1-2	September 2023

### **General**

Before designing underground distribution systems, consideration should be taken to determine the location of all underground services such as water mains, sewers, gas and oil pipelines, telephone and power cables and land drainage titles. In a new underground subdivision, this is typically provided to Hydro One by the developer as a CADD site plan. For locating existing infrastructure, a "stakeout" from all utilities that are present there is done and can be obtained through the Public Utility Coordinating Committee for the particular location, or, where no such committee exists, by contacting each utility. Adequate separations shall be provided to avoid damage to underground services during any installation or maintenance.

All proposals for the construction of any underground distribution systems must be approved by the governing Road Authority. Location of underground plant within the boulevard is dictated by the Road Authority, generally in the form of road cross-sections with offset dimensions. Designers must ensure that all Hydro One clearances are maintained, as well as identifying any easement requirements where Hydro One plant does not fit in the ROW.

All proposals for the construction of any underground distribution systems within a half kilometer of an existing or proposed provincial controlled access highway must be referred to the appropriate Regional Office of the Ministry of Transportation and Communications for their approval. This procedure is intended to facilitate coordination between the plans of Hydro One and the Ministry.

### **On Road Allowance**

Underground Distribution Systems should be routed along public road allowances to minimize right of way problems. The location of Hydro facilities shall be satisfactory to both Hydro One and the Road Authority. In some cases, this will require compromises by both parties.

Therefore, prior to designing the layout of underground distribution system on any road allowance, the Road Authority involved shall be advised and their agreement shall be obtained

for the location of all trenches, cables and ducts, pad-mounted equipment, and crossings. Upon completion of the designs, copies of the plan shall be forwarded to the road authority for formal approval. It may be necessary to contact other regulatory authorities for approval of the location.

#### **Approval of Regulating Authorities**

During the design and layout of an underground distribution network, approval for the location shall be obtained, where the following situations occur:

- a) Inductive co-ordination (prevention of telecommunication interference) between a proposed distribution line and any existing or proposed communication circuit.

Where subtransmission lines exceeding one kilometer in length are proposed, written notice shall be submitted to all members of the Joint-Committee on Electrical Coordination (JCEC).

- b) Occupation of road or highway allowance and highway crossings.
- c) Crossings of navigable waters and canals.
- d) Occupation of Crown lands.
- e) Occupation of First Nations Reserve lands.
- f) Occupation of, crossing of, or parallel to railway rights of way.
- g) In the vicinity of existing or proposed airports or landing strips (e.g for riser/dip poles).
- h) In the vicinity of existing or proposed communications antennae.
- i) On private property and in proposed subdivisions.
- j) Crossing or occupation of petroleum, gas, and electrical transmission rights of way.
- k) Occupation of joint use poles.

#### **On Other Properties**

Underground distribution systems shall be located on other property only where, in the long run, economic benefits result. Where the line is to be located on property other than road allowances, it should, in general be near enough to the road that customers on the opposite side can be served. Poles and anchors, trenches, cables/ducts, and pad-mounted equipment should be located, wherever possible, on fence lines or in locations that offer minimum interference with land use.

Prior to designing the layout of underground distribution network, permission **must** be obtained from the property owner to enter the property.

### **Trench/Cable and Duct Locations Requirements**

For typical relative location of various utility services see DU6-101-0500. Townships and Municipal Authorities may dictate other locations. Hydro One shall review and approve these locations prior to construction. All approved deviations shall, as a minimum, comply with CSA Standard C22.3 No. 7.

The centerline of primary cable trenches shall run parallel to the street property line and be as specified on project specific subdivision design drawings or based on the typical utility service locations as outlined in DU6-101-0500. Utility service locations are specific to each locality and the concerned Municipality Standards will supersede Hydro One typical standard drawings. The Municipality Standards must, as a minimum, comply with CSA Standard C22.3 No.7. Any deviations from Hydro One Standards, or project specific subdivision design drawings, **must** be referred to Hydro One for prior approval.

An underground distribution system shall be located such that it causes or be subject to the least practicable disturbance. Cable trenches shall be typically located at standard offsets within the boulevard, as established by each Municipality. Typical installation details are covered in this sub-section. Cable locations near to steam pipes/heat sources shall be avoided. Underground cables/ducts shall be located as far from future structures to avoid being disturbed when basements and foundations are excavated.

For urban underground subdivisions, all primary and secondary cables shall be installed in ducts to avoid disruption of the soil and surroundings due to future replacement/maintenance of cables. The location and configuration of these ducts shall be marked on the layout drawings. In addition to the duct/cable's parameters, the location and configurations of duct banks all have an effect on the ability to pull a cable in a ducted system and must be considered at the design stage.

For locations other than urban underground subdivisions, both primary and secondary cables shall be installed in duct whenever they are located under paved areas (e.g. roads, driveways, etc.) and in non-paved locations where disruption of the soil and surroundings (due to replacement/maintenance of cables) must be avoided. Municipality requirements may also warrant the need to have cables installed in ducts. The location of these ducts shall be marked on the drawings. As a good construction practice, it is recommended that long lengths of ducts (typically 30 m or more) shall be graded 1:400, to drain the water away from buildings and equipment foundations.

In all ducted trenches and street crossings, a spare duct shall be specified in each trench and at each crossing location. Where there is a primary and secondary cable in the same trench and at the same street crossing location, there shall be a spare duct for each. An additional spare duct per express feeder is also required. Where possible, it is preferred that the spare duct for each circuit category be located at its respective elevation.

**R02 ►** Where ducts (including spare duct) are installed and cables are to be pulled at a later time, a 5/8" polyester pulling tape shall be installed in all ducts, from end to end. Both ends of ducts shall be capped. To facilitate locating these ducts, until cables are pulled at a later time (in immediate short term after ducts are installed), such duct locations shall be marked by above ground wooden stakes, embedded 60 cm in the ground, at both ends of the ducts.

### **Trench/Cable and Duct Locations for Submarine Installations**

Trenching will normally be:

- Limited to the short distance from the dip pole on the mainland to the point where the primary cable enters the water,
- From the point where the cable emerges from the water to the pad-mounted transformer or riser pole, and
- Between pad-mounted equipment or vaults.

If a trench cannot be excavated, other alternatives such as, poured concrete over flexible pipe should be used to provide for a secure and safe mechanical protection arrangement. For the installation details refer to *Mechanical Protection for Primary Cables* in *Sub-Section 3-3*.

In addition to trenching, at the shorelines, mechanical protection is required to be provided for entire length of the cable on land.

From the transformer/pole to 1 m above the high-water mark, the cables must be hidden from public exposure. They must be either buried in a trench or fed through a flexible pipe covered in concrete. See *Table 3* in *Sub-Section 6-2* for minimum cover.

For both primary and secondary cables, ducts shall be used under roadways, or in locations where mechanical protection of the cables is considered necessary. Note that if non-standard cable is required by the customer, the supply and installation of secondary cable is the responsibility of the customer and approval for its installation and any mechanical protection is to be granted from the Electrical Safety Authority.

### **Crossing Other Utilities**

Where it is necessary for one underground system to cross over or under another underground system, the crossing shall be made at 90° angle or as nearly so as circumstances will permit.

For power cables crossing a gas pipeline, a minimum of 30 cm clear vertical separation of well compacted fill must be maintained, see DU6-106-0500. Contact Engineering if this separation **cannot** be achieved. The final solution will have to satisfy both utilities.

For power cables crossing high pressure pipelines, specific approvals are required from the pipeline owning authority.

### **Cable Route Identification**

See *Section 2*.

### **Street Crossing**

For street crossing requirements see *Section 3*.

### **Pad-Mounted Equipment and Foundation Location**

The location of pad-mounted equipment and foundations within the ROW shall conform to local Municipality Standards and based on DU6-101-0500. The preferred location is front lot or road allowance. Minimum separations to other utility services and structures shall be maintained as per these Standards.

R01 ►

Pad-mounted transformers should typically be installed within 5 meters of a year-round drivable surface for single-phase units and within 3 meters for three-phase units. However, additional exceptions exist, including island installations, off-road applications, and other site-specific conditions where alternative access solutions may be necessary.

Equipment shall be located so that it will have the following minimum separations:

- 3m on access side and 1 m on non-access side.
- 3 m, line of sight, from window/door openings and any ventilation openings. Transformers that are not protected by an internal current-limiting (CL) fuse AND equipped with a pressure relief device (PRD) (most HONI transformers are equipped with CL fuse and PRD) must be installed at 6 m or more.
- 3 m (preferred) from driveway. Minimum shall be 1 m. If 1 m cannot be achieved, bollards shall be installed per DU6-107-0500.
- 2 m (preferred) from roadway curb. Minimum shall be 1 m. If 1 m cannot be achieved, bollards shall be installed per DU6-107-0500.
- 30 cm from sidewalk.
- 3 m from trees.
- Refer to *Table 1* in *Sub-Section 6-2* for minimum horizontal separations between underground distribution equipment and other utility equipment / structure foundations. See DU6-101-0500 for typical exclusion zones for equipment located near street intersections in urban and rural areas. (Note: Metallic parts of such equipment must be bonded to Hydro One pad-mounted equipment ground grid. If not bonded, the separation shall be at least 3 m).

The following operating and maintenance clearances shall be provided around pad-mounted equipment:

- 3 m on access side of equipment.

And

- 1 m on all other non-access sides for working space.

Foundations shall be:

- Centered on the common lot line projection unless otherwise noted in the drawing.
- Preferably oriented to enable the access hood/door to be opened from the street side for operation/maintenance.

Where 3 m operating clearances are assured, the equipment hood/doors can be oriented at 90° to the street direction, so that Lines staff can view the equipment location number and Faulted Circuit Indicator (FCI) for Light Emitting Diode (LED) type FCI's through the front windshield glass of their vehicle, while driving along the street. It can also be rotated 180°

(operating side facing the sidewalk), provided operating clearances are met. If this orientation is favored due to limited space along the boulevard, but this orientation is not preferred due to the lack of visibility of the FCI's LED (and equipment number if pasted on the front) from the road.

Pad-mounted equipment shall be located such that movement of operating and maintenance staff, during operation of the high voltage switches, connection of cables or operation of separable insulated connectors will not be impeded by any physical obstructions. The operating side of equipment shall be indicated on the layout drawings. Equipment with doors/hoods on more than one side will have more than one operating side. The site should also be suitable for installing the equipment foundation, ground rods and ground-gradient control grid. In addition, future replacement of equipment must also be considered during site selection.

Pad-mounted equipment foundations shall be located as far from future structures to avoid being disturbed when basements and foundations are excavated.

Equipment foundation shall be installed in accordance with DU4-901-0500. Foundations shall be level, placed on a minimum 15 cm base of compacted granular "A", and totally supported by undisturbed earth.

Should the foundation installation require placement on sloped ground, Hydro One shall be contacted for specific remedial measures. Equipment located on roads with an "open ditch" profile shall be installed per DU6-104-0500.

After installation of cables/ducts and equipment grounding, a minimum of 3 m of space in front of the operating side(s) of the equipment and 1 m of space around other sides must be backfilled, compacted, and leveled to the proposed final grade level.

#### **Pad-Mounted Equipment Location for Submarine Installations**

In addition to the standard requirements typical for pad-mounted equipment location, covered in the paragraph above, following requirements are typical for submarine installations:

- For operating and working clearances, a minimum of 3 m shall be provided on the operating side of the equipment, and 1 m on all other sides. In order to facilitate switch stick operation, the terrain on the 3 m operating side must be relatively level.
- Whenever possible it is preferred to locate pad-mounted equipment no further than 10 m from the high-water mark; such that it is visible from the boat.

#### **Cable Pulling/Splicing Vaults Location and Installation**

For cable pulling/splicing vault installations there are some exceptions from the requirements covered in the *Pad-Mounted Equipment Location and Foundations* paragraph above:

- For standard cable pulling/splicing vaults ground grid is **not** required. For any non-standard application contact Engineering.
- Only 1 m of space around all sides of the cable pulling/splicing vaults shall be backfilled, compacted, and leveled to the proposed final grade level to allow for normal operation and maintenance, since there is no operating side.

Cable pulling/splicing vaults shall be installed per DU4-902-0500 or DU4-903-0500. For additional information related to cable pulling/splicing vaults see *Section 4*.

### **Marker Balls**

See *Section 2*.

### **Secondary Services Locations**

Secondary service trenches shall be made as perpendicular as practicable to the main trench and aligned with the service entrance. See DU6-102-0500/0501.

For design and installation requirements including details related to secondary service location, clearances and separations refer to *Sub-Section 11-1-1*.

### **Bollards for Equipment Protection**

For mechanical protection of pad-mounted equipment in situations where such equipment is exposed to vehicular traffic or snow removal equipment, bollards shall be specified as per DU6-107-0500. The location, height and quantity of bollards shall be decided by the Designer, and it shall be indicated on the design drawing. Locations shall be such as not to impede the operation, maintenance, and replacement of equipment.

To eliminate potential clearance issues and unnecessary or unsecured easement requirements, during the construction stage, it is important that the need for bollards, quantity, location, and the final foundation location to accommodate the bollards are identified and specified during the design stage.

When specified by Hydro One, concrete filled, galvanized steel bollards, shall be installed as per DU6-107-0500. The bollards shall be painted high-visibility yellow and be bonded to the pad-mounted equipment ground grid per DU6-107-0500 and *Sub-Section 12-1*.

### **Streetlight and Communication Equipment**

Streetlight systems are typically owned and operated by the municipality and as such shall be installed as per the Ontario Electrical Safety Code (OESC).

The location of the streetlight fused disconnect box or the communication pedestal shall conform to local municipal standards, and such equipment shall not be attached to Hydro One pad-mounted transformer or equipment foundations. Locations shall be such as not to impede the operation, maintenance, and replacement of Hydro One equipment.

Metallic parts of streetlight or communication equipment located within 3 m of a Hydro One pad-mounted equipment ground grid shall be bonded to this ground grid with minimum #4 AWG copper ground conductor. Hydro One makes the final connection of streetlight and communication equipment power supply cables to Hydro One transformer.

Refer to DU6-108-0500 for typical installation details.

**Equipment Grounding & Bonding**

For pad-mounted equipment grounding and bonding requirements see *Section 12*.

Some specific designs such as streetlight disconnect or communication cable pedestal, stray voltage isolator and/or metering equipment require additional bonding when placed within the ground grid or within 3 m from the ground grid. Alternatively, they must be installed minimum 3 m outside of ground grid. For specific design, location and clearances refer to DU6-108-0500, DU11-201-0500, DU11-202-0500 and DL11-301-0500.

In Process

Rev. No.	Issue Date	Description
02	February 2026	<ul style="list-style-type: none"> <li>Updated the description of the polyester pulling tape in “<i>Trench/Cable and Duct Locations Requirements</i>” paragraph to align with the engineering material catalog description.</li> </ul>
01	February 2025	<ul style="list-style-type: none"> <li>Provided installation location for 1-ph and 3-ph pad-mounted equipment in the “<i>Pad-Mounted Equipment and Foundation Location</i>” paragraph to align with design tool standards clauses.</li> </ul>

## Sub-Section 6-2 Separations

### Introduction

This sub-section covers the general standards for the separations of underground distribution systems, operating at voltages of 44 kV or lower.

### General

This sub-section covers the minimum horizontal and vertical separations between Hydro One distribution equipment and other plant and structures, minimum cover over cables and ducts, and separations of cables from heavy railways. In addition, this section covers the 3<sup>rd</sup> party excavation zone limits around underground power cables and pad-mounted equipment. In general, the separations comply with or exceed those specified in CSA Standard C22.3 No.7-20.

Unless otherwise indicated, the separations specified in this section are the minimum requirements and are suitable for most situations. Where special conditions occur, it may be necessary to increase the minimum values accordingly.

For other separations not specified in this section, refer to CSA Standard C22.3 No.7-20.

The separations specified in this section are applicable to Hydro One facilities. Separations applicable to customer-owned facilities are specified in the Ontario Electrical Safety Code.

### Cable and Duct Separation from Other Utilities

Minimum separations to other utility services shall be maintained as per *Table 1* below.

For primary and secondary underground cables direct buried or installed in duct, the minimum horizontal clear separation to another underground facility less than 1 m below grade, such as water service, catch basin, hydrant, or manhole, is 30 cm.

Cables should have a minimum horizontal separation of 60 cm from the underground portion of overhead structures, such as poles or buildings, unless they are riser cables attached to these structures.

For deeper facilities such as water mains and sewers, the preferred horizontal separation is outside the zone of disturbance of that facility. As a general design guideline, the separation is equal to the depth of burial on each side of the service (e.g. 2 m deep water main would require 2 m of separation). Where separations cannot be maintained, Engineering will determine the need for mechanical protection.

To improve safety and allow accessibility with mechanical excavators, the preferred horizontal clear separation of primary and secondary underground cables to gas pipelines is 1 m. Where necessary, this can be reduced to 30 cm with no added mechanical protection. For cases where the 30 cm minimum horizontal clear separation **cannot** be met, a mechanical barrier, approved by both utilities, shall be required. When crossing gas pipelines 30 cm minimum vertical

separation is required, per DU6-106-0500. Where 30 cm minimum vertical clear separation **cannot** be met, contact Engineering.

Note: Gas pipelines shall have a minimum horizontal separation of 30 cm (preferred 60 cm) from any part of Hydro One equipment ground grid.

Cables, direct buried or in duct, shall have a minimum clear horizontal separation, from the inside walls of swimming pools to the nearest edge of the cable/duct, as per *Table 1* below.

Cables, direct buried or in duct, of all voltages shall have a minimum clear horizontal separation from propane tanks and from underground oil and gasoline storage tanks as per *Table 1* below.

Note: In the case of ducted cables, the separations above are measured from the nearest edge of the duct.

Cables/ducts must not run in the same vertical plane as the gas, water, and sewer pipelines. The preferred location for primary and secondary underground cables is 30 cm deeper than the gas main, to permit crossings as needed. For typical locations and separations of supply cables, communication cables and gas distribution pipelines see *Section 3*.

At crossings, a minimum vertical separation of 30 cm shall be maintained between cables/ducts and pipelines. Contact Engineering if this separation cannot be achieved. Approval of both utilities shall be obtained for this. For all-in-duct installation details see DU6-106-0500. For direct buried cable installation details see *Section 15*.

For cables crossing or parallel to a railway line, the clearances shall be as per *Table 2* below.

#### **Minimum Horizontal Clearances**

The minimum horizontal separations between Hydro One distribution equipment and other plant/structure are per *Table 1* below.

R03 ► Table 1

**MINIMUM HORIZONTAL SEPARATIONS BETWEEN HONI DISTRIBUTION EQUIPMENT (<50 kV) & OTHER PLANT/STRUCTURES**

		Separation (cm)			
		Primary & Secondary Cables/ Ducts	Underground		Overhead
			Access Side	Non-Access Side	Pole (below grade)
Notes: Other Plant/Structures			Pad-mounted Equipment (Foundation)		
Water Plant	Water Line	30	30	30	60
	Valve Box / Chamber	30	30 (see Note 1)	30 (see Note 1)	60
	Hydrant	30	300	100	100
Sewer Plant	Sewer Line	30	30	30	60
	Catch Basin	30	30 (see Note 1)	30 (see Note 1)	60
	Manhole	30	30 (see Note 1)	30 (see Note 1)	60
Swimming Pools	Swimming Pools	200 / 100 (see Note 9)	-	-	-
Combustibles Gas/Fuel	Natural Gas Line	30 (see Note 4)	30	30	60
	Above Ground Propane Tanks	-	300 / 750 (see Note 8)	300 / 750 (see Note 8)	-
	Underground Propane Tanks/Equipment	150	-	-	-
	Above Ground Natural Gas Discharge Openings	-	100 / 30 (see Note 7)	100 / 30 (see Note 7)	-
	Above Ground Propane Gas Discharge Openings	-	300	300	-

UNDERGROUND DISTRIBUTION STANDARDS - INTERIM

VOLTAGES, LINE LOCATIONS & SEPARATIONS

<b>Traffic / Street Lighting</b>	<b>Pole/Mast/Pillar</b>	60	300	100	300
	<b>Cable or Duct</b>	30	30	30	60
	<b>Joint Use Pole</b>	60	300	100	300
	<b>U/G Vault / Hand-hole</b>	30	30 (see Note 1)	30 (see Note 1)	100
	<b>Control Pedestal</b>	30	300	15 (see Note 5)	100
<b>Comm.</b>	<b>Pedestal</b>	30	300	15 (see Note 5)	100
	<b>Cable (Direct Buried / Joint-Use Trench)</b>	30 / 0 (see Note 2)	30	30	60
	<b>U/G Vault / Hand-hole</b>	30	30 (see Note 1)	30 (see Note 1)	100
<b>Misc.</b>	<b>Tree (Direct Buried / Duct)</b>	100	300	300	300
	<b>Building/Structure Foundation (see Note 6)</b>	30	300	200	150 (see Note 12)

Notes:

1. The specified separation is to the outside of the ground grid of the pad-mounted equipment.
2. Only applicable in a joint-use trench when there is 30 cm of vertical separation between the communication and supply cables.
3. Overhead conductors are in full position of horizontal swing as calculated in DL6-109-0500.
4. Zero horizontal separation is allowed during cable crossing if there is a 30 cm vertical separation.
5. Communication pedestals located within 3 m of pad-mounted supply equipment shall be bonded to the ground grid. See DU6-108-0500 for details.
6. Measured from the nearest extent of the structure including footings and any associated drainage components.
7. Only applicable if regulators equipped with certified overpressure cut-off/shut-off with limited or no relief installed for the gas discharge opening.
8. Minimum of 3 m from the valve on a propane tank with a capacity between 475-3800 L or 7.5 m from the valve on a propane tank with a capacity greater than 3800 L.
9. Minimum horizontal separation between cable/duct and swimming pool shall be 1 m for secondary cables/ducts and 2 m for primary cables/ducts. Cables, direct buried or in duct, shall have a minimum clear horizontal separation, from the inside walls of swimming pools to the nearest edge of the cable/duct.
10. The separations are measured from the surface of the listed equipment to the closest surface of the other.
11. For excavation zone limits around pad-mounted equipment locations see drawing DU6-302-0500 for additional details. For excavation zone limits around underground power cable see drawing DU6-301-0500 for additional details.
12. Minimum horizontal clear separation between pole (below grade) installation and building or structure foundation shall be no less than 150 cm. All applicable clearances, from Overhead Distribution Standards Section 6, for the pole (above grade) shall also be considered and respected when determining the actual minimum horizontal clear separation.

**Separation of Underground Cable Plant from Heavy Railways**

The minimum separation of cables from railway tracks are shown in *Table 2* below.

**Table 2  
SEPARATION OF UNDERGROUND CABLE PLANT FROM  
RAILWAY TRACKS**

Type of Installation	Separation (cm)	
	Horizontally from Tracks	Vertically from Tracks
Cable crossing in steel casing pipe, ducts, and duct banks	-	170
Cable duct system installed longitudinally on railway ROW	Contact Engineering	-

Note: Engineering consultation and approval of railway authority required for all installations on railway ROW according to CSA Standard C22.3 No.7.

**Minimum Cover over Cables and Ducts**

The minimum earth cover that shall be maintained over cables and ducts per *Table 3* below. Depth of cover is measured from finished grade level to the top of the upper most cable/duct or concrete duct bank.

In rocky areas where burial is not possible, cable shall be run through duct on the rock bed and the duct shall be covered by concrete. The minimum thickness of the concrete shall **not** be less than 7.5 cm.

*Table 3* below incorporates all typical, reduced cover and submarine cable/duct installations.

For more details on the mechanical protection for submarine cables and level of protection in the area of the shoreline up to the point where either the Hydro One equipment or the minimum required amount of cover is reached, refer to *Sub-Section 3-3*.

**R02 ▶ Table 3  
MINIMUM COVER OVER CABLES AND DUCTS**

	Minimum Cover (cm)			
	Non-Vehicular Areas		Vehicular Areas (see Note 1)	
	Up to 750 V	> 750 V	Up to 750 V	> 750 V
Direct Buried Cable with Sand Envelope (10 cm of sand above and below cable)	90	90	Not Permitted	Not Permitted
Direct Buried Ducts with Clean Backfill	60	75	90*†	100†
Direct buried ducts covered with concrete patio slabs and clean backfill (see Note 2 & 3)	45	60	Reduced Depth Not Permitted	Reduced Depth Not Permitted
Duct bank encased with 7.5 cm envelope of reinforced concrete	30**	30**	60	60
Cable under ditches - Cover from bottom of ditches - cable in direct buried duct	60	75	-	-

Notes:

<sup>1</sup> All primary and secondary cables in street/road crossings shall be installed as per DU3-111-0500/0501 or DU3-112-0500.

<sup>2</sup> Patio slabs shall be separated from the ducts by 15 cm of compacted, clean backfill.

<sup>3</sup> This construction is to be used only in exceptional cases where normal minimum cover for direct buried cable or direct buried ducts cannot be achieved.

\* Cover may be reduced to 60 cm under residential driveways.

\*\* Concrete encased duct bank may be left exposed (e.g. no cover) in rocky terrain when unavoidable.

† Cover may be reduced to 75 cm under vehicular area if Schedule 40 PVC ducts are used.

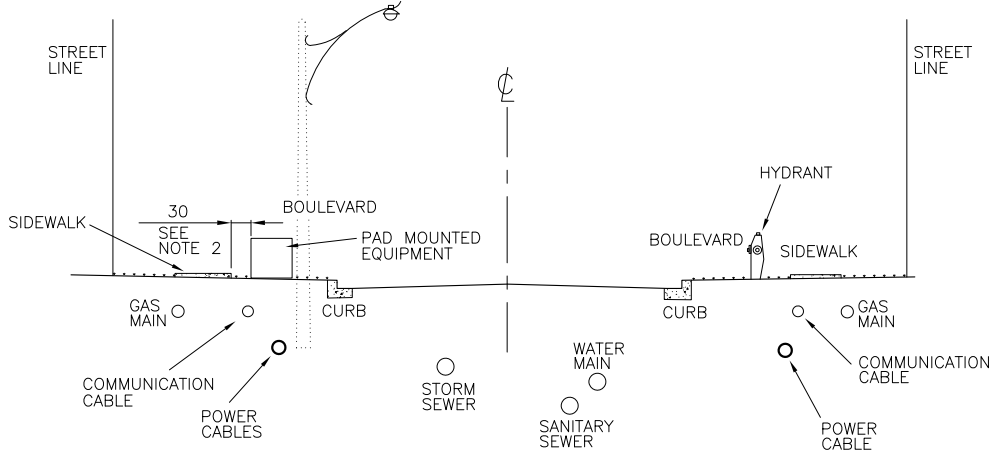
**Reference to Applicable Drawing**

This sub-section covers the typical separations of the underground distribution systems, operating at voltages of 44 kV or lower. Additional information related to separations can be found in the standard drawings of this and other sections of the Underground Distribution Standards.

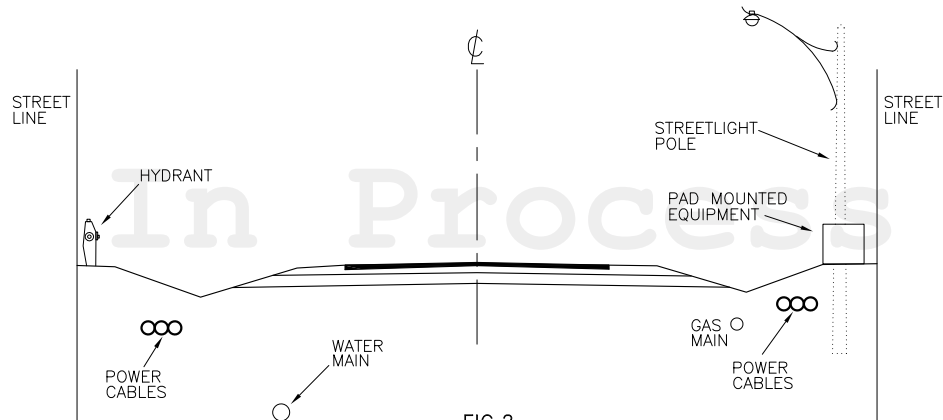
Refer to *Sub-Section 6-1* and *Sub-Section 6-3* for typical separations related to:

- Trenching and common (joint) utility trenching.
- Equipment foundation.
- Crossing other utilities (all-in-duct).
- Protective bollards.
- Streetlight disconnect/communication cable pedestal near pad-mounted equipment.
- Cable route markers and marker balls.
- Excavation around underground power cables.
- Excavation around pad-mounted equipment.

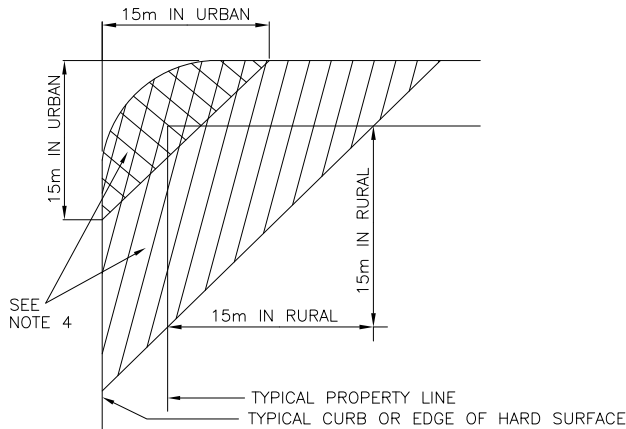
Rev. No.	Issue Date	Description
03	February 2026	<ul style="list-style-type: none"> <li>• Table 1 Updates:                             <ul style="list-style-type: none"> <li>○ Updated Note 8 to correct the propane tank capacity from 3000 L to 3800 L to align with CSA requirements.</li> <li>○ Updated the minimum horizontal separation requirement between below-grade pole installations and building or structure foundations. Added Note 12 to further clarify the updated minimum horizontal separation.</li> </ul> </li> </ul>
02	July 2025	<ul style="list-style-type: none"> <li>• Table 3 Updates:                             <ul style="list-style-type: none"> <li>○ Reordered notes to enhance clarity and alignment with the table content sequence.</li> <li>○ Added new Note 1 to clarify that the minimum cover dimensions, listed in Table 3, do not apply to street or road crossings. For these scenarios, refer to drawings DU3-111-0500/0501 and DU3-112-0500 for the applicable requirements.</li> <li>○ Removed the note permitting cover reduction to 30 cm in minimal overburden situations in vehicular areas. Any cover below 60 cm in vehicular areas must be reviewed by Engineering.</li> <li>○ Added new Note † to clarify that the cover may be reduced to 75 cm in vehicular areas when using Schedule 40 PVC ducts for Direct Buried Ducts with Clean Backfill.</li> </ul> </li> </ul>
01	November 2024	<ul style="list-style-type: none"> <li>• Updated <i>Table 1</i> value for Non-Access Side clearance for Building/Structure Foundation from 100 cm to 200 cm.</li> <li>• Added Note 11 for reference to excavation zone limits.</li> </ul>



**FIG.1**  
SERVICES AND EQUIPMENT LOCATIONS ALONG STREET  
TYPICAL URBAN SETTING



**FIG.2**  
SERVICES AND EQUIPMENT LOCATIONS ALONG STREET  
TYPICAL RURAL SETTING



**FIG.3**  
EQUIPMENT LOCATION NEAR STREET INTERSECTION

**NOTES:**

1. LOCATIONS SHOWN ARE TYPICAL ONLY. SPECIFIC LOCATIONS SHOULD BE DETERMINED BY THE MUNICIPALITY.
2. LOCATE PAD MOUNTED EQUIPMENT FOUNDATION MINIMUM 30cm TO THE SIDEWALK. IF THE STREET HAS NO SIDEWALK, LOCATE IT AS FAR AWAY FROM THE TRAVELED PORTION OF THE ROAD AS POSSIBLE (ON THE ROAD ALLOWANCE) AS PERMITTED BY LOCAL STANDARDS.
3. A MINIMUM SEPARATION OF 1m SHALL BE MAINTAINED BETWEEN POWER CABLES & EXISTING OR PROPOSED TREES.
4. DO NOT INSTALL EQUIPMENT WITHIN THE HATCHED AREAS.

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-201-0500-R3 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 6. GENERAL UPDATES TO DIMENSIONS AND NOTES.	PC	MM	MM	MM	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	
Drawn By: PC			Checked By: M.MATEVSKI		Designed By: M.MATEVSKI		Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.			Date: (yyyy/mm/dd) 2021/02/02		Pole ID:		



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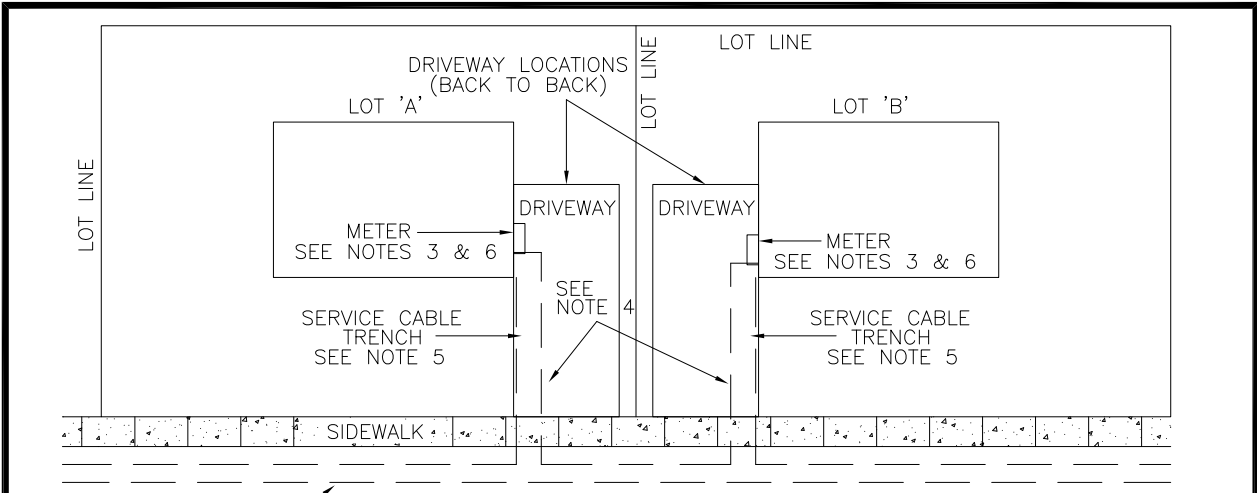
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Title:  
**STREET LOCATION OF VARIOUS SERVICES & EQUIPMENT - TYPICAL**

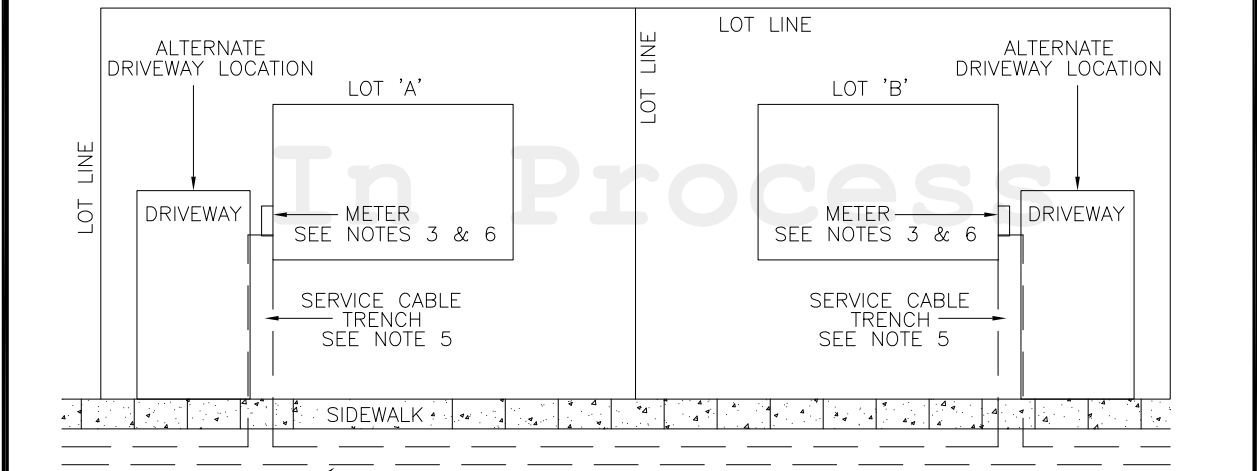
Drawing No.  
**DU6-101-0500**

Rev. No.  
**01**

TITLE BLOCK REV 02 - AUGUST 2014



**FIG.1**  
SEPARATE SERVICE TRENCHES  
TYPICAL DRIVEWAY SIDE (BACK TO BACK) – PREFERRED



**FIG.2**  
SEPARATE SERVICE TRENCHES  
TYPICAL DRIVEWAY SIDE (ALTERNATE) – PREFERRED

**NOTES:**

1. SERVICE CABLES ARE INSTALLED IN DUCTS.
2. LOCATION OF MAIN TRENCH IN RELATION TO CURB AND SIDEWALK TO BE DETERMINED FROM DU6-101-0500 OR BY LOCAL REGULATIONS.
3. METER LOCATION SHALL BE AT HYDRO ONE'S DISCRETION AND ALSO MUST MEET ONTARIO ELECTRICAL SAFETY CODE (OESC) REQUIREMENTS. FOR PREFERRED AND NON-PREFERRED TYPICAL METER BASE ARRANGEMENTS AND LOCATION SEE SUB-SECTION 11-1-1.
4. SHARED SECONDARY SERVICE CABLE TRENCHES (ONE TRENCH SERVICING MULTIPLE LOTS) ARE NOT ENCOURAGED. IF UNAVOIDABLE CONTACT DISTRIBUTION PLANNER. (E.G. EASEMENTS WILL BE REQUIRED ACROSS LOT 'A' TO FACILITATE REPAIR OF SERVICE TO LOT 'B' IN CASE OF FAULTS).
5. SERVICE TRENCHES TO TAKE OFF FROM MAIN TRENCH AT A 90° ANGLE.
6. REGARDLESS OF METER LOCATION (DRIVEWAY OR NON-DRIVEWAY SIDE), UNOBSTRUCTED ACCESS MUST BE PROVIDED AT ALL TIMES TO THE METER BASE.
7. WHERE POSSIBLE DEEP SERVICES SUCH AS WATER, SANITARY AND SEWER LINES SHOULD BE LOCATED ON THE SIDE OPPOSITE OF THE SECONDARY SERVICE, OTHERWISE MAINTAIN 1M MINIMUM SEPARATION BETWEEN SECONDARY SERVICES AND DEEP SERVICES.

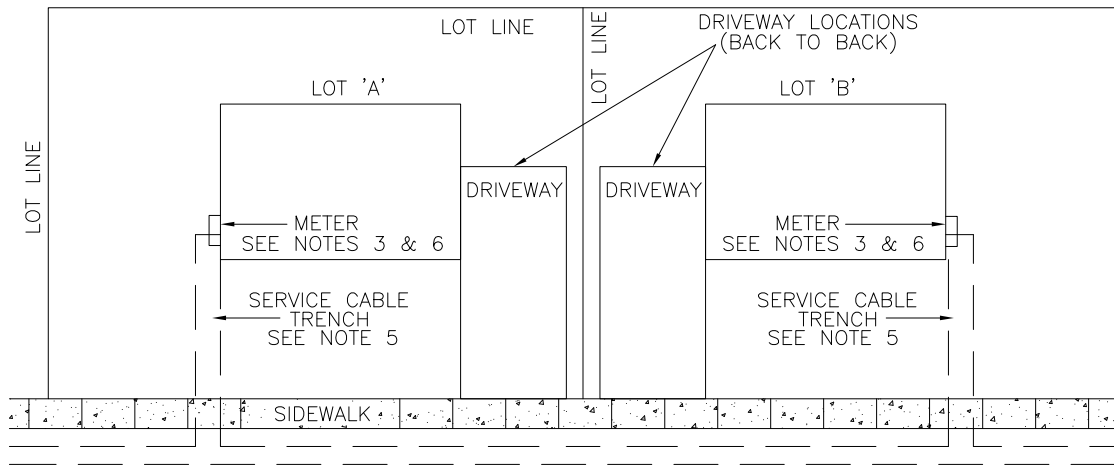
FOR SHEET 2 OF THIS DRAWING  
SEE DU6-102-0501

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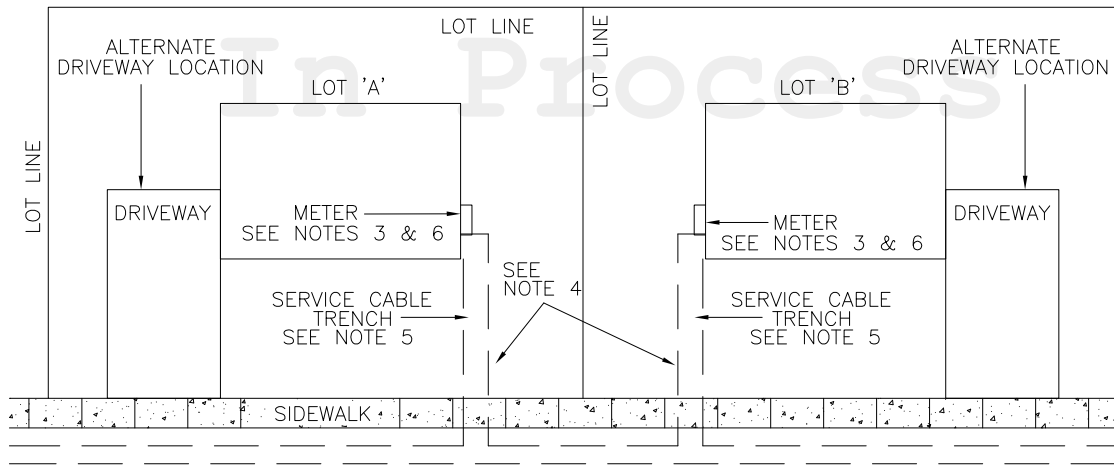
01	SEPT 2023	ORIGINAL DU-03-202-0500-R3 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 6. GENERAL UPDATES TO DIMENSIONS AND NOTES. UPDATED NOTES 2, 3, 4 & ADDED NOTES 6 & 7. ADDED SECOND SHEET FOR PREFERRED & NOT PREFERRED METER INSTALLATION ON DRIVEWAY & NON-DRIVEWAY SIDE - FIG.1 TO FIG.4.	PC	MM	MM	MM
		Revision Particulars	dwn	ckd	des	app
Drawn By:		Checked By:	Designed By:	Design Approved By:		
PC		M.MATEVSKI	M.MATEVSKI	M.MATEVSKI P.Eng.		
Scale:		Date: (yyyy/mm/dd)	Pole ID:			
N.T.S.		2021/02/02				

	Title: LAYOUT OF SERVICE CABLE TRENCH WITHIN LOT BOUNDARIES - TYPICAL		
	Drawing No. DU6-102-0500	Rev. No. 01	

TITLE BLOCK REV 02 - AUGUST 2014



**FIG. 3**  
SEPARATE SERVICE TRENCHES  
TYPICAL NON-DRIVEWAY SIDE (BACK TO BACK) - NON-PREFERRED



**FIG. 4**  
SEPARATE SERVICE TRENCHES  
TYPICAL NON-DRIVEWAY SIDE (ALTERNATE) - NON-PREFERRED

FOR SHEET 1 OF THIS DRAWING SEE DU6-102-0500

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Rev No.	Date	Revision Particulars	dwn	ckd	des	app

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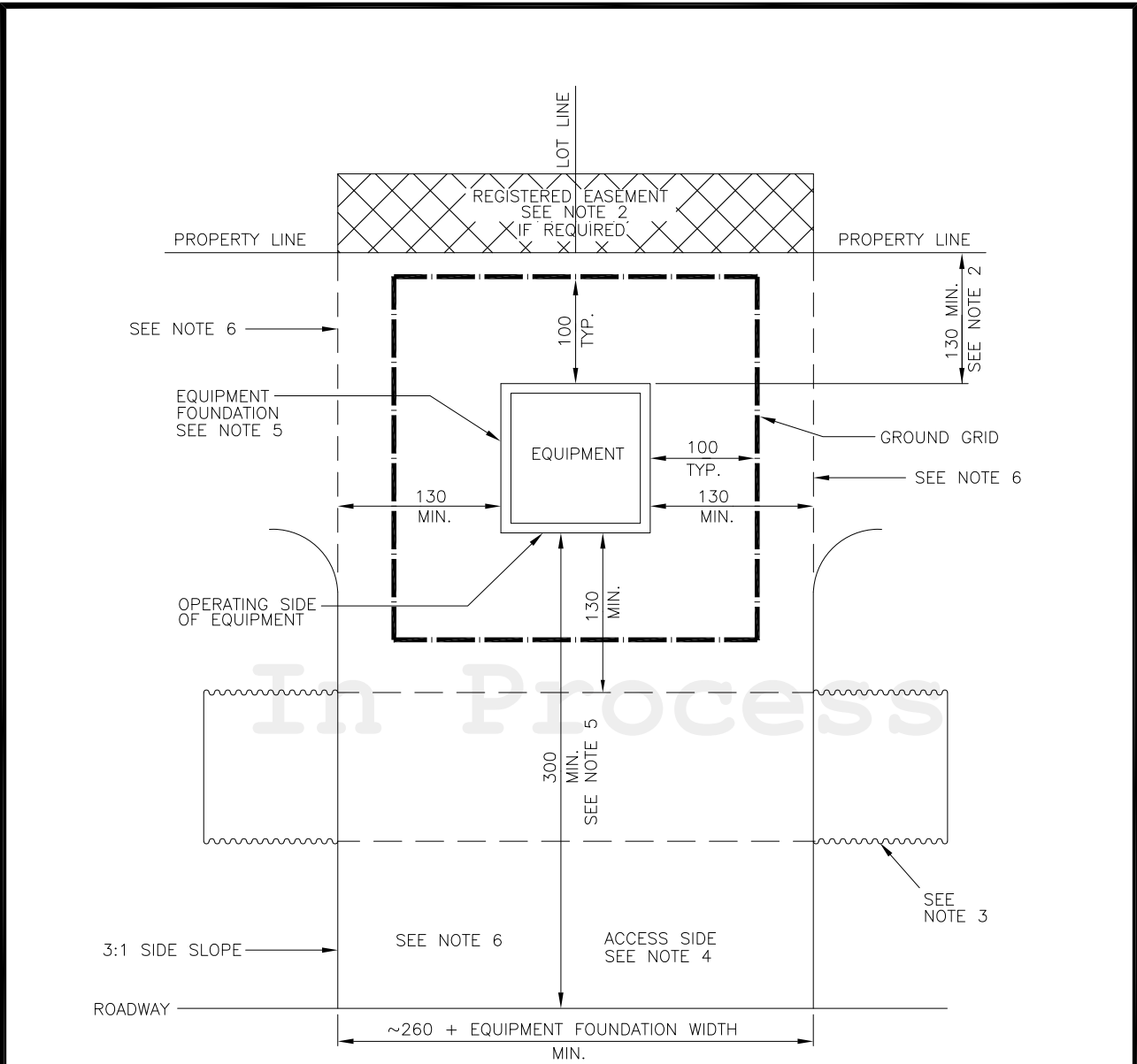
Title:  
LAYOUT OF SERVICE CABLE TRENCH  
WITHIN LOT BOUNDARIES - TYPICAL

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Drawing No. DU6-102-0501	Rev. No. 01
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**NOTES:**

1. FOR FOUNDATION INSTALLATION SEE DU4-901-0500.
2. REGISTERED EASEMENT IS REQUIRED IF THE PROPERTY LINE IS LESS THAN 1.3m AWAY FROM THE EQUIPMENT FOUNDATION.
3. CORRUGATED POLYMER PIPE CULVERT. TYPE AND SIZE PER MUNICIPAL SPECIFICATIONS.
4. MINIMUM 15cm LAYER OF GRANULAR 'A' ABOVE CULVERT AND FINISHED PER MUNICIPALITY'S SPECIFICATIONS.
5. FINAL EQUIPMENT LOCATION/DISTANCE APPROVED BY ROAD AUTHORITY.
6. UPON COMPLETION OF EQUIPMENT INSTALLATION, BACKFILL AND GRADE THE SURROUNDING AREA TO MATCH THE PROPOSED FINISHED ELEVATION WITHIN A MINIMUM 1.3m ON THE NON-OPERATING SIDES AND 3m ON THE OPERATING SIDE OF THE EQUIPMENT FOUNDATION.

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

02	FEB 2026	UPDATED LAYOUT TO SHOW GROUND GRID AND UPDATED DIMENSIONS ON THE NON-ACCESS SIDES. REMOVED REFERENCES FOR EASEMENT DIMENSIONS AND SPECIFIED IF REQUIRED EASEMENT CONDITIONS. UPDATED NOTE 2. ADDED NOTE 6 TO CLARIFY BACKFILL AND GRADING AROUND FOUNDATION.	PC	MM	DK	MM
01	SEPT 2023	ORIGINAL DU-03-204-0500-R2 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 6. GENERAL UPDATES TO DIMENSIONS AND NOTES. UPDATED NOTE 1. ADDED NOTE 5.	PC	MM	MM	MM
Rev. No.	Date	Revision Particulars	dwn	ckd	des	app

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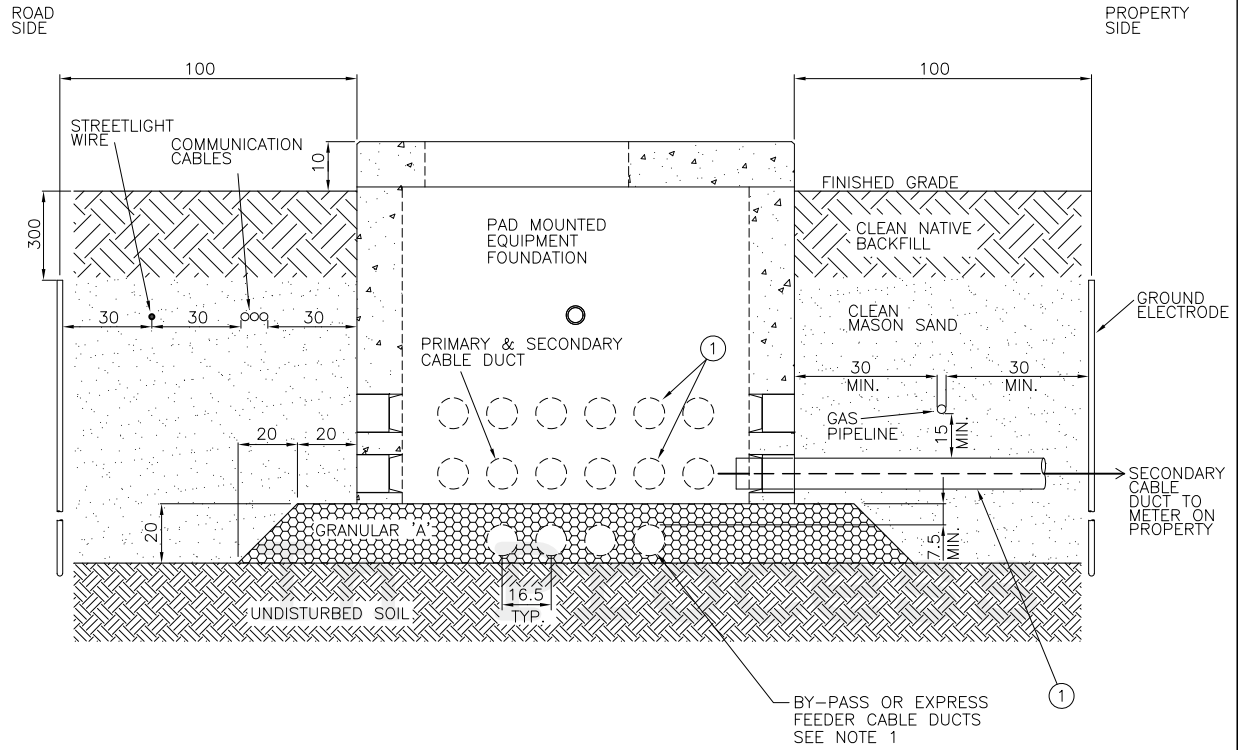
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Title:  
**LOCATION OF EQUIPMENT FOUNDATION CULVERT SYSTEM**

Drawing No. **DU6-104-0500** Rev. No. **02**

TITLE BLOCK REV 02 - AUGUST 2014



**FIG.1**  
TRENCH AND FOUNDATION  
(FOUNDATION INLINE WITH TRENCH)

**NOTES:**

1. FEEDER CABLES NOT SERVICING THE PAD-MOUNTED EQUIPMENT IN QUESTION SHALL BY-PASS THE FOUNDATION AS SHOWN IN FIG.1.
2. ALL DUCT SECTIONS SHALL BE SOLVENT CEMENTED TOGETHER AND ALLOWED TO CURE FOR 24 HOURS.

FOR SHEET 2 OF THIS DRAWING SEE DU6-105-0501

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30007710	DUCT, PVC, 100mm DIA., DB2	A/R
MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED			

01	SEPT 2023	ORIGINAL DU-03-205-0500-R1 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 6. GENERAL UPDATES TO DIMENSIONS. UPDATED NOTE 1.	PC	MM	MM	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/02/02	Pole ID:	



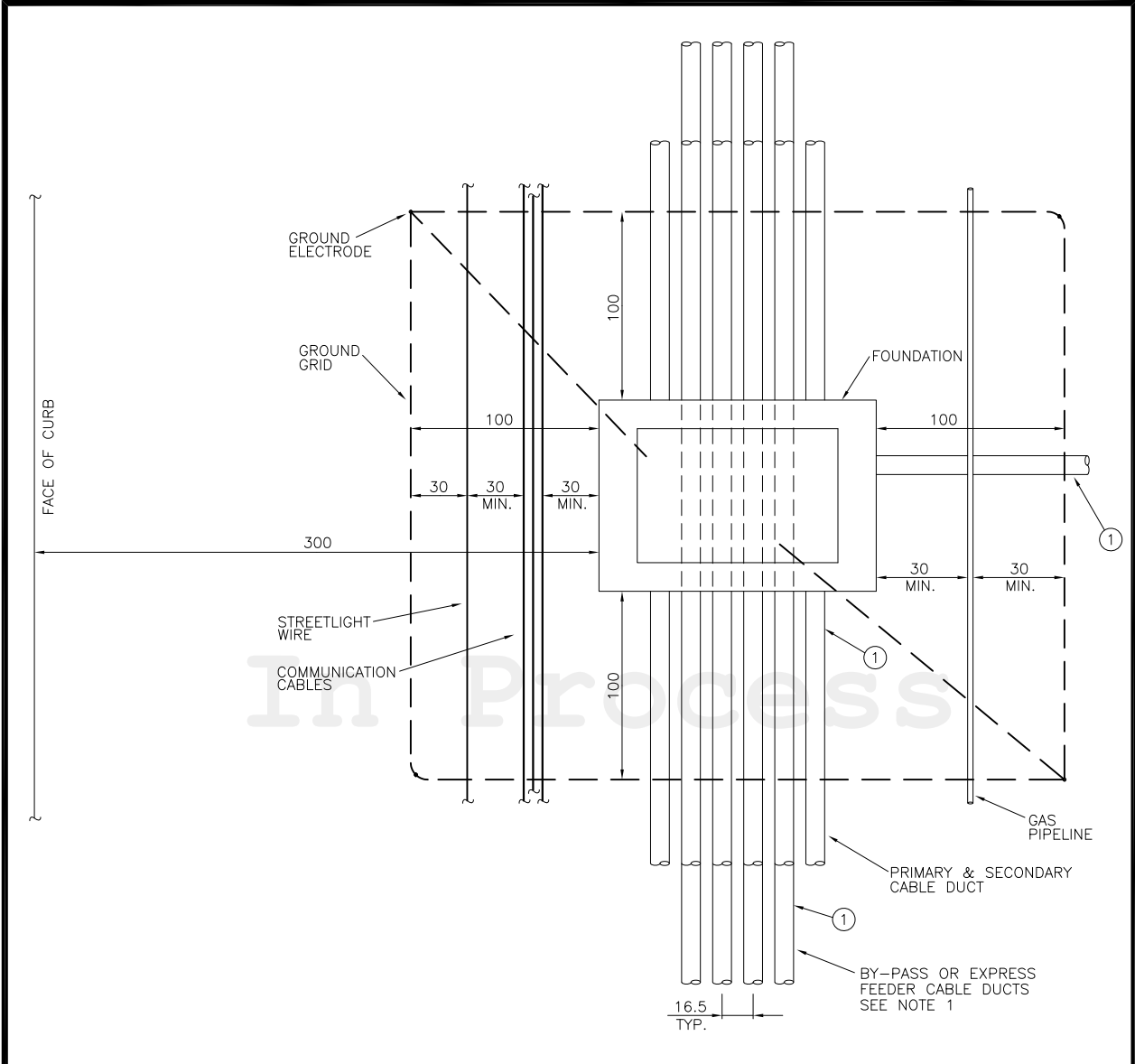
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Title:  
4-PARTY TRENCH - ALL-IN-DUCT PAD-MOUNTED EQUIPMENT FOUNDATION ARRANGEMENT AND CLEARANCES - TYPICAL

Drawing No.  
DU6-105-0500

Rev. No.  
01

TITLE BLOCK REV 02 - AUGUST 2014



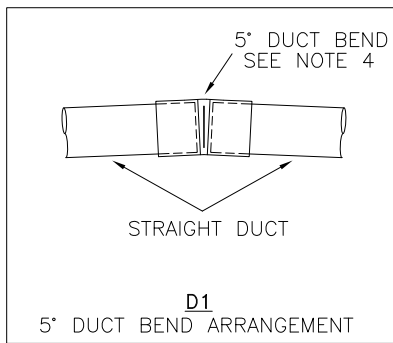
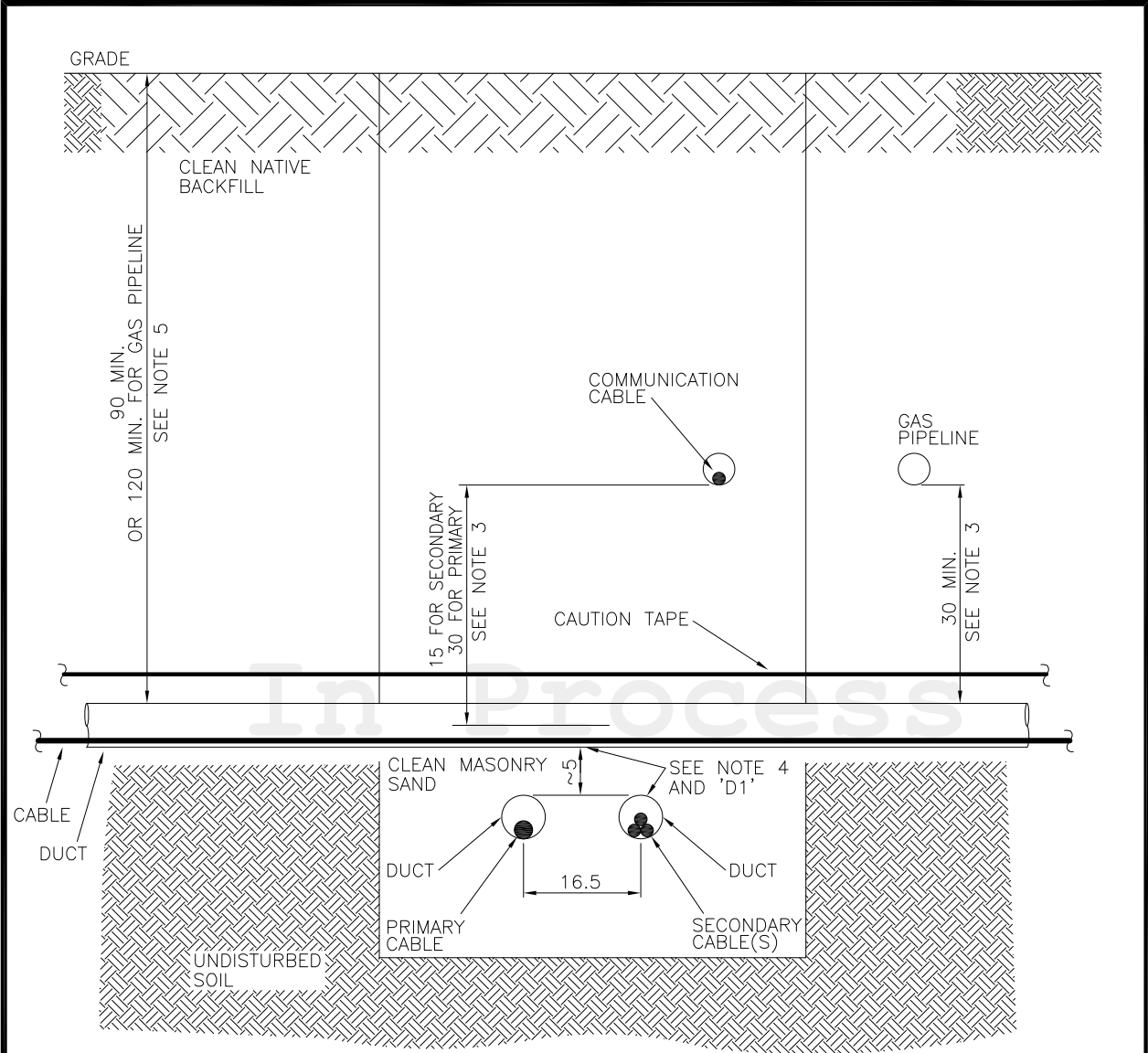
**FIG.2**  
PLAN VIEW OF  
TRENCH AND FOUNDATION

FOR SHEET 1 OF THIS DRAWING SEE DU6-105-0500

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-205-0501-R1 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 6. GENERAL UPDATES TO DIMENSIONS. UPDATED NOTE 1.	PC	MM	MM	MM	MM	Drawn By: PC	Checked By: M.MATEVSKI	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Rev No.	Date	Revision Particulars	dwn	ckd	des	app		Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/02/02	Pole ID:	
								Title: <b>4-PARTY TRENCH - ALL-IN-DUCT PAD-MOUNTED EQUIPMENT FOUNDATION ARRANGEMENT AND CLEARANCES - TYPICAL</b>			
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TITLE BLOCK REV 02 - AUGUST 2014



**NOTES:**

1. ALL SEPARATIONS ARE THE MINIMUM REQUIREMENT.
2. THE SEPARATION FROM ALL POWER CABLES TO GAS PIPELINE MUST BE 30cm MINIMUM.
3. IF THE SPECIFIED SEPARATION CANNOT BE ACHIEVED CONTACT ENGINEERING.
4. IF POWER CABLE DUCTS AT THE POINT OF CROSSING ARE AT SIMILAR ELEVATION, DUCTS CAN BE GRADUALLY DEFLECTED TO OBTAIN THE REQUIRED SEPARATION. 5° DUCT BENDS MAY BE UTILIZED AT THE CROSSING IN ONE DIRECTION TO FACILITATE THE TRANSITION, IF REQUIRED. SEE 'D1'.
5. 120cm MINIMUM DIMENSION TO GRADE IS REQUIRED IF GAS PIPELINE IS PRESENT.

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-208-0500-R4 IS NOW SUPERSEDED BY DU15-111-0500-R1 FOR DIRECT BURIED INSTALLATIONS. THIS NEW DRAWING/REVISION IS FOR ALL-IN-DUCT INSTALLATIONS. CHANGED TO SECTION 6. GENERAL UPDATES TO LAYOUT, DIMENSIONS AND NOTES. DETAIL 'D1' AND NOTES 4 & 5 ADDED.	PC	MM	MM	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/02/02	Pole ID:	

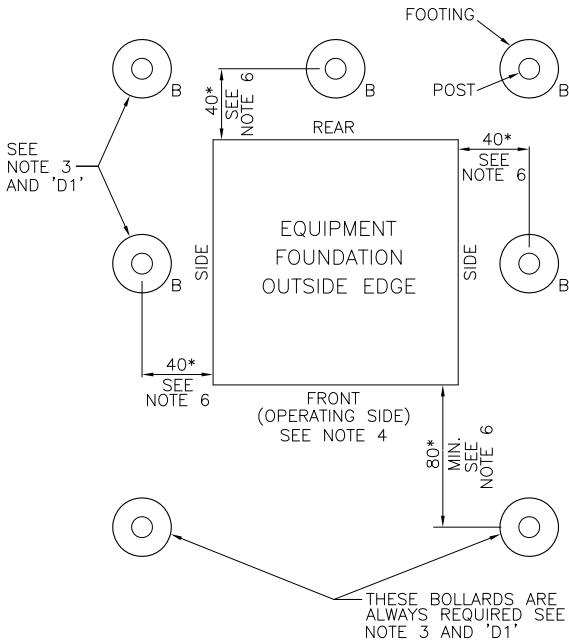
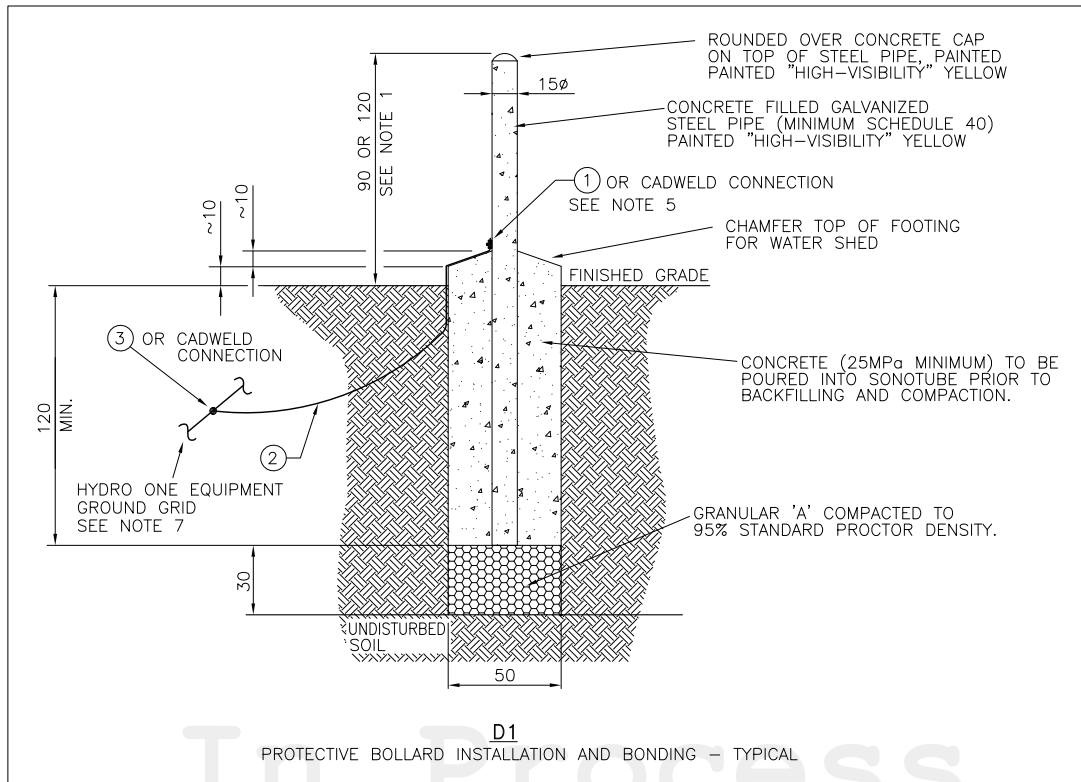


Title:  
CROSSING ARRANGEMENTS OF GAS PIPE LINE, COMMUNICATION & POWER CABLES - TYPICAL ALL-IN-DUCT INSTALLATIONS

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Drawing No. DU6-106-0500	Rev. No. 01
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TITLE BLOCK REV 02 - AUGUST 2014



NOTES:

- PROTECTIVE BOLLARD HEIGHT ABOVE GRADE:
  - FOR SINGLE-PHASE EQUIPMENT: 90cm
  - FOR THREE-PHASE EQUIPMENT: 120cm
- BOLLARDS SHALL BE PROVIDED AS SHOWN IN DESIGN DRAWINGS.
- BOLLARDS AT 'B' ARE OPTIONAL AND WOULD ONLY BE REQUIRED FOR HIGH TRAFFIC AREAS AND LARGE SIZED EQUIPMENT. REAR AND SIDE CENTER POSITIONS ARE GENERALLY NOT REQUIRED FOR SINGLE-PHASE EQUIPMENT DUE TO THEIR SMALL SIZE. ALSO BOLLARDS AT THE REAR AND SIDE OF THE EQUIPMENT MAY BE OMITTED AT LOCAL DISCRETION IF THE LIKELIHOOD OF DAMAGE/IMPACT IS LOW.
- LOCATION OF BOLLARDS SHOULD NOT OBSTRUCT EQUIPMENT OPERATION, MAINTENANCE AND REPLACEMENT.
- WHEN USING COMPRESSION CONNECTOR DRILL THROUGH HOLE IN THE PIPE AND REMOVE PAINT FROM CONNECTION AREA OF THE PIPE. ALTERNATIVELY SUPPLY AND INSTALL STEEL PIPE WITH 1/2" BONDING HARDWARE.
- DIMENSIONS WITH "\*" ARE PREFERRED TO BE 150cm WHERE POSSIBLE.
- SEE DU12-101-0500 FOR HYDRO ONE EQUIPMENT GROUND GRID DETAILS.

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

Rev No.	Date	Revision Particulars	dwn	ckd	des	app
02	FEB 2026	REVISED THE MAIN FIGURE TO REFLECT BOLLARD'S BELOW-GRADE INSTALLATION DEPTH IN ACCORDANCE WITH CSA REQUIREMENTS. UPDATED THE CHAMFER DIMENSION FOR THE BOLLARD'S WATER-SHED FEATURE.	GJ	PC	DK	MM
01	SEPT 2023	ORIGINAL DU-03-212-0500-R4 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 6. GENERAL UPDATES TO DIMENSIONS AND NOTES. UPDATED NOTES 3 & 5. ADDED NOTE 7 AND PARTS LIST. UPDATED FIG.1 & 2 TO MAIN FIGURE AND 'D1'.	PC	MM	MM	MM

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30024855	CONNECTOR, COMPRESSION, 1-HOLE, FOR #4 AWG	A/R
2	30014480	CONDUCTOR, BARE, CU, #4	A/R
3	30028496	CONNECTOR, CU, FOR #4 AWG CU WIRE	A/R
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED

Drawn By: P.C	Checked By: M.MATEVSKI	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/02/02	Pole ID:	

**hydro one** **Hydro One Networks Inc.**

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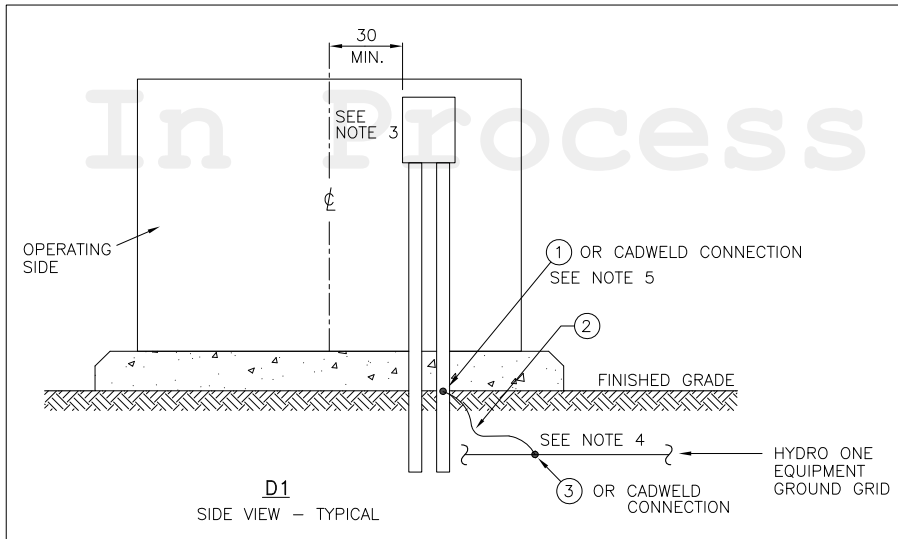
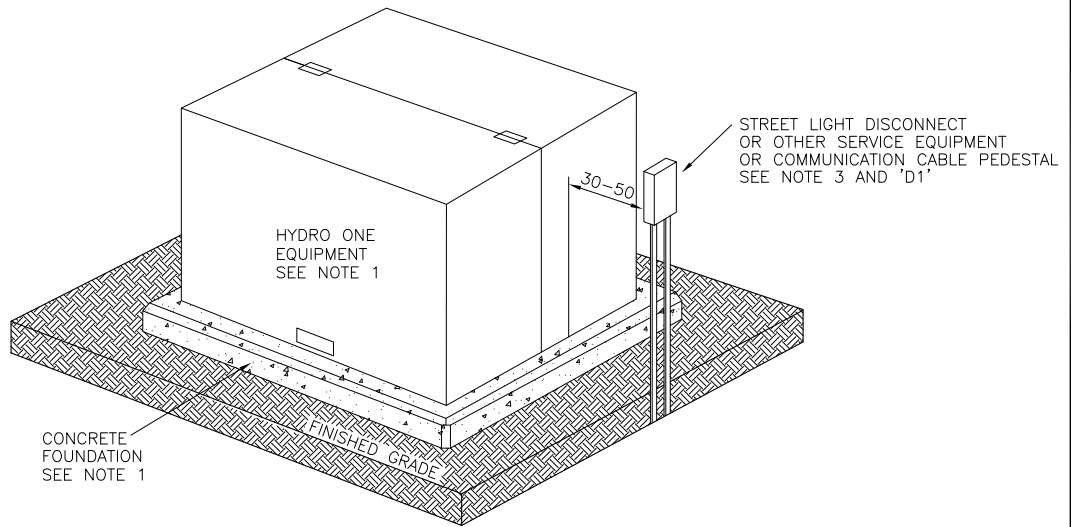
Information contained in this drawing is considered to be confidential. Recipients shall only use the drawing for its intended purpose and shall take necessary measures to prevent disclosure or transmission to outside parties.

Title: PROTECTIVE BOLLARDS INSTALLATION

Drawing No. DU6-107-0500

Rev. No. 02

TITLE BLOCK REV 02 - AUGUST 2014



**NOTES:**

1. DO NOT DRILL OR TAP EQUIPMENT CASING OR FOUNDATION.
2. ALL METAL PARTS WITHIN 3m OF EQUIPMENT GROUND GRID SHALL BE BONDED TO THE GRID VIA #4 AWG COPPER CONDUCTOR.
3. LOCATION OF STREET LIGHT OR COMMUNICATION EQUIPMENT SHALL NOT OBSTRUCT INSTALLATION AND MAINTENANCE OF HYDRO ONE EQUIPMENT.
4. SEE DU12-101-0500 FOR HYDRO ONE EQUIPMENT GROUND GRID DETAILS. BONDING TO THE GROUND GRID LOOP OR COPPER LEADS INSIDE THE FOUNDATION IS ACCEPTABLE.
5. ATTACHMENT HARDWARE SUPPLIED WITH EQUIPMENT.

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.
1	30024855	CONNECTOR, COMPRESSION, 1-HOLE, FOR #4 AWG	A/R
2	30014480	CONDUCTOR, BARE, CU, #4	A/R
3	30028496	CONNECTOR, CU, FOR #4 AWG CU WIRE	A/R
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-214-0500-R3 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 6. GENERAL UPDATES TO DIMENSIONS AND NOTES. ADDED NOTE 5 AND PARTS LIST. UPDATED FIG.1 & 2 TO MAIN FIGURE AND 'D1'.	PC	MM	MM	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2021/02/02	Pole ID:	



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STREET LIGHT DISCONNECT, OR COMMUNICATION CABLE PEDESTAL NEAR HYDRO ONE PAD-MOUNTED EQUIPMENT

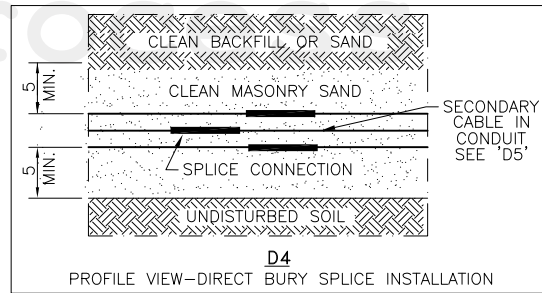
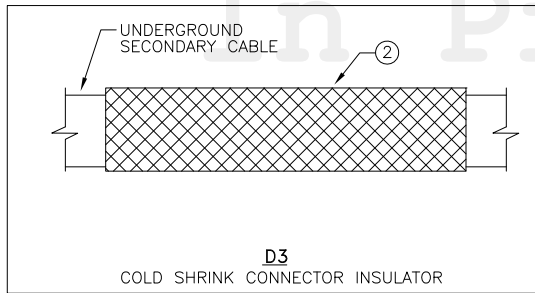
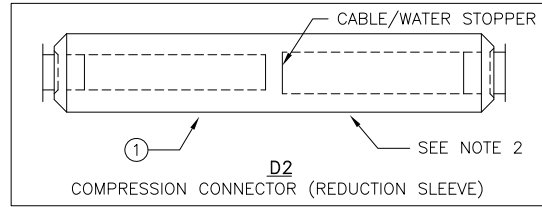
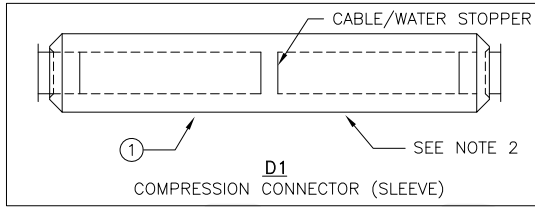
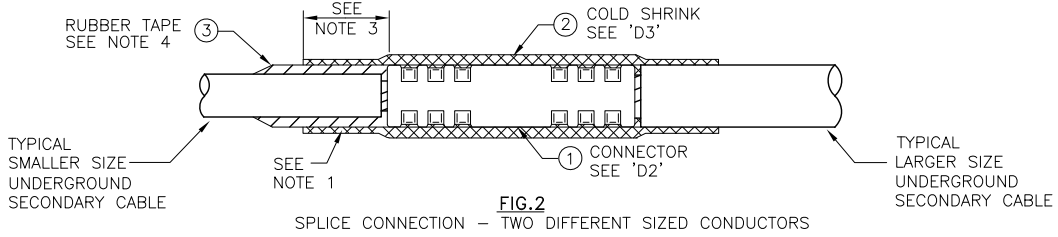
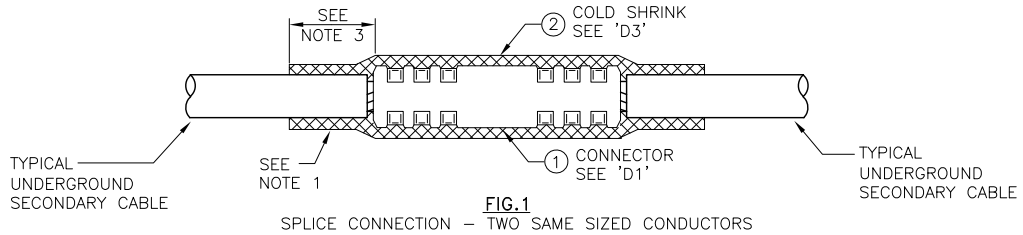
Drawing No. DU6-108-0500	Rev. No. 01
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TITLE BLOCK REV 02 - AUGUST 2014

UNDERGROUND DISTRIBUTION STANDARDS

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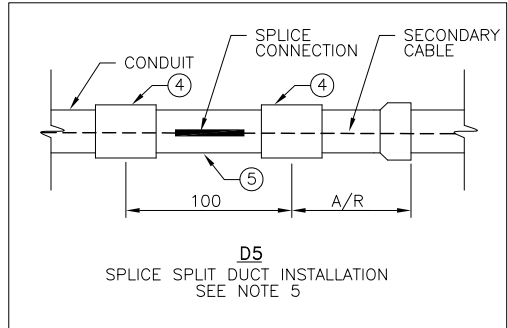
In Process  
**SECTION 7**  
**CABLES**  
**CONNECTORS & TERMINATIONS**



**TABLE 1 - COMPRESSION CONNECTOR AND COLD SHRINK SELECTION CHART**

CONDUCTOR SIZE (KCMIL/AWG)	NON-TENSION UNDERGROUND SPLICE		
	CONNECTOR, SPLICE MM#	CSA DIE SIZE#	COLD SHRINK 600V INSULATOR MM#
500	30006397	30	30013875
250	30006455	26	30008346
4/0	30006456	24	30008346
3/0	30006695	24	30008346
3/0-1/0	30006817	26	30008346

- NOTES:**
1. INSERT THE COLD SHRINK INSULATOR COVER ON ONE OF THE CABLES BEFORE SPLICING. APPLY SHRINK PER FIG.1 OR FIG.2 AFTER CONNECTOR IS INSTALLED. ALL SURFACES MUST BE CLEAN AND DRY.
  2. STRIP ONLY REQUIRED AMOUNT OF CABLE JACKET NEEDED TO INSTALL SLEEVE. FILE DOWN ANY SHARP EDGES SMOOTH AFTER COMPRESSION.
  3. FINAL INSTALLATION SHALL HAVE AN EQUAL OVERLAP OF COLD SHRINK INSULATOR COVER OVER THE INSULATED PART OF THE SECONDARY CABLE ON EACH SIDE OF THE COMPRESSION CONNECTOR.
  4. APPLY TAPE (PART #3) AROUND THE SMALLER SIZED CABLE TO INCREASE ITS DIAMETER TO BE EQUIVALENT TO THE LARGER SIZED CABLE AND ENSURE THE COLD SHRINK CREATES A TIGHT SEAL.
  5. SPLICE SPLIT DUCT INSTALLATION NOT PREFERRED. ONLY ONE CONNECTION SHOWN FOR DRAWING CLARITY. DUCT MUST ALSO BE BACKFILLED WITH MASONRY SAND PER D4.



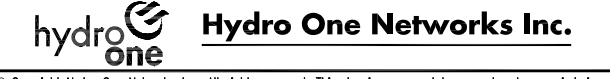
ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-03-219-0500-RO IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 7.	PC	MM	KX	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	CONNECTOR, SPLICE, COMPRESSION, NON-TENSION, AL	A/R
2	SEE TABLE 1	COLD SHRINK INSULATOR	A/R
3	30008334	TAPE, SPLICING, RUBBER, SELF-AMALGAMATING	A/R
4	30003292	COUPLER, POLY, PUSH FIT	A/R
5	30031628	CONDUIT, 4", SPLIT DB2	A/R
MM# = REFER TO SECTION 16 ONLY   A/R = AS REQUIRED			

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: K.XU	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2022/11/18	Pole ID:	



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Title: COLD SHRINK SPLICE (NON-TENSION COMPRESSION) FOR UNDERGROUND SECONDARY CABLE UP TO 600V  
 Drawing No. DU7-422-0500  
 Rev. No. 01

TITLE BLOCK REV 02 - AUGUST 2014

UNDERGROUND DISTRIBUTION STANDARDS

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In Process

**SECTION 11**  
**SERVICES & METERING**

## Sub-Section 11-1-1 Secondary Services

### **In this Sub-Section**

This sub-section covers the specific information about the underground secondary systems and secondary services including typical layout, equipment, cables, and connections.

The relevant information and details for the equipment, secondary service cable transitions, support, and connections to the source side, covered in other sections, are referenced below.

### **1-PH Secondary Services**

For 1-phase applications operated at 120/240 V, the secondary system consists of 1-phase secondary circuits that connect one or more customer service(s) to a Hydro One 1-phase secondary system. Each service may be either directly connected to the transformer (pad-mounted or pole mounted) or connected to a bus (underground or overhead).

Secondary 1-phase service cables/ducts and trenches shall be installed in accordance with drawings DU6-102-0500, DU11-101-0500/0501, DU11-102-0500/0501/0502, DU11-103-0500/0501 and DU11-104-0500. For secondary cable identification, refer to *Section 2*.

Where possible, secondary service cables shall run directly from the transformer/bus to the service entrance or meter base in duct. The service cable should only be pulled through after the entire duct run is complete.

When this is not possible due to logistical reasons (e.g. the house wall not being ready), the preferred method is to install the duct (with a pulling tape inside) from the transformer/bus to a minimum of 1 m inside the property line. This duct shall be terminated with a cap and the end shall be marked with a steel fence post or a 50 x 100 mm nominal wood stake. When the service support structure is ready, the post/stake's location will be excavated to reveal the capped duct, which can then be extended to reach the meter base. The service cable shall then be pulled from the transformer/bus to the meter base in one pull/run.

Alternatively, the ducted service cable may be installed from the transformer/bus and terminate a minimum of 1 m inside the property line and the duct shall cover the cable length above grade to provide temporary mechanical protection. This duct shall extend from the trench bottom level to a minimum of 600 mm above grade and shall be securely attached to a fence post or 50 x 100 mm nominal wood stake. The fence post or wood stake shall extend from bottom of the trench to a minimum of 1 m above existing grade. When the service support structure is ready, trench excavation and duct/cable installation can then resume towards the service location. This method may involve splicing of the cable (if the cable is not long enough to reach the final location of the meter base) and is therefore not preferred.

The preferred location for the meter and service cables is on the driveway side of the property as this location typically affords easy access to the meter base. Alternatively, the meter and service cables may be installed on the non-driveway (non-preferred) side of the property provided that ready access to the meter base is assured. Where possible deep services such as

water, sanitary and sewer lines should be located on the side opposite of the secondary service, otherwise maintain 1.0 m minimum separation between secondary services and deep services. Shared secondary service cable trenches (one trench servicing multiple lots) are not preferred. If unavailable contact Distribution Planner. Secondary service trenches shall be made as perpendicular as practicable to the main trench and aligned with the service entrance. See DU6-102-0500/0501.

See *Secondary Tap Enclosure* and *Secondary Buses* paragraphs above for other alternate options on how to connect 1-phase secondary customer services.

For secondary service cable terminations at the pad-mounted transformer end, refer to *Sub-Section 9-4* and DU9-401-0500 for typical 1-phase underground cable or armoured cable terminations. For 1-phase secondary junction kiosk connections see DU11-121-0500. For secondary connections on a dip pole with overhead distribution transformer see DU5-401-0500. For secondary connections to triplex or open wire bus on a dip pole see DU5-403-0500 and DU5-404-0500.

When left exposed in transformers, at poles, vaults, or service locations, the cable ends shall be adequately protected (e.g. taped).

### **3-PH Secondary Services**

For 3-phase applications operated at 120/208 V or 347/600 V, the secondary system consists of direct connection(s) for one or more customer service(s) to a Hydro One 3-phase pad-mounted transformer or 3-phase overhead distribution transformer bank.

For 3-phase secondary services, cables shall be owned, supplied and installed by the customer. All aspects of the underground secondary service including trenching (regular or reduced cover), installation and all associated materials shall meet Ontario Electrical Safety Code (OESC) requirements and be CSA approved. The customer is responsible for the temporary but clear markings at both ends of the cables. The final markings and labeling at the transformer end will be done by Hydro One per *Section 2*. At the customer service entrances or meter bases the termination shall be done by the customer and shall meet OESC requirements.

For secondary service cable terminations at the pad-mounted transformer end, refer to *Sub-Section 9-4* and DU9-402-0500 for typical 3-phase underground cable or armoured cable terminations.

For secondary connections on a dip pole with overhead distribution transformer bank see DU5-402-0500. For secondary connections to quadruplex bus on a dip pole see DU5-403-0500.

### **Secondary Buses**

A secondary bus is a 1-phase 120/240 V circuit (triplex cable) installed and connected between a distribution transformer (pad-mounted or a bank of overhead distribution transformers) and secondary tap enclosure, and to which multiple secondary services are connected. For more detail on application see *Secondary Tap Enclosure* paragraph below.

The secondary bus should be designed to handle a diversified peak load and supply the appropriate voltage level. Total number source cables and service taps to be coordinated with Distribution Planning.

### **Secondary Tap Enclosures**

Secondary cables will run from the pad-mounted supply transformer and/or dip pole to the service's wall mounted meter base. Secondary cables shall be continuously ducted, with the possibility of short lengths of flexible conduit at the trench ends to facilitate the transition to the meter base or dip pole.

If an intermediate secondary junction point is required, a pad-mounted tap enclosure (junction kiosk) shall be used to maintain the continuously ducted system. The purpose of a secondary tap enclosure (junction kiosk) is to prevent long individual service cable runs. The tap enclosure provides the ability to service multiple customers from a single point.

For row housing and/or high-density subdivisions, secondary bus (Triplex Cable) (250 kcmil or 500 kcmil AL cable) may be run to a secondary junction kiosk to reduce the number of cables in the trench and the source transformer to help reduce congestion. A maximum of two source cables and six service taps are allowable depending on the arrangement. See DU11-121-0500. This solution has a higher economical cost but it is more robust and visible and should be used primarily for road crossing applications.

### **Secondary O/H to U/G Transition**

For underground cable, conduit, guard, and attachment to pole refer to the applicable *300 Series* drawings in *Section 5*. Underground secondary dip connections shall be per *400 Series* drawings in *Section 5*.

Temporary cable loops shall be tied on the dip pole with enough cable length to reach overhead secondary system to which the cable is to be connected. For installation, see DU5-310-0500.

### **Trenching, Line Locations and Clearances**

For typical trenching installation details, including secondary circuits, see *Section 3*. Typical 1-phase secondary services cable trenching details are covered in *100 Series* drawings in this section. For applicable line location and clearances requirements see *Section 6*.

### **Secondary Service Metering**

For secondary service metering and meter base information see *Sub-Section 11-2-1*. For additional information refer to *Retail Revenue Metering Standards Guide*.

Only meter bases listed in the Hydro One Approved Meter Socket Base List are accepted.

### **Secondary Cables and Loading**

For secondary cables and loading, refer to *Sub-Section 3-1* for 1-phase and *Sub-Section 3-2* for 3-phase applications.

### **Secondary Cable Splices**

For secondary cable splices installation details refer to *100 Series* drawing of this section. For additional information on secondary cable splices refer to *Sub-Section 7-4-2*.

**Hydro One Owned Secondary Cable**

If a standard Hydro One service cable is being selected and installed by Hydro One, refer to *Section 7* for applicable cable and accessories selection.

For requirements, when Hydro One owned secondary cable is installed on Hydro One owned poles refer to *Sub-Section 5-1*. For Hydro One owned secondary service cable terminations at the pad-mounted transformer end, refer to *Sub-Section 9-4*. For typical secondary service cable trenching details, refer to *100 Series* drawings in this section.

**Customer Owned Secondary Cable**

If a customer owned non-standard triplex secondary service cable (including all matching connection/termination accessories) are being supplied and installed by the customer, the type of cable selected (including all matching connection/termination accessories) shall be able to handle the load, voltage drop, fault current, and to be of a voltage class suitable for the service.

For requirements, when customer owned secondary service cable is installed on Hydro One owned poles refer to *Sub-Section 5-1*. For customer owned secondary service cable terminations at the pad-mounted transformer end, refer to *Sub-Section 9-4*.

In Process

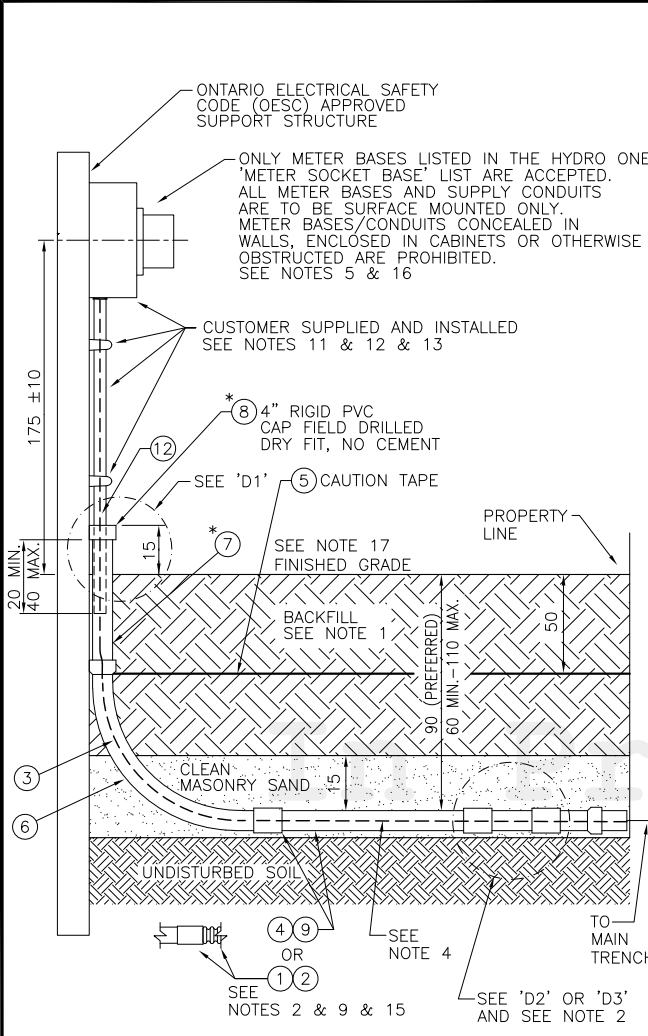
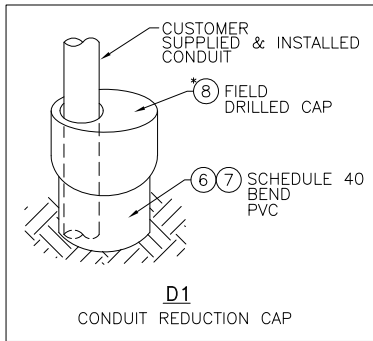


FIG. 1 TYPICAL ALL-IN-DUCT TRENCH DETAIL



FOR SHEET 2 OF THIS DRAWING SEE DU11-103-0501

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

Rev No.	Date	Revision Particulars	dwn	ckd	des	app
02	JUNE 2024	ADDED NOTE 17 AND PROVIDED A REFERENCE TO IT FOR CUSTOMER'S BACKFILLING RESPONSIBILITIES.	GJ	PC	DK	MM
01	SEPT 2023	ORIGINAL DU-03-209.2-0500-R02 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 11. GENERAL UPDATES. CHANGED TO NEW DWG. & NUMBERING FORMAT. UPDATED DETAILS TO FIGURES. UPDATED NOTE 5. ADDED NOTES 13, 14, 15 & 16.	PC	MM	MM	MM

NOTES:

- BACKFILL: ENSURE 5cm CLEAN MASONRY SAND BETWEEN THE TRENCH BASE AND THE DUCTS TO PROTECT THE DUCTS FROM SHARP ROCKS. IF THE TRENCH BOTTOM IS FREE OF SHARP ROCKS THE SAND MAY BE OMITTED. 15cm OF SAND BUFFER SHALL BE PLACED BETWEEN THE DUCTS AND NATIVE BACKFILL. NATIVE BACKFILL MUST BE CLEAN AND FREE OF DEBRIS TO PREVENT DAMAGE TO THE DUCT. BACKFILL SHALL BE WELL TAMPED.
- WHEREVER POSSIBLE AVOID THE SECONDARY SPLICE AT THE PROPERTY LINE BY INSTALLING A CONTINUOUS DUCT FROM THE TRANSFORMER TO THE METER BASE. IF SPLICE IS REQUIRED, FLEXIBLE CONDUIT SHALL NOT BE USED.
- THE TRENCH SHOULD BE AS STRAIGHT AS POSSIBLE, TO ENSURE AN OPTIMAL CABLE PULL.
- PULL TAPE: A 1/2" WIDE POLYESTER PULLING TAPE MUST BE INSTALLED THROUGH THE ENTIRE LENGTH OF THE DUCT.
- INSTALL METER COMPARTMENT AS PER ONTARIO ELECTRICAL SAFETY CODE (OESC), USE ONLY HYDRO ONE APPROVED METER BASES LISTED IN THE HYDRO ONE 'METER SOCKET BASE' LIST.
- TELECOMMUNICATION PLANT MAY SHARE SERVICE TRENCH BUT MUST BE INSTALLED IN ITS OWN CONDUIT.
- PREFERRED ROUTING FOR GAS SERVICE SHALL BE ON OPPOSITE SIDE OF THE BUILDING THAN THAT OF THE ELECTRICAL SERVICE. IF COMMON TRENCHING IS UNAVOIDABLE, 30cm MINIMUM CLEAR SEPARATION SHALL BE MAINTAINED IN ALL DIRECTIONS BETWEEN GAS SERVICE AND ELECTRICAL SUPPLY CABLE.
- CLEARANCES, DEPTHS, SEPARATIONS AND FORMS OF MECHANICAL PROTECTION OF THE CABLE ARE MINIMUM REQUIREMENTS. INCREASED CLEARANCES AND OR ADDITIONAL FORMS OF MECHANICAL PROTECTION ARE CONSIDERED POSITIVE DEVIATIONS AND ARE ALLOWED.
- FLEXIBLE CONDUIT, WITH APPROVED COUPLER MAY BE INSTALLED, IF SPLICE IS NOT REQUIRED.
- RADIUS MUST BE GREATER THAN THE SPECIFIED CABLE MINIMUM BENDING RADIUS.
- CUSTOMER SUPPLIED AND INSTALLED METER BASE, CONDUIT, CLAMPS AND ASSOCIATED HARDWARE INSTALLED PER ONTARIO ELECTRICAL SAFETY CODE (OESC).
- THE METER BASE CONDUITS WILL VARY IN SIZE DEPENDING ON CONDUCTOR SIZE (i.e. 2" DIAMETER FOR 3/0 AWG, 3" FOR 250 kcmil or 500 kcmil CONDUCTOR). ONLY ONE SERVICE CABLE PERMITTED PER CONDUIT.
- THE SUPPLY SERVICE CABLE AT THE METER BASE SHALL BE HOUSED IN ITS OWN DISTINCT CUSTOMER SUPPLIED CONDUIT (CONDUIT SHALL NOT HOUSE ANY OTHER PLANT), AND SHALL NOT HAVE ANY ACCESS PORT (LB CONDUIT FITTING, JUNCTION BOX, ETC.). ANY MODIFICATION TO CUSTOMER OWNED METER-BASE WHICH VOIDS CSA CERTIFICATION IS NOT PERMITTED.
- FOR TYPICAL TEMPORARY TERMINATION SEE FIG.2.
- SCHEDULE 40 PVC CONDUIT AND ASSOCIATED FITTINGS ARE ACCEPTABLE POSITIVE DEVIATION, IF DB2 CONDUIT IS NOT AVAILABLE, PROVIDED SEPARATIONS SPECIFIED ON THIS DRAWING ARE MAINTAINED.
- METER BASE TO MAINTAIN 1m MINIMUM CLEARANCE FROM DISCHARGE OF ANY COMBUSTIBLE GAS RELIEF DEVICE OR VENT. IF 1m CLEARANCE IS NOT AVAILABLE IT CAN BE REDUCED TO 0.3m MINIMUM CLEARANCE WHICH IS ONLY APPLICABLE IF REGULATORS EQUIPPED WITH CERTIFIED OVERPRESSURE CUT-OFF/SHUT-OFF WITH LIMITED OR NO RELIEF IS INSTALLED FOR THE GAS DISCHARGE OPENING. THE OVERPRESSURE RELIEF DEVICES MUST BE MARKED "LR-OPCO", "P-OPCO" OR "OPSO".
- IT IS THE CUSTOMER'S RESPONSIBILITY TO ENSURE THAT THE TRENCH END IS BACKFILLED AFTER CABLE INSTALLATION.

PARTS LIST

PART No.	MM No.	DESCRIPTION	QTY.
1	30031918	COUPLER KIT, 4", FLEX TO 4" RIGID	A/R
2	30031917	CONDUIT, FLEX, 4"	A/R
3	30005908	SERVICE CABLE, 3/0 AWG, 3-COND., AL.	A/R
	30005915	SERVICE CABLE, 250Kcmil, 3-COND., AL.	
	30005959	SERVICE CABLE, 500Kcmil, 3-COND., AL.	
4	30007710	CONDUIT, PVC, 4", DB2	A/R
5	20002181	CAUTION TAPE, BURIED ELECTRIC LINE	A/R
6	30007687	SWEEP, 4" x 16" RADIUS, SCHEDULE 40, PVC	A/R
7	30007583	CONDUIT, 4", SCHEDULE 40, PVC	A/R
8	30031602	CAP, 4", SCHEDULE 40, PVC	A/R
9	30031626	COUPLER, 4", DB2 TO 4" RIGID	A/R
10	30003292	COUPLER, PVC DUCT, PUSH FIT, 4"	A/R
11	30031628	CONDUIT, 4", SPLIT DB2	A/R
12	20000007	TAPE, PULLING, 1/2" WIDE, POLYESTER	A/R
13	30006695	CONNECTOR, SPLICE, 600V, 3/0 AWG	A/R
	30006455	CONNECTOR, SPLICE, 600V, 250Kcmil	
	30006397	CONNECTOR, SPLICE, 600V, 500Kcmil	
14	30008346	COLD SHRINK, 600V, 2/0 AWG-250Kcmil	A/R
	30013875	COLD SHRINK, 600V, 500Kcmil	
15	30013701	SWEEP, 4" x 16" RADIUS, PVC, FOR DB2	A/R

MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED  
\* = SUPPLIED BY CUSTOMER

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Scale: N.T.S.	Date: (yyyy/mm/dd) 2022/05/03	Pole ID:	



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TRENCH DETAIL – SECONDARY SERVICE CABLE FROM UNDERGROUND ALL-IN-DUCT TRENCH TO METER BASE

Drawing No. DU11-103-0500	Rev. No. 02
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TITLE BLOCK REV 02 – AUGUST 2014

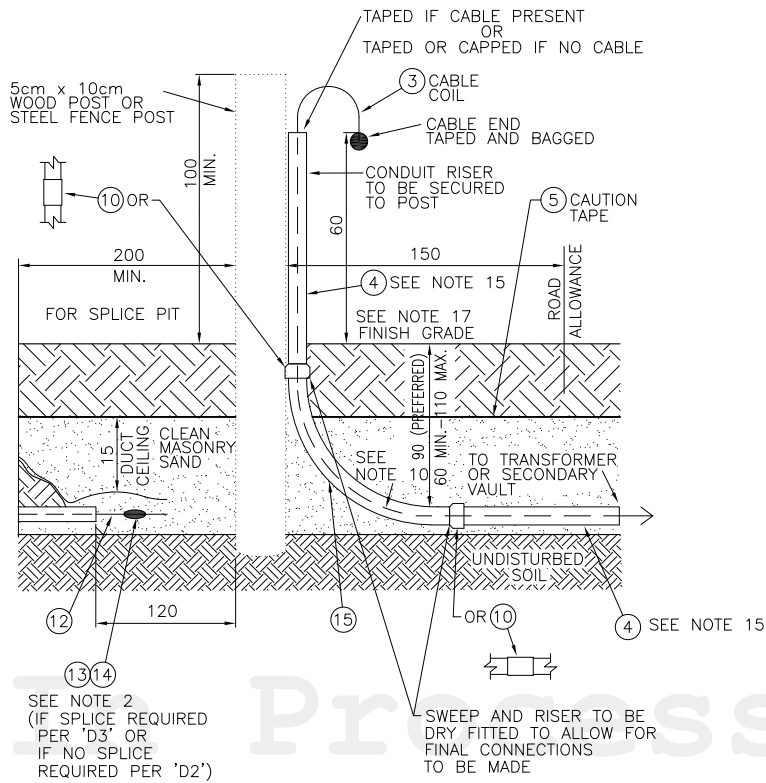
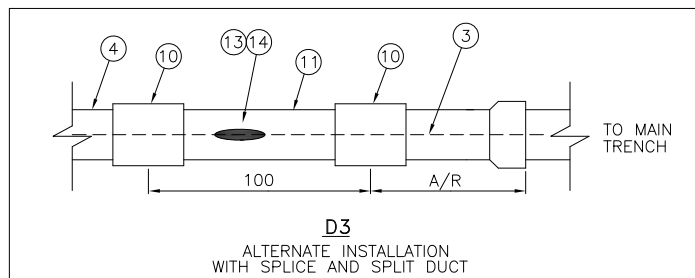
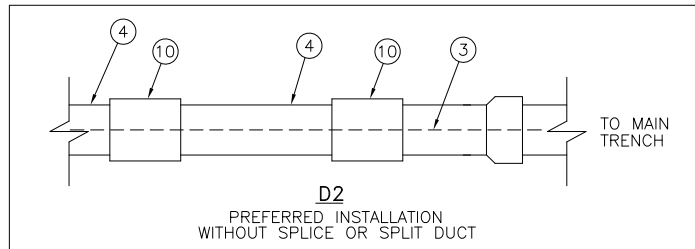


FIG. 2

TYPICAL TEMPORARY TERMINATION OF SECONDARY SERVICE CABLE AT PROPERTY LINE



FOR SHEET 1 OF THIS DRAWING SEE DU11-103-0500

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

02	JUNE 2024	ADDED NOTE 17 AND PROVIDED A REFERENCE TO IT FOR CUSTOMER'S BACKFILLING RESPONSIBILITIES.	GJ	PC	DK	MM
01	SEPT 2023	ORIGINAL DU-03-209.2-0500-R02 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 11. GENERAL UPDATES. CHANGED TO NEW DWG. & NUMBERING FORMAT. UPDATED DETAILS TO FIGURES. UPDATED NOTE 5. ADDED NOTES 13, 14, 15 & 16.	PC	MM	MM	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

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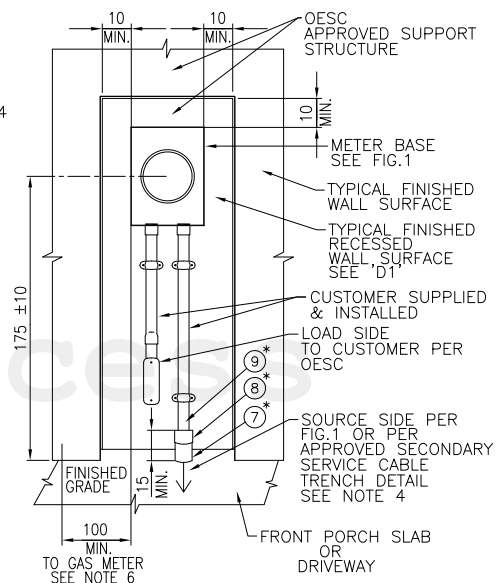
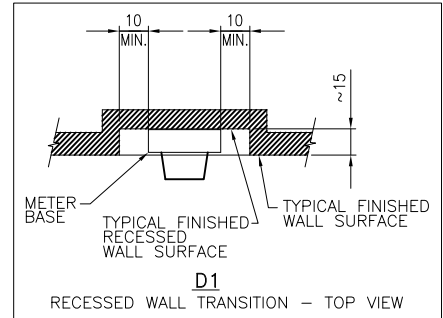
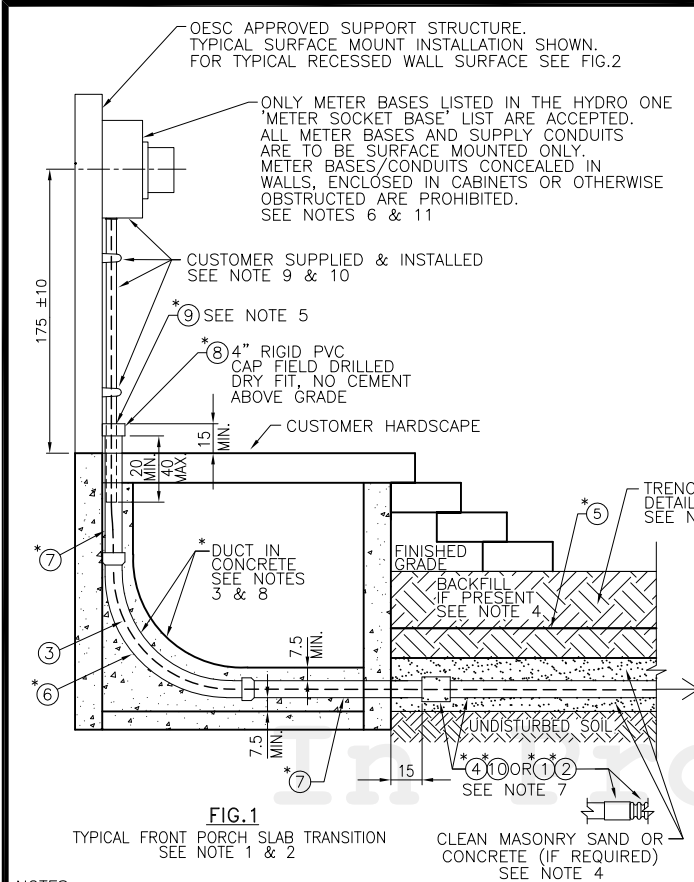
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Title:  
**TRENCH DETAIL – SECONDARY SERVICE CABLE FROM UNDERGROUND ALL-IN-DUCT TRENCH TO METER BASE**

Drawing No.  
**DU11-103-0501**

Rev. No.  
**02**

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**FIG.1**  
TYPICAL FRONT PORCH SLAB TRANSITION  
SEE NOTE 1 & 2

**FIG.2**  
TYPICAL RECESSED WALL TRANSITION  
SEE NOTES 1 & 2

- NOTES:**
- FIG.1 AND FIG.2 ARE ALTERNATE ARRANGEMENTS. FOR PREFERRED DEFAULT ARRANGEMENTS SEE DU11-101-0500/0501, DU11-102-0500/0501/0502, OR DU11-103-0500/0501.
  - FIG.1 REPRESENTS TYPICAL FRONT PORCH SURFACE MOUNT INSTALLATION. FOR TYPICAL FRONT PORCH OR DRIVEWAY RECESSED INSTALLATION SEE FIG.2.
  - PVC CONDUIT AND SWEEP UNDER THE FRONT PORCH SLAB ARE CUSTOMER OWNED AND MUST BE CONCRETE ENCASED AND INSTALLED PER ONTARIO BUILDING CODE (OBC) AND ONTARIO ELECTRICAL SAFETY CODE (OESC).
  - REGULAR OR REDUCED COVER TRENCH PER APPROVED SECONDARY SERVICE CABLE TRENCH DETAIL. SEE DU11-101-0500/0501, DU11-102-0500/0501/0502 OR DU11-103-0500/0501.
  - ALL DUCTS TO BE MANDRELLED AND CLEANED AFTER INSTALLATION. ALL DUCTS TO HAVE 1/2" POLYESTER PULLING TAPE INSTALLED.
  - INSTALL METER COMPARTMENT AS PER ONTARIO ELECTRICAL SAFETY CODE (OESC). USE ONLY HYDRO ONE APPROVED METER BASES LISTED IN THE HYDRO ONE "METER SOCKET BASE" LIST.
  - FLEXIBLE CONDUIT, WITH APPROVED COUPLER MAY BE INSTALLED. FOR REDUCED COVER SCHEDULE 40 PVC CONDUIT MAY BE INSTALLED, PER NOTE 4 ABOVE.
  - PART#S MARKED WITH "\*" ARE SUPPLIED BY CUSTOMER; MM#S OF SUCH PARTS ARE FOR REFERENCE ONLY.
  - THE METER BASE CONDUITS WILL VARY IN SIZE DEPENDING ON CONDUCTOR SIZE (i.e. 2" DIAMETER FOR 3/0 AWG, 3" FOR 250 kcmil or 500 kcmil CONDUCTOR). ONLY ONE SERVICE CABLE PERMITTED PER CONDUIT.
  - THE SUPPLY SERVICE CABLE AT THE METER BASE SHALL BE HOUSED IN ITS OWN DISTINCT CUSTOMER SUPPLIED CONDUIT (CONDUIT SHALL NOT HOUSE ANY OTHER PLANT), AND SHALL NOT HAVE ANY ACCESS PORT (LB CONDUIT FITTING, JUNCTION BOX, ETC.). ANY MODIFICATION TO CUSTOMER OWNED METER-BASE WHICH VOIDS CSA CERTIFICATION IS NOT PERMITTED.
  - METER BASE TO MAINTAIN 1m MINIMUM CLEARANCE FROM DISCHARGE OF ANY COMBUSTIBLE GAS RELIEF DEVICE OR VENT. IF 1m CLEARANCE IS NOT AVAILABLE IT CAN BE REDUCED TO 0.3m MINIMUM CLEARANCE WHICH IS ONLY APPLICABLE IF REGULATORS EQUIPPED WITH CERTIFIED OVERPRESSURE CUT-OFF/SHUT-OFF WITH LIMITED OR NO RELIEF IS INSTALLED FOR THE GAS DISCHARGE OPENING. THE OVERPRESSURE RELIEF DEVICES MUST BE MARKED "LR-OPCO", "P-OPCO" OR "OPSO".

ALL DIMENSIONS IN CENTIMETRES UNLESS OTHERWISE STATED

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30031918	COUPLER KIT, 4", FLEX TO 4" RIGID	A/R
2	30031917	CONDUIT, FLEX, 4"	A/R
3	30005908	SERVICE CABLE, 3/0 AWG, 3-COND., AL.	A/R
	30005915	SERVICE CABLE, 250kcmil, 3-COND., AL.	A/R
4	*	CONDUIT, PVC, 4", DB2	A/R
5	20002181	CAUTION TAPE, BURIED ELECTRIC LINE	A/R
6	*	SWEEP, 4" x 24" RADIUS, SCHEDULE 40, PVC	A/R
7	*	CONDUIT, 4", SCHEDULE 40, PVC	A/R
8	30031602	CAP, 4", SCHEDULE 40, PVC	A/R
9	20000007	TAPE, PULLING, 1/2" WIDE, POLYESTER	A/R
10	30031626	COUPLER, 4", DB2 TO 4" RIGID	A/R
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED
* = SUPPLIED BY CUSTOMER - SEE NOTE 8			

01	SEPT 2023	ORIGINAL DU-03-209.3-0500-R01 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 11. GENERAL UPDATES. UPDATE NOTE 6. ADDED NOTES 10 & 11. CHANGED TO NEW DWG. & NUMBERING FORMAT.	PC	MM	MM	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

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Scale: N.T.S.	Date: (yyyy/mm/dd) 2022/05/03	Pole ID:	

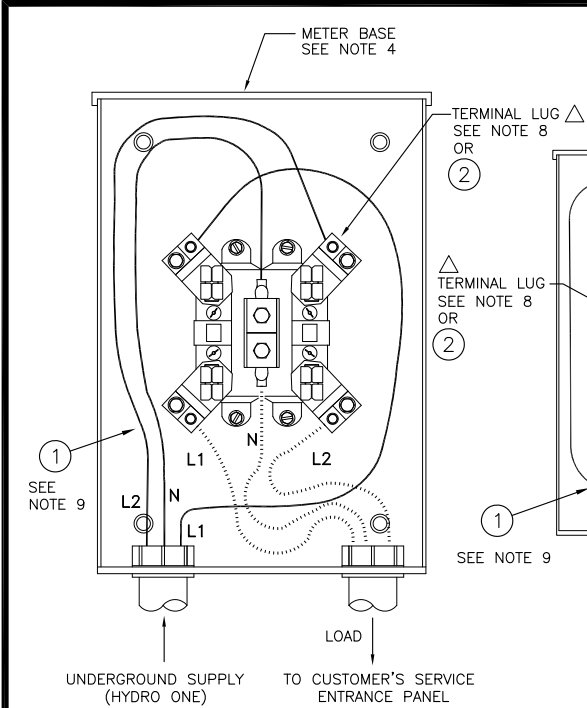


Title:  
TRENCH DETAIL - SECONDARY SERVICE CABLE FROM UNDERGROUND TRENCH TO METER BASE UP TO 200A ALTERNATE ARRANGEMENTS, 1Ø, 120/240V

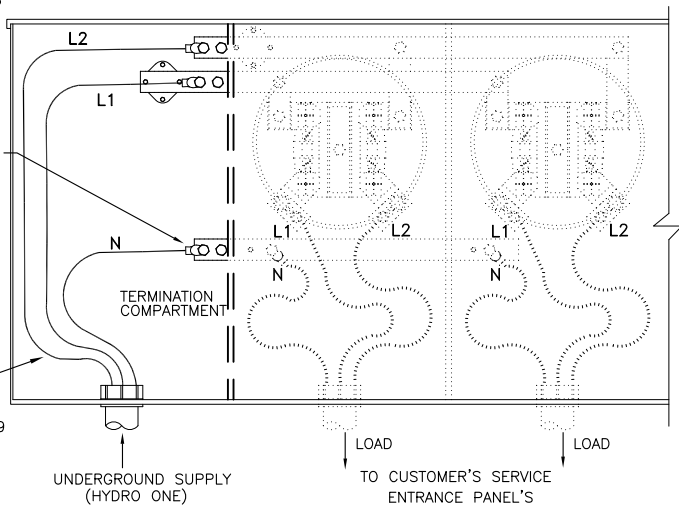
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Drawing No. DU11-104-0500	Rev. No. 01
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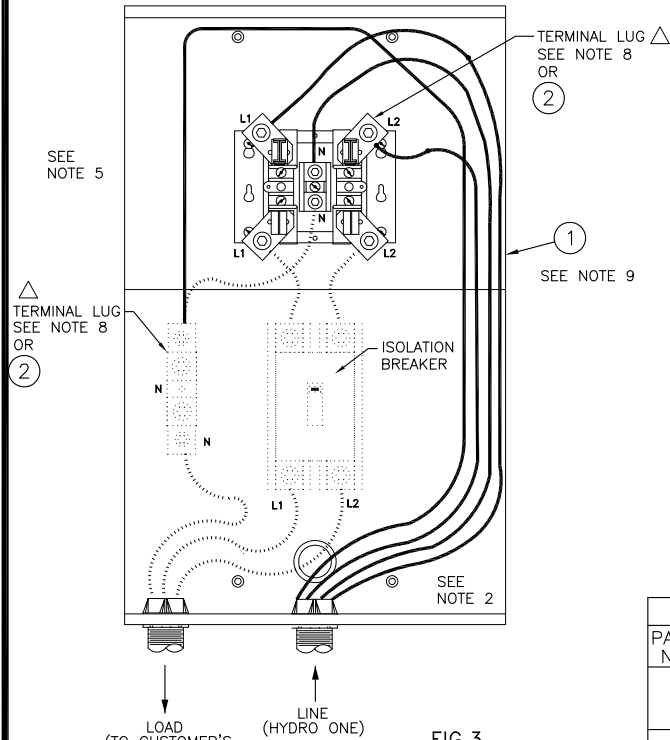
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**FIG. 1**  
TYPICAL SELF-CONTAINED METER-BASE  
UP TO 200A SERVICE



**FIG. 2**  
TYPICAL SELF-CONTAINED MULTI-GANG (MULTI-POSITION) METER-BASE  
UP TO 200A OR UP TO 400A SERVICE  
(REFER TO NOTE 3)



**FIG. 3**  
TYPICAL SELF-CONTAINED  
METER BASE WITH ISOLATION BREAKER  
200A SERVICE

- NOTES:**
- CONDUCTORS DEPICTED BY DASHED LINES ARE THE RESPONSIBILITY OF THE CUSTOMER AND ARE ONLY REPRESENTATIVE OF THE CONNECTION REQUIRED AT THE METER BASE TERMINALS. WIRING SHALL CONFORM TO THE RELEVANT SECTION(S) OF THE ONTARIO ELECTRICAL SAFETY CODE (OESC).
  - REFER TO METERBASE LIST. CONTACT METERING TECHNICAL SUPPORT FOR MORE INFORMATION.
  - ONLY CSA APPROVED HORIZONTAL TROUGH STYLE GANG METER-BASE WITH A MAXIMUM OF SIX (6) METER SOCKETS ARE PERMITTED. A SEPARATE SUPPLY CABLE TERMINATION COMPARTMENT IS REQUIRED FOR UNDERGROUND SERVICES.
  - UNDERGROUND METER BASES ARE TO BE OVERSIZED (JUBMO SIZE) TO ACCOMMODATE EXCESS CONDUCTOR SLACK.
  - IF THE NEUTRAL CONNECTOR IS INSULATED FROM THE METER BASE HOUSING, A SEPARATE BONDING CONDUCTOR BETWEEN THE SERVICE DISCONNECT AND METER BASE IS REQUIRED.
  - ALL METER BASES TO MAINTAIN MINIMUM CLEARANCES TO COMBUSTIBLE GAS RELIEF DISCHARGE DEVICES OR VENTS AS FOLLOWS:
    - 1m FROM NATURAL GAS. IF 1m CLEARANCE IS NOT AVAILABLE IT CAN BE REDUCED TO 0.3m MINIMUM CLEARANCE WHICH IS ONLY APPLICABLE IF REGULATORS EQUIPPED WITH CERTIFIED OVERPRESSURE CUT-OFF/SHUT-OFF WITH LIMITED OR NO RELIEF IS INSTALLED FOR THE GAS DISCHARGE OPENING. THE OVERPRESSURE RELIEF DEVICES MUST BE MARKED "LR-OPCO", "P-OPCO" OR "OPCO", AND
    - 3m FROM PROPANE GAS.
  - ALL METER BASES AND SUPPLY CONDUITS ARE TO BE SURFACE MOUNTED PER HYDRO ONE STANDARDS. METER BASES/CONDUITS CONCEALED IN WALLS, ENCLOSED IN CABINETS OR OTHERWISE OBSTRUCTED ARE NOT PERMITTED.
  - LINE SIDE TERMINATION:
    - USE TUNNEL TYPE CONNECTOR (MAXIMUM 250kcmil SINGLE OR 3/0AWG SINGLE RUN) FOR UP TO 200A, OR
    - USE TUNNEL TYPE CONNECTOR (MAXIMUM 500kcmil SINGLE OR 250kcmil PARALLEL RUN) FOR UP TO 400A.
  - DRAW ADDITIONAL 2ft. OF CONDUCTOR INTO THE METER BASE TO PROVIDE EXCESS SLACK IN THE EVENT OF GROUND SETTLEMENT.

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	30005908	SERVICE CABLE, 3/0 AWG, 3-COND., AL.	A/R
	30005915	SERVICE CABLE, 250Kcmil, 3-COND., AL.	
	30005959	SERVICE CABLE, 500Kcmil, 3-COND., AL.	
2	30006404	CONNECTOR, COMPRESSION, 1-HOLE, FOR 3/0 AWG AL.	A/R
	30006405	CONNECTOR, COMPRESSION, 1-HOLE, FOR 250 KCMIL AL.	
	30032559	CONNECTOR, COMPRESSION, 1-HOLE, FOR 500 KCMIL AL.	
MM# = REFER TO SECTION 16 ONLY		A/R = AS REQUIRED	
△ = SUPPLIED WITH EQUIPMENT			

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	SEPT 2023	THIS NEW DRAWING CONSISTS OF APPLICABLE CONTENT FROM RM7-301-0500-R4 AND OTHER RELEVANT CONTENT FOR 200A AND 400A TYPICAL UNDERGROUND SECONDARY SERVICE CABLE TERMINATIONS AT METER BASE.	PC	MM	MM	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: PC	Checked By: M.MATEVSKI	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2022/05/16	Pole ID:	

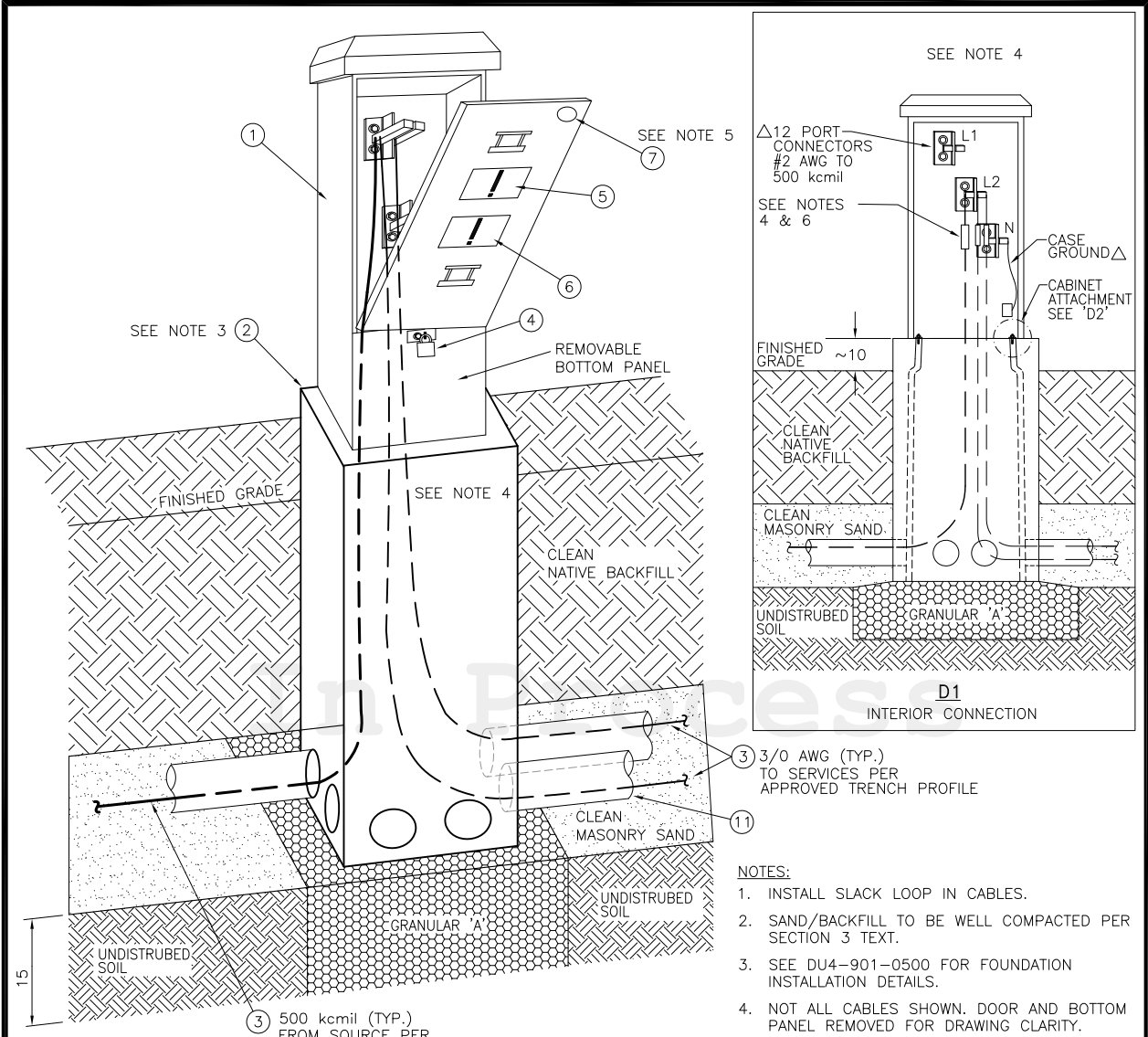


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Title:  
TYPICAL UNDERGROUND SECONDARY SERVICE CABLE  
TERMINATIONS AT THE METER BASE  
UP TO 200A OR UP TO 400A, 1Ø, 120/240V, 3-WIRE

Drawing No. <b>DU11-111-0500</b>	Rev. No. <b>01</b>
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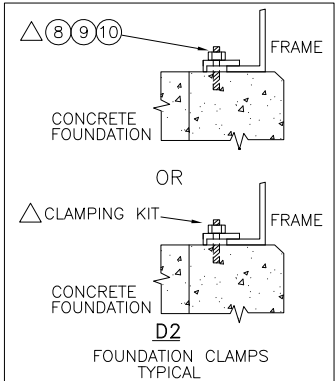
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- NOTES:**
1. INSTALL SLACK LOOP IN CABLES.
  2. SAND/BACKFILL TO BE WELL COMPACTED PER SECTION 3 TEXT.
  3. SEE DU4-901-0500 FOR FOUNDATION INSTALLATION DETAILS.
  4. NOT ALL CABLES SHOWN. DOOR AND BOTTOM PANEL REMOVED FOR DRAWING CLARITY.
  5. SEE DU2-102-0500 FOR REQUIRED SIGNS AND MARKERS.
  6. CABLE IDENTIFICATION MARKERS PER DU2-112-0500.

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.
1	30033171	KIOSK, PAD-MOUNTED, SECONDARY, JUNCTION, 600V, 600A	1
2	30033083	FOUNDATION, PRECAST	1
3	30005908	SERVICE CABLE, 3-CONDUCTOR, 600V, UG, AL, 3/0AWG	A/R
	30005915	SERVICE CABLE, 3-CONDUCTOR, 600V, UG, AL, 250kcmil	
	30005959	SERVICE CABLE, 3-CONDUCTOR, 600V, UG, AL, 500kcmil	
4	30000346	PADLOCK	1
5	20002119	SIGN, "DANGER, DO NOT OPEN YOU CAN BE HURT"	1
6	20002125	SIGN, "DO NOT DIG OR DRIVE STAKES"	1
7	MM#	MARKER, PHASE	1
8	30001591	WASHER, ROUND, 1/2", GALV.	2
9	30001605	WASHER, LOCK, SPRING, 1/2", GALV.	2
10	30031727	BOLT, GALV., GR2, 1/2" x 1-3/4" W/NUT	2
11	MM#	CONDUIT, PVC, 4", DB2	2
MM# = REFER TO SECTION 16 ONLY		A/R = AS REQUIRED	
Δ = SUPPLIED WITH EQUIPMENT			



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01	SEPT 2023	ORIGINAL DU-03-218-0500-R1 IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. CHANGED TO SECTION 11. GENERAL UPDATES TO ALL-IN-DUCT SYSTEM. CHANGED TO NEW DWG. & NUMBERING FORMAT. ADDED NOTES 3 TO 6. ADDED PART#11.	PC	MM	MM	MM	MM	MM	MM							
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Drawn By:	Checked By:	Designed By:	Design Approved By:													
PC	M.MATEVSKI	M.MATEVSKI	M.MATEVSKI P.Eng.													
Scale:	Date: (yyyy/mm/dd)	Pole ID:														
N.T.S.	2022/05/03															
Rev No.	Date	Revision Particulars	dwn	ckd	des	app	Title: SECONDARY JUNCTION KIOSK, METAL ENCLOSED 1Ø, 120/240V, 3-WIRE									
							Drawing No. <b>DU11-121-0500</b>		Rev. No. <b>01</b>							

TITLE BLOCK REV 02 - AUGUST 2014

In Process

**SECTION 12**  
**GROUNDING & BONDING**

## Section 12 Grounding & Bonding

### **Introduction**

This section covers the grounding & bonding requirements for typical Underground and Submarine Distribution Systems up to and including 44 kV.

### **General**

Pad-mounted equipment grounding and bonding details, referenced in this section, are shown on the specific equipment installation drawings in their respective sections of the Underground Distribution Standards. This section contains common grounding and bonding details, connections, and instructions, that are not captured but referenced on the specific equipment installation drawing.

### **System Requirements**

For minimum system and grounding design requirements, see *Sub-Sections 12-1 & 12-2* and *Overhead Distribution Standards - Section 12*.

### **In This Section**

This section is divided into the following two sub-sections:

Topic	Sub-Section #	Revision
Grounding & Bonding of Underground Distribution Systems	12-1	September 2023
Grounding & Bonding of Submarine Distribution Systems	12-2	September 2023

## Section 12-1

### Grounding & Bonding of Underground Distribution Systems

#### **In This Sub-Section**

This sub-section covers the grounding and bonding requirements for typical underground distribution systems, operating at following voltages and designation:

**Table 1**  
**UNDERGROUND DISTRIBUTION NETWORKS OPERATING**  
**VOLTAGES AND DESIGNATION**

Voltage Ranges	Designation
1 $\phi$ , 2.4 to 16 kV, 2 Wire	Single Phase Primary
3 $\phi$ , 2.4/4.16 to 16/27.6 kV, 4 Wire	Three Phase Primary
3 $\phi$ , 27.6 kV or 44 kV, 3 Wire	Subtransmission

Grounding & bonding details referenced in this section, that are pad-mounted equipment specific (1-phase & 3-phase primary only) or riser/dip pole specific (1-phase & 3-phase primary and 3-phase subtransmission cables only), are shown in the individual equipment installation drawings located in their respective sections of the Underground Distribution Standards.

For specific grounding and bonding requirements for submarine distribution systems, that are different and/or in addition to the requirements covered in this sub-section, refer to *Sub-Section 12-2*

#### **Pad-Mounted Equipment**

For pad-mounted equipment grounding, four (4) ground rods (or ground plates) are a standard requirement in all cases and there is no need to measure the ground resistance when four rods or plates are installed.

The four (4) ground rods shall be, 1.9 cm x 3.0 m (3/4" x 10') long galvanized steel rods, driven into the ground at 1.0 m from the pad-mounted equipment foundation, and shall:

- a) Be installed a minimum of 3.0 m (10') from each other and connected together by a ground conductor forming a ground grid around the pad-mounted equipment;
- b) The top of the ground rods shall be a minimum of 30 cm below final grade.

The ground conductor shall be a continuous piece of #4 AWG minimum, stranded bare copper conductor, and it shall:

- a) Completely encircle the foundation and be buried to a minimum of 30 cm below finished grade level;

- b) Be fastened securely to the ground rods with the ground rod connector. Each ground rod connector shall connect **only** one conductor to the rod.

A minimum of 2.0 m of each end of the ground conductor shall be left inside the equipment foundation for connection by Hydro One to the pad-mounted equipment. The two independent grounding connections are for redundancy within the system.

If pad-mounted equipment requires aluminum base, bond the ground lug of the aluminum base to the ground grid.

For grounding details, see DU12-101-0500 and DU12-102-0500.

All pad-mounted primary equipment must be supplied by equipment manufacturer with pre-installed bonding straps bonding together all non-current carrying metallic components such as hoods, doors, etc.

For every grounding arrangement, the non-current carrying portion of each major piece of accessible equipment (e.g. equipment metal enclosures) shall have two independent connections to ground.

#### **Ground Plates - Alternative**

Ground rods are preferred, however, ground plates may be used as an alternative in rocky conditions where soil conditions do not facilitate the installation of a ground rod. The grounding of pad-mounted equipment can be accomplished by using a minimum of four (4), 25.4 cm x 40.6 cm x 0.6 cm (10" x 16" x 1/4") galvanized steel ground plates installed horizontally and located 1.0 m from the pad-mounted equipment. The plates shall be installed a minimum of 60 cm below finished grade on undisturbed soil. The plates shall be connected together by a ground conductor, forming a ground grid around the pad-mounted equipment.

The ground conductor shall be a continuous piece of #4 AWG bare stranded copper conductor. A minimum of 2.0 m of each end of the ground conductor shall be left inside the equipment foundation for connection by Hydro One to the equipment. The two independent connections are for redundancy within the system.

If pad-mounted equipment requires aluminum base, bond the ground lug of the aluminum base to the ground grid.

For grounding details, see DU12-101-0500 and DU12-102-0500.

The use of Ground Enhancing Material (G.E.M.), described in paragraph below, is mandatory when ground plates have less than 60 cm of cover. For burial depths less than 30 cm, the grounding conductor and ground plates already surrounded with G.E.M. must also be covered in concrete.

#### **Ground Enhancing Material (G.E.M.)**

The application of G.E.M. at the riser/dip poles is covered in *Overhead Distribution Standards - Sub-Section 12-3*.

For pad-mounted equipment, where soil conditions do not facilitate the installation of ground rods and the ground plates used as an alternative have less than 60 cm of cover, it is mandatory to effectively increase the diameter of the electrode by modifying the soil surrounding the electrode. The inner shell of the soil closest to the electrode normally comprises the bulk of the electrode ground resistance to remote earth. This phenomenon is utilized to an advantage using G.E.M.

### **Concentric Neutral Grounding**

Unless specified by the Distribution Planner, the primary and subtransmission cable concentric neutral (CN) is normally bonded to ground at both ends of cable sections.

On riser/dip poles, the CN shall be connected to the system neutral conductor on the pole and bonded to ground at both ends of the cable. Extra length of bare copper 1/0 AWG, 7 strand, conductor shall be used, if required, to connect the CN strands to the system neutral. The CN of subtransmission cables (44 kV) on riser/dip poles shall be connected to the system neutral conductor, as preferred option when available on the pole, or otherwise to the pole down ground lead. For guidance on exceptional cases of single-end bonding to ground of CN, refer to *Sub-Section 7-1-4* and DU7-141-0500.

Where primary cables terminate on pad-mounted equipment, including radial and loop supply configurations, the CN strands of each cable shall be bundled together and connected to the ground terminal or ground bus of the equipment. In addition, a minimum of #4 AWG stranded bonding jumper conductor shall be installed across the CN strands of each cable and connected to the equipment ground. Grounding of equipment and cables shall be arranged so that any individual piece of equipment may be removed without opening the system neutral. For details, see DU12-103-0500, DU12-104-0500 and DU12-107-0500.

### **Riser/Dip Poles**

The information on grounding of riser/dip poles with underground or submarine cable terminations is covered in *Section 5*, where specific grounding connection details of the armour/concentric neutral for the underground and submarine cables can be found. The down ground lead and the ground electrode requirements shall be per *Overhead Distribution Standards - Section 12*. If the riser/dip pole is in close proximity to roadways, it is preferred to install the grounding conductor on the side of the pole that is **not** adjacent to the road.

All metal guards installed in direct contact with the riser/dip cable shall be bonded to ground as shown on DU5-301-0500. Where the cable is installed inside rigid PVC conduit, bonding of the metal guard is **not** required, as shown on DU5-302-0500.

### **Transformers**

Pad-mounted transformers shall be connected to their ground grid with a minimum #4 AWG bare copper conductor and ground connectors. For 1-phase pad-mounted transformer grounding details, see DU12-103-0500 and DU12-105-0500. For 3-phase pad-mounted transformer grounding details, see DU12-104-0500/0501. For ground grid details, see DU12-101-0500 and DU12-102-0500. For specific pad-mounted transformer bonding requirements see applicable *Section 9* drawing.

Details and different installation and grounding requirements, between underground and submarine primary cable, can be found in the applicable drawings of this sub-section.

For 1-phase transformers operating at primary voltages up to 16 kV, the final connections of ground grid conductors to the transformer H2 and tank ground terminals, and to cable concentric neutral wires, is done by Hydro One.

For 3-phase transformers operating at primary voltages up to 27.6 kV, the final connections of ground grid wires to the transformer ground bus (connecting H0 and tank ground terminal), and to cable CN wires, are done by Hydro One.

### **Kiosks & Switchgear**

Pad-mounted 1-phase and 3-phase kiosk/switchgears shall be connected to their ground grid per DU12-107-0500/0501, with a minimum #4 AWG bare copper conductor and ground connectors. For ground grid details, see DU12-101-0500 and DU12-102-0500. For specific kiosk/switchgear bonding requirements see applicable *Section 8* drawing.

Details and different installation and grounding requirements, between underground and submarine primary cable, can be found in the applicable drawings of this sub-section.

The final connections of ground grid conductors to the kiosk/switchgear ground bus/ground terminals and cable CN wires are done by Hydro One.

### **Primary Metering Units**

Pad-mounted 1-phase and 3-phase primary metering units shall be connected to their ground grid per DU12-107-0500/0501, with a minimum #4 AWG bare copper conductor and ground connectors. For ground grid details, see DU12-101-0500. For specific pad-mounted metering bonding requirements see DU11-211-0500/0501 and DU11-212-0500/0501.

### **Grounding and Bonding Connectors**

Typically grounding and bonding connections are used to join two grounding conductors, grounding/bonding conductors to equipment's ground, and grounding conductors to grounding plates/ground rods. Below ground connections shall use only the connectors that are approved for direct burial/concrete encasement application. Above ground wedge-type, compression and split bolt connectors are allowed to be used inside the pad-mounted enclosure or on riser/dip pole, as specified on the applicable drawing in this section and *Overhead Distribution Standards - Section 12*. For additional information on grounding & bonding connectors, refer to *Sub-Section 7-4-1*.

### **Faulted Circuit Indicator (FCI)**

To operate effectively, faulted circuit indicators (where specified), shall be installed on the cable such that they do **not** enclose the concentric neutral wires or armour wires, in the case of submarine cables. For FCI installation detail, see DU12-106-0500.

### **Cable Pulling/Splicing Vaults**

Grounding of the vaults is typically not required, unless specified by Engineering on a case-by-case base.

**Bonding of Nearby Metallic Equipment**

All above ground metallic parts of other equipment (e.g. metallic street light disconnect, communication equipment or bollards) located within 3.0 m of pad-mounted equipment, shall be bonded to the equipment's ground grid or directly to the equipment's ground. Bonding shall be done with a minimum #4 AWG bare copper conductor and ground connectors. For typical bonding details, see DU6-107-0500 and DU6-108-0500.

**Bollards for Equipment Protection**

Bollards shall be bonded to the pad-mounted equipment ground grid. The bonding conductor shall be a continuous #4 AWG stranded bare copper wire "cad-welded" to the steel pipe and connected to the ground rod. Alternatively, the wire can be connected to the steel pipe using an approved terminal compression connector. In this case, paint on the pipe at the point of connection of the connector shall be removed and a hole will have to be drilled through the pipe for connecting the compression connector. For typical bonding details, see DU6-107-0500.

**Resolution of Stray Voltage**

For resolution of stray voltage grounding and bonding requirements refer to *Sub-Section 11-3* and see DU11-301-0500.

**Surge Protection of Primary Cables and Equipment**

All surge arresters specified on pad-mounted equipment must be bonded to the equipment ground bus or ground terminal. See *Sub-Section 8-3* and DU8-301-0500.

For all riser/dip poles, at cable terminations, surge arresters must be bonded to the pole down ground lead. See applicable drawings in *Section 5*.

**Primary Cable Terminations & Support Brackets Bonding**

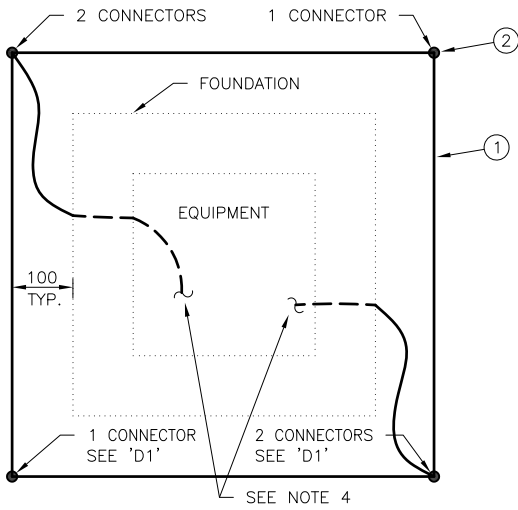
For bonding of primary cable terminations of 200 A loadbreak, 200 A loadbreak junction blocks, 600A deadbreak, insulating caps, and terminations cable support brackets, see requirements and applicable drawings in *Sub-Section 7-4-3*.

**Insulating Cap Bonding**

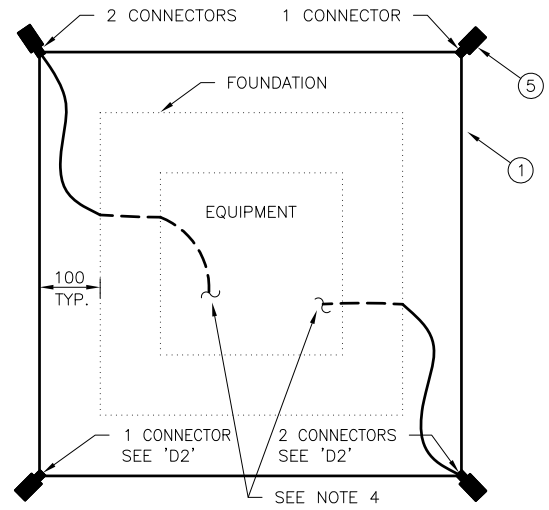
Insulating caps must be installed on all unused 600 A and 200 A primary bushings of pad-mounted equipment. In addition, all 600 A elbows shall be fitted with 200 A reducing plugs and then capped off with an insulating cap. All insulating caps bleed wires must be bonded to the pad-mounted equipment ground bus, or H0 for 3-phase transformers, or H2 for 1-phase transformers. Bolted terminal connectors are used for bonding insulating cap bleed wires. 200 A insulated caps are supplied with bleed wires. 600 A insulating cap bleed wires must be supplied and installed by Hydro One, if not supplied with the cap. For insulating cap bonding details see DU7-431-0500 and DU7-433-0500. For typical insulating cap installation and bonding connector, see DU12-106-0500 and DU8-202-0500/0501.

**Excavation near Grounding for Pad-Mounted Equipment and Riser/Dip Poles**

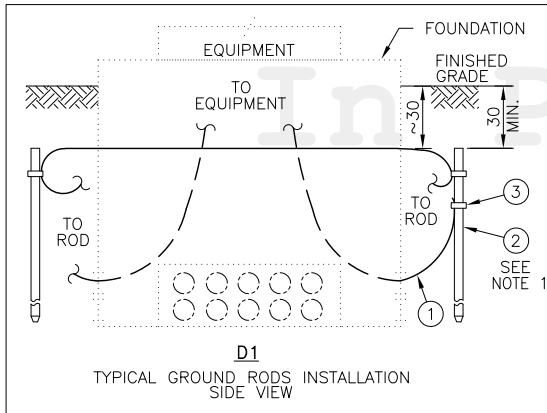
For grounding requirements related to excavation near riser/dip poles, refer to *Overhead Distribution Standards - Sub-Section 6-7*. For excavation near Pad-Mounted equipment, follow the 3<sup>rd</sup> Party Excavation requirements in *Sub-Section 6-3*.



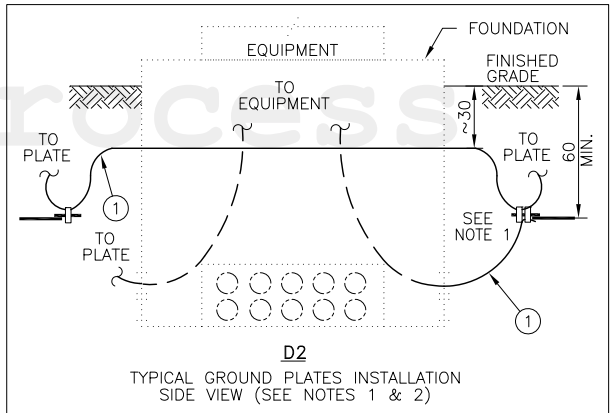
**FIG. 1**  
GROUND GRID WITH GROUND RODS  
PLAN VIEW



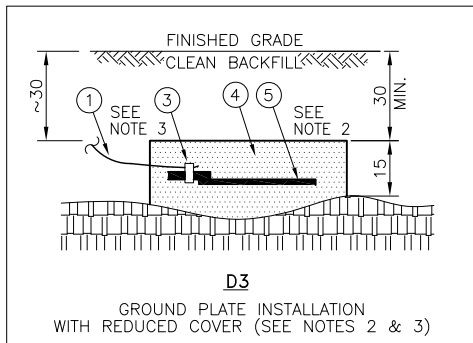
**ALT. 1**  
GROUND GRID WITH GROUND PLATES  
PLAN VIEW (SEE NOTES 1 & 2)



**D1**  
TYPICAL GROUND RODS INSTALLATION  
SIDE VIEW



**D2**  
TYPICAL GROUND PLATES INSTALLATION  
SIDE VIEW (SEE NOTES 1 & 2)



**D3**  
GROUND PLATE INSTALLATION  
WITH REDUCED COVER (SEE NOTES 2 & 3)

**NOTES:**

- GROUND RODS MAY BE SUBSTITUTED WITH GROUND PLATES ONLY IF GROUND RODS CANNOT BE DRIVEN DUE TO ROCKY GROUND CONDITIONS. MAINTAIN 60cm MINIMUM NATIVE SOIL COVER OVER PLATES, 30cm MINIMUM OVER GROUND RODS AND APPROX. 30cm OVER GROUND WIRE(S).
- PLATES INSTALLED WITH LESS THAN 60cm OF COVER MUST BE INSTALLED PER 'D3'. EACH GROUND PLATE REQUIRES MINIMUM ONE BAG OF G.E.M. PLATE TO BE CENTERED WITHIN MIXTURE.
- MECHANICAL PROTECTION (7.5cm OF CONCRETE, 20MPa MIN. STRENGTH) IS REQUIRED OVER PLATES AND GROUND WIRES FOR BURIAL DEPTHS LESS THAN 30cm.
- LEAVE MINIMUM 2m COIL OF #4 AWG BARE COPPER WIRE IN FOUNDATION FOR FINAL CONNECTION TO EQUIPMENT.

**PARTS LIST**

PART No.	MM No.	DESCRIPTION	QTY.	
			FIG.1	ALT.1
1	30014480	CONDUCTOR, BARE, COPPER, #4 AWG	A/R	A/R
2	30014142	GROUND ROD, 3/4" x 10', GALV.	4	N/A
3	30006646	CONNECTOR, GROUND ROD TO #4 AWG COPPER WIRE	6	6
4	30025402	REDUCED DUST GROUND ENHANCEMENT MATERIAL (G.E.M.)	N/A	A/R
5	30025401	GROUND PLATE, GALV., 10" x 16", C/W 8" BAR	N/A	4
MM# = REFER TO SECTION 16 ONLY			A/R = AS REQUIRED	
△ = SUPPLIED WITH EQUIPMENT			N/A = NOT APPLICABLE	

ALL DIMENSIONS IN CENTIMETRES  
UNLESS OTHERWISE STATED

01	SEPT 2023	ORIGINAL DU-14-101-RO IS NOW SUPERSEDED BY THIS NEW DRAWING/REVISION. GENERAL UPDATES. CHANGED TO NEW SECTION 12. CHANGED TO NEW DWG. & NUMBERING FORMAT.	GJ	PC	MM	MM
Rev No.	Date	Revision Particulars	dwn	ckd	des	app

Drawn By: GJ	Checked By: PC	Designed By: M.MATEVSKI	Design Approved By: M.MATEVSKI P.Eng.
Scale: N.T.S.	Date: (yyyy/mm/dd) 2020/03/12	Pole ID:	



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**GROUNDING FOR PAD-MOUNTED EQUIPMENT  
- TYPICAL CONCRETE FOUNDATION INSTALLATIONS  
WITH GROUND ROD OR GROUND PLATE**

Drawing No. <b>DU12-101-0500</b>	Rev. No. <b>01</b>
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TITLE BLOCK REV 02 - AUGUST 2014

**SECTION 16**

**MATERIALS**

In Process

## Section 16 Key Word Index

<b>ANCHOR, SLEEVE</b>	
<b>ARRESTER, SURGE</b>	<b>Intermediate Class</b>
	<b>Distribution Class / Riser Pole</b>
	<b>Bushing</b>
	<b>Elbow</b>
	<b>Parking Stand</b>
<b>BOLT</b>	<b>Hex Head</b>
	<b>Double Arming</b>
<b>BOLT, LAG</b>	<b>Gimlet Point, Hex Head</b>
	<b>Fetter Drive</b>
<b>BOLT, U</b>	
<b>BOLT-EYE</b>	
<b>BRACKET AND SUPPORT</b>	
<b>BRACKET, CLAMP REST</b>	
<b>BRACKET, INSULATOR, POST TYPE</b>	<b>Pole Top</b>
<b>BUSHING &amp; ACCESSORIES</b>	<b>Loadbreak Bushings</b>
	<b>Insulating Caps</b>
	<b>Feed-Thru</b>
	<b>Elbow</b>
<b>CLAMPS &amp; ACCESSORIES</b>	<b>Clamp</b>
	<b>Rest</b>
<b>CLAMP, CONDUCTOR</b>	
<b>CLAMP, CONDUCTOR, BOLTED, DEAD-END</b>	<b>Swing Away Type</b>
<b>CLEVIS BAIL, DEAD-END</b>	
<b>CONCRETE</b>	
<b>CONDUCTOR, BARE</b>	
<b>CONDCUTOR, BUNDLED</b>	
<b>CONDUCTOR, COPPER CLAD STEEL</b>	<b>For Grounding</b>
<b>CONDUCTOR, INSULATED COPPER</b>	<b>Type RWU, 1000V Building Wire</b>
	<b>600V Triplex</b>
	<b>600V Quadruplex</b>
	<b>28kV</b>
	<b>46kV</b>
<b>CONDUCTOR ACCESSORIES</b>	
<b>CONDUIT &amp; FITTINGS</b>	<b>Riser Accessories</b>
<b>CONNECTOR, BOX</b>	<b>Liquid Tight, STR</b>
<b>CONNECTOR, FOR COPPER CLAD STEEL (CCS) WIRE</b>	<b>For Grounding</b>
<b>CONNECTOR, GROUND ROD, SHEAR BOLT</b>	
<b>CONNECTOR, LIVE LINE</b>	<b>Conductor to Bail</b>
	<b>Connector to stud, Pigtail Wedge</b>
<b>CONNECTOR, STIRRUP</b>	
<b>CONNECTOR, TAP, BOLTED</b>	<b>Bolted</b>
	<b>Junction Block</b>
	<b>Insulated</b>

<b>CONNECTOR, TAP WEDGE</b>	<b>Non-Tension Parallel</b>
	<b>Mini-Wedge</b>
<b>CONNECTOR, TERMINAL</b>	<b>Bolted</b>
	<b>Compression</b>
<b>COVER, CONNECTOR, INSULATING</b>	<b>Wedge Connector, 600V</b>
<b>CROSSARM, COMPOSITE</b>	
<b>CUTOUT, FUSED (In-Line)</b>	<b>In-Line Type, SPST</b>
<b>CUTOUT, FUSED, (Bracket Mount Porcelain)</b>	<b>Open Type, With Fuse Holder Less Mounting Bracket</b>
<b>CUTOUT, FUSED, (Bracket Mount Polymer)</b>	<b>Open Type, With Fuse Holder Less Mounting Bracket</b>
	<b>Copper Blade Only, Fuse Holder Less</b>
<b>CUTOUT, SOLID BLADE (Bracket Mount Polymer)</b>	<b>Open Type, With Fuse Holder Less Mounting Bracket</b>
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<b>EQUIPMENT FOUNDATIONS</b>	
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<b>FUSE, ELBOW</b>	
<b>FUSE LINK</b>	<b>Cable Type</b>
<b>GRIP, CABLE SUPPORT</b>	
<b>GRIP, CONDUCTOR, PREFORMED</b>	<b>Bare Conductors</b>
	<b>Steel Conductor</b>
	<b>Service</b>
	<b>Guy</b>
<b>GROUND ENHANCING MATERIAL</b>	
<b>GROUND PLATE</b>	
<b>GROUND ROD</b>	
<b>GUARD AND MOULDING</b>	
<b>INSULATOR, STANDOFF</b>	
<b>INSULATOR, DEAD-END (Polymeric)</b>	
<b>INSULATOR, LINE POST (Polymeric)</b>	
<b>KIOSK</b>	<b>Single Phase</b>
	<b>Three Phase</b>
	<b>Junction, Secondary</b>
<b>LUBRICANT</b>	
<b>LUMBER</b>	
<b>MARKER, SIGN AND NUMBER</b>	<b>Numbers</b>
	<b>Phase</b>
	<b>Miscellaneous Stickers/Labels</b>
	<b>Signs/Placards</b>
	<b>Miscellaneous/Markers</b>
	<b>Sign Accessories</b>
<b>METERING UNIT, PRIMARY, PADMOUNTED</b>	
<b>NEUTRAL ISOLATOR</b>	
<b>NUT</b>	
<b>PADLOCK, LOCK AND KEY</b>	
<b>PEDESTAL</b>	
<b>RECLOSER, G&amp;W, VIPER</b>	<b>Three Phase</b>
<b>ROOFING NAIL</b>	
<b>SCREW</b>	
<b>SEALANT</b>	
<b>SMART GRID</b>	<b>Miscellaneous, Scada-enablement</b>

<b>SPLICE</b>	
<b>STAPLE</b>	
<b>STRAP</b>	
<b>STUD, INSULATOR</b>	<b>Line Post</b>
<b>SUPPORT, CABLE TIE, SELF LOCKING</b>	<b>Plastic, Nylon, Tefzel</b>
<b>SWITCH, DISCONNECT</b>	
<b>SWITCH, LINE-TAP</b>	
<b>SWITCHGEAR</b>	<b>Single Phase</b>
	<b>Three Phase</b>
<b>TAPE</b>	
<b>TERMINATION</b>	
<b>TRANSFORMER, PADMOUNTED</b>	<b>Single Phase</b>
	<b>Three Phase</b>
<b>TRANSFORMER, PARTS</b>	
<b>TIE, CABLE</b>	
<b>VAULT</b>	<b>Primary</b>
	<b>Secondary, vault</b>
<b>WASHER</b>	
<b>WASHER, CURVED</b>	

In Process

### Reference List by Material Name

#### ANCHOR, SLEEVE

Description	MM#	Manufacturers (Part Number)
BOLT HEAD, 3/8" DIA., 3" LENGTH	30024584	HILTI (336253)

#### ARRESTER, SURGE

##### Intermediate Class

Description	MM#	Manufacturers (Part Number)
ARREST INTERMEDIATE, 48kV RATED, 39kV MCOV, POLY	10000230	HUBBELL (PVI300039-3001_PVI)
ARREST INTERMEDIATE, 30kV RATED, 24.4kV MCOV, POLY	30031204	HUBBELL (300024-3001)
ARREST INTERMEDIATE, 21kV RATED, 17kV MCOV, POLY	10000231	HUBBELL (300017-3001_PVI)

##### Secondary

Description	MM#	Manufacturer (Part Number)
ARREST SECONDARY, 120V, 1 POLE	10011891	COOPER POWER SYSTEMS (ASZ175B1) MACLEAN POWER SYSTEMS (Z1-175-0)

##### Distribution Class / Riser Pole

Description	MM#	Manufacturers (Part Number)
3kV RATED, RISER POLE	30016918	ALUMAFORM (ARP -03A- 1GX - 6M1 - 6H) EATON ELECTRICAL (URS0303S7X31A1A) HUBBELL (221603-7214) MACLEAN POWER SYSTEMS (ZRP003-0014119)
6kV RATED, RISER POLE	30014652	ALUMAFORM (ARP -06B- 1GX - 6M1 - 6H) EATON ELECTRICAL (URS0604S7X31A1A) HUBBELL (221605-7524_PVR) MACLEAN POWER SYSTEMS (ZRP006-0014119)
9kV RATED, RISER POLE	30014651	ALUMAFORM (ARP -09B- 1GX - 6M1 - 6H) EATON ELECTRICAL (URS0905S7X31A1A) HUBBELL (221608-7514) MACLEAN POWER SYSTEMS (ZRP009-0014119)
18kV RATED, RISER POLE	30014650	ALUMAFORM (ARP -18D - 2GX - 6M1 - 6H) EATON ELECTRICAL (URS1810S7X31A1A) HUBBELL (221615-7514) MACLEAN POWER SYSTEMS (ZRP018-0014119)
21kV RATED, RISER POLE	30014649	ALUMAFORM (ARP -21E - 2GX - 6M1 - 6H) EATON ELECTRICAL (URS2111S7X31A1A) HUBBELL (221617-7514_PVR) MACLEAN POWER SYSTEMS (ZRP021-0014119)

##### Bushing

Description	MM#	Manufacturers (Part Number)
28kV RATED, 200A, 10kV DUTY CYCLE	30013203	T&B (273BSA-10)
28kV RATED, 200A, 12kV DUTY CYCLE	30013204	T&B (273BSA-12)
28kV RATED, 200A, 21kV DUTY CYCLE	30005599	T&B (273BSA-21)

**Elbow**

Description	MM#	Manufacturers (Part Number)
28kV RATED, 200A, 6kV DUTY CYCLE	30011253	COOPER POWER SYSTEMS (3238019C06M) MACLEAN POWER SYSTEMS (8132B1006J001) T&B (273ESA-6)
28kV RATED, 200A, 10kV DUTY CYCLE	30011254	COOPER POWER SYSTEMS (3238019C10M) MACLEAN POWER SYSTEMS (8132B1010J001) T&B (273ESA-10)
28kV RATED, 200A, 21kV DUTY CYCLE	30005598	COOPER POWER SYSTEMS (3238020C21M) MACLEAN POWER SYSTEMS (8132B0021J001)
28kV RATED, 3.0 kV DUTY CYCLE, 2.55 kV MCOV	30037961	COOPER POWER SYSTEMS (3238019C03M) MACLEAN POWER SYSTEMS (8132B1003J001)

**Parking Stand**

Description	MM#	Manufacturers (Part Number)
15kV RATED, 200A, 6kV DUTY CYCLE	30009905	COOPER POWER SYSTEMS (3237686C06M) T&B (167PSA-6)
28kV RATED, 200A, 10kV DUTY CYCLE	30013202	COOPER POWER SYSTEMS (3237758C10M) T&B (273PSA-10)
28kV RATED, 200A, 21kV DUTY CYCLE	30005604	T&B (273PSA-21)

**BOLT**

**Hex Head**

Description	MM#	Manufacturers (Part Number)
1/2" DIA., 1 1/2" LENGTH	30001184	NIAGARA FASTENERS INC (BZHB12X0112NC) PAULIN, MS ELAINE (5400-583) SPAENAUR INC (CS569)
1/2" DIA., 2" (51mm) LENGTH	30001185	NIAGARA FASTENERS INC (BZHB12X02NC) PAULIN, MS ELAINE (5400-586)
3/8" DIA., 1 1/2" LENGTH	30001181	BURNDY INC (38X150HEBBOX) NIAGARA FASTENERS INC (BZHB38X0112NC) PAULIN, MS ELAINE (5400-493)
5/8" DIA., 8" LENGTH, GALV.	30001113	NIAGARA FASTENERS INC (1336-0) SLACAN INDUSTRIES INC (9808-HHF_MC81904F)
1/2" DIA, 1.75" LENGTH, GALV.	30031727	NIAGARA FASTENERS INC (31727-2)

**Double Arming**

Description	MM#	Manufacturers (Part Number)
5/8"(16mm), 12"(305mm), GALV.	30020498	NIAGARA FASTENERS INC (20498-0) SLACAN INDUSTRIES INC (62622H-MC11026BF)
5/8" (16 mm), 14" (356 mm), GALV.	30001217	NIAGARA FASTENERS INC (01217-0) SLACAN INDUSTRIES INC (62624H-MC11027BFH)
5/8" (16 mm), 18" (457 mm), GALV.	30001128	NIAGARA FASTENERS INC (1353-0)
5/8" (16 mm), 20" (508 mm), GALV.	30001129	NIAGARA FASTENERS INC (1354-0) SLACAN INDUSTRIES INC (11091F-MC62630H)
5/8" (16 mm), 22" (559 mm), GALV.	30001130	NIAGARA FASTENERS INC (1353-0) SLACAN INDUSTRIES INC (11031F-MC62632H)
5/8" (16 mm), 24" (610 mm), GALV.	30001131	NIAGARA FASTENERS INC (1356-0) SLACAN INDUSTRIES INC (62634-MC11093F)

3/4" (19 mm), 16" (406 mm), GALV.	30029187	SLACAN INDUSTRIES INC (62646H)
3/4" (19 mm), 18" (457 mm), GALV.	30020499	NIAGARA FASTENERS INC (20499-0) SLACAN INDUSTRIES INC (9888H-MC11035FH)
3/4" (19 mm), 20" (508 mm), GALV.	30029188	SLACAN INDUSTRIES INC (62650H)
3/4" (19 mm), 24" (610 mm), GALV.	30029189	SLACAN INDUSTRIES INC (62654H)

**BOLT-EYE**

Description	MM#	Manufacturer (Part Number)
EYE, OVAL EYE, STEEL GALV. FOR 3/4" BOLT	10000058	ALMAT METAL (K499-1F) HYDEL (113BE) SLACAN INDUSTRIES INC (60457_MC14486)

**BOLT, LAG**

**Gimlet Point, Hex Head**

Description	MM#	Manufacturers (Part Number)
3/8" DIA., 2" (51mm) LENGTH	30001234	H PAULIN & COMPANY LIMITE (854-496_CHARLES J P/N GHLB-6X32) NIAGARA FASTENERS INC (G2LS38X02-G)
3/8" DIA., 4" (102mm) LENGTH	30001777	NIAGARA FASTENERS INC (G2LS38X04-G)
1/4" DIA., 2 1/2" (64mm) LENGTH	30001989	MACLEAN POWER SYSTEMS (J8722-1/2) NIAGARA FASTENERS INC (G2LS14X0212-G) PAULIN, MS ELAINE (B854-318_CHARLES J P#HDGLB- 4X40) SLACAN INDUSTRIES INC (9972-1/2HHF_MC17501BF)
1/2" DIA., 4" (114mm) LENGTH	30001237	CHARLES JONES INDUSTRIAL (HDGLB- 8X64_GENERIC) NIAGARA FASTENERS INC (G2LS12X04-G)
1/2" DIA., 4 1/2" (114mm) LENGTH	30001755	ALMAT METAL (K338-4.5F) NIAGARA FASTENERS INC (G2LS12X0412-G) PAULIN, MS ELAINE (854-595)

**Fetter Drive**

Description	MM#	Manufacturers (Part Number)
3/8" DIA., 2-1/2"(64mm) LENGTH, REGULAR POINT, SQUARE HEAD	30037113	MACLEAN POWER SYSTEMS (J8742-1/2)
3/8" DIA., 4"(102mm) LENGTH, DRIVE POINT, SQUARE HEAD	30037071	MACLEAN POWER SYSTEMS (J8744P)
1/4" DIA., 2-1/2"(64mm) LENGTH, REGULAR POINT, HEX HEAD	30037073	MACLEAN POWER SYSTEMS (J8652-1/2HH)
1/2" DIA., 4-1/2"(114mm) LENGTH, DRIVE POINT, SQUARE HEAD	30037072	MACLEAN POWER SYSTEMS (J8754-1/2P)

**BOLT, U**

Description	MM#	Manufacturers (Part Number)
U-BOLT-1-1/2"NPS-PIPE SUPP-GALV	30024551	CHARLES JONES INDUSTRIAL ( HYDAC HRBS-L-48.3-1-1) NIAGARA FASTENERS INC (24551-0)

**BRACKET AND SUPPORT**

Description	MM#	Manufacturers (Part Number)
3-PH CLUSTER MOUNT, ANGLED	30000846	ALUMAFORM (3IAP)
1-PH MOUNT, ANGLED	10000049	ALUMAFORM (1IAP)
STAND-OFF, CONDUIT, 36" WIDE	30015612	ALUMAFORM (9-CS0-36-4WT)
STAND-OFF, SUPPORTING CONDUIT, 24" WIDE	30009335	ALUMAFORM (9-CSO-24)
1-PH POLE MOUNT, GALV.	30000825	SLACAN INDUSTRIES INC (CAB-1600-21-MC80299)
STRAP, STAND-OFF, SUPPORTING CONDUIT, 2" WIDE	30009336	ALUMAFORM (STK-2)
SUPPORT, CABLE & MOLDED TERMINATION, AL SADDLE 26CM LENGTH	30008041	ALUMAFORM (CS820) BURNDY INC (BACS-820-KIT)
ARM, CABLE RACK, FIBERGLASS, HEAVY DUTY, 14" LENGTH	30034227	UNDERGROUND DEVICES INC. (RA14)
STANCHION, CABLE RACK, FIBERGLASS, HEAVY DUTY, 36" LENGTH	30034228	UNDERGROUND DEVICES INC. (CR36-B)

**BRACKET, CLAMP REST**

CROSSARM MOUNT, GALV., FOR DROP LEADS, 'T' TYPE	30000952	SLACAN INDUSTRIES INC (T778_MC81257)
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**BRACKET, INSULATOR, POST TYPE**

Description	MM#	Manufacturer (Part Number)
POLE TOP, 14 1/2" LENGTH	30000800	ALMAT METAL (K81-1S) SLACAN INDUSTRIES INC (63411_MC81079)

**BUSHING & ACCESSORIES**

**Loadbreak Bushings**

Description	MM#	Manufacturers (Part Number)
STANDOFF, PARKING, 15kV, 200A	30006645	COOPER POWER SYSTEMS (ISB215) T&B (161SOP)
INSERT, 15kV, 200A	30007437	COOPER POWER SYSTEMS (LBI215) T&B (1601A4)
JUNCTION BLK, 4 POSITION, 28KV, 200A	30007451	COOPER POWER SYSTEMS (LJ228C4B) T&B (274J4(1)-CS854)
JUNCTION BLK, 3 POSITION, 28KV, 200A	30007477	COOPER POWER SYSTEMS (LJ228C3B) T&B (274J3-CS854)
JUNCTION BLK, 15kV, 200A, 3 POSITION	30007440	COOPER POWER SYSTEMS (LJ215C3B) T&B (164J3)
JUNCTION BLK, 4 POSITION, 15KV, 200A	30007452	COOPER POWER SYSTEMS (LJ215C4B) T&B (164J4)
INSERT, 28kV, 200A	30007479	COOPER POWER SYSTEMS (LBI228) T&B (2701A4-CS854)

STANDOFF, PARKING, 28kV, 200A	30007492	COOPER POWER SYSTEMS (ISB228) T&B (272SOP)
GROUNDING PLU/G, PARKING, 28kV, 200A	30007493	T&B (272GP)
FEEDTHROU/GH, INSERT, 15kV, 200A	30014608	COOPER POWER SYSTEMS (LFI215) T&B (1602A3R)
FEEDTHROU/GH, INSERT, 28kV, 200A	30010601	COOPER POWER SYSTEMS (LFI228) T&B (2702A1A-CS854)

**Insulating Caps**

Description	MM#	Manufacturers (Part Number)
FOR LOADBREAK BUSHING INSERT, 15kV, 200A	30007438	COOPER POWER SYSTEMS (LPC215) T&B (160DRG)
28kV, FOR LOADBREAK BUSHING INSERT, 200A	30007478	COOPER POWER SYSTEMS (LPC228) T&B (273DRG-CS854)
FOR INTEGRATED BUSHING (DEADBREAK), 28kV, 600A	30017838	T&B (K656DR)

**Feed-Thru**

Description	MM#	Manufacturers (Part Number)
PORTABLE, 15kV, 200A	30007439	COOPER POWER SYSTEMS (LPF215H) T&B (164FT)
PORTABLE, 28kV, 200A	30007480	COOPER POWER SYSTEMS (LPF228H) T&B (274FT1-CS854)
TEMPORARILY PARKING, 28kV, 600A	30042898	JESSTEC INDUSTRIES INC (J600-2 WAY-SP)

**Elbow**

Description	MM#	Manufacturers (Part Number)
15kV, 200A, 1/0 AL SOL, FOR 15kV SUBCABLE	30007491	COOPER POWER SYSTEMS (LE215AB05TCSA) T&B (162LR-B5230A) T&B (166LR-B-5230A)
15kV, 200A, 1/0 AL SOL, FOR 28kV SUBMARINE CABLE	10009433	COOPER POWER SYSTEMS (LE215CC05TCSA) ELASTIMOLD C/O EAGLE UTIL (166LR-C-5230)
28kV, 200A, 1/0 AL SOL, FOR 15kV SUBCABLE	30032766	EATON CUTLER HAMMER (LE228AB05TCSA) T&B (276LR-B-5230-CS854)
28kV, 200A, 1/0 AL SOL, FOR 28kV SUBMARINE CABLE	30007475	COOPER POWER SYSTEMS (LE228CC05TCSA) T&B (262LRC5230C)
15kV, 200A, 2/0 AL COMPACT, FOR 28kV URD CABLE	30033669	T&B (162LR-C5240C)
28kV, 200A, 2/0 AL COMPACT, FOR 28kV URD CABLE	30007476	COOPER POWER SYSTEMS (LE228CC07TCSA) T&B (262LRC5240)
28kV, 200A, 2/0 CU COMPACT, FOR 28kV SUBMARINE CABLE	10012409	T&B (262LRD5240)
28kV, 600A, 350 CU COMPACT	30014211	T&B (K656LR-K-0290)
28kV, 600A, 500 CU COMPACT,	30017777	COOPER POWER SYSTEMS (BT628EE21A1TCSA) RICHARDS MANUFACTURING (62CSHT2PR4) T&B (K656LR-M-0320)
28kV, 600A, 750 CU COMPRESSED, FOR 28kV URD CABLE	10011576	T&B (K656LR-M-0380)
28kV, 600A, 1000 CU COMPRESSED, FOR 28kV URD CABLE	10011577	T&B (K656LR-N-0410)
DEAD/LOADBREAK, REDUCING PLU/G, 28kV, 600/200A, FOR 600A CONNECTORS	30017000	COOPER POWER SYSTEMS (BLRTP628A) T&B (K650ETPA)

LOADBREAK, FUSED, 28KV INTERFACE, 17.2KV RATED, 200A, FOR 28KV 2/0 AL PRIMARY UNDERGROUND CABLE	30037522	T&B (274FLR3-C5240)
LOADBREAK, FUSED, 28KV INTERFACE, 17.2KV RATED, 200A, FOR 28KV 1/0 AL SOL SUBMARINE CABLE	30037523	T&B (274FLR3-C5230)
LOADBREAK, FUSED, 28KV INTERFACE, 17.2KV RATED, 200A, FOR 15KV 1/0 AL SOL SUBMARINE CABLE	30037524	T&B (274FLR3-B5230)
15KV, 200A TEST PT, 2/0 AL, ELBOW, LDBRK	30007466	COOPER POWER SYSTEMS (LE215AB07TCSA) T&B (166LR-B-5240C) T&B (162LR-B5240)

**CLAMPS & ACCESSORIES**

**Clamp**

Description	MM#	Manufacturers (Part Number)
GEAR TYPE, STAINLESS STEEL, 2 13/16" TO 3 3/4" HOSE DIA.	30003502	BREEZE CORP (M52H) CANADIAN TIRE (632122) TRIDON (HS52)

**Rest**

Description	MM#	Manufacturers (Part Number)
LIVE LINE, 'INSULATOR' TYPE	30000770	SLACAN INDUSTRIES INC (T538_MC80675)

**CLAMP, CONDUCTOR**

Description	MM#	Manufacturer (Part Number)
NEUTRAL/MESSENGER, #2 ACSR TO 336.4 ASC	30000808	ALMAT METAL (K193-1) SLACAN INDUSTRIES INC (T759_MC81058)
NEUTRAL/MESSENGER, #556.5 COND. ONLY, FOR WOOD POLE	30029184	K LINE (KLOP-HWCP08A)

**CLAMP, CONDUCTOR, BOLTED, DEAD-END**

**Swing Away Type**

Description	MM#	Manufacturer (Part Number)
STRAIN BOLTED, ANGULAR, 'SWING WAY' TYPE, #2 ACSR TO 3/0 ACSR	30010772	HUBBELL (GD963A) MACLEAN POWER SYSTEMS (AGD 90)
STRAIN BOLTED, ANGULAR, 'SWING WAY' TYPE, #3/0 AACSR TO 556.5 ASC	10011475	FIRON METAL IND (3352) HUBBELL (FARGO_GD965A)

**CLEVIS BAIL, DEAD-END**

Description	MM#	Manufacturer (Part Number)
THIMBLE, DEAD-END, ADAPTER, STRAIN, FOR PREFORM GRIPS	30007338	SLACAN INDUSTRIES INC (24236H_MC80361)

**CONCRETE**

Description	MM#	Manufacturers (Part Number)
QUICK SETTING DRY CONCRET MIX, 25MPa	30035711	THE QUIKRETE COMPANIES (100425)

**CONDUCTOR, BARE**

Description	MM#	Manufacturers (Part Number)
COPPER, #4, SOLID	30005813	NEHRING ELECTRICAL WORKS (4SDBC-01)
COPPER, #4, 7 STRS	30014480	NEHRING ELECTRICAL WORKS (4-7SDBC-01) NEXANS CANADA INC (618702) REPUBLIC (1B-0407)
COPPER, #1/0, 7 STRS.	30005821	ALCATEL CANADA INC (CAB) NEHRING ELECTRICAL WORKS (231030000_20M) NEHRING ELECTRICAL WORKS (1/0-7MDBC-01) SOUTHWIRE CANADA (106963)
COPPER, 2/0, 19 STRS.	30005823	NEHRING ELECTRICAL WORKS (2/0-MD-BC-19) NEHRING ELECTRICAL WORKS (2/0-19MDBC-01)
COPPER, #4/0, 19 STRS	30005825	NEHRING ELECTRICAL WORKS (4/0-19MDBC-01) NEHRING ELECTRICAL WORKS (224020000_20M) SOUTHWIRE CANADA (135186)
#4/0, 259 STRS, SD	30005826	COLEMAN CABLE CANADA (BC004ST-259) NORTHEAST WIRE CABLE CO I (1B-404259)
COPPER, 350KCMIL, 61 STRS	10000248	NEHRING ELECTRICAL WORKS (350-61SDBC-01) REPUBLIC (1B-35061-20MT) REPUBLIC WIRE INC (1B-35061_20M)
COPPER, 500KCMIL, 61 STRS	30005854	NEHRING ELECTRICAL WORKS (500-61SDBC-01) REPUBLIC (1B-50061) REPUBLIC WIRE INC (BC50061SD)

**CONDUCTOR, BUNDLED**

Description	MM#	Manufacturers (Part Number)
5 CONDUCTOR BUNDLED WIRE (RED, BLACK, RED/WHITE, RED/BLACK, GREEN)	30022056	ANIXTER (ANIXTER OH-30022056) GRAYBAR ELECTRIC (ONTARIO (TEWCOND5HYDRO1)

**CONDUCTOR, COPPER CLAD STEEL**

For Grounding

Description	MM#	Manufacturers (Part Number)
#3 CCS, 7 STRD	30034306	COPPERWELD (Q6C7X0860A-CAMO) COPPERWELD (QC7X0860A-CAMO)

**CONDUCTOR, INSULATED COPPER**

Type RWU, 1000V Building Wire

Description	MM#	Manufacturers (Part Number)
350KCMIL, 37 STRS	30005994	DECA CABLES INC (21-3511H1) NEXANS CANADA INC (612788)
1000KCMIL, 1 CONDUCTOR	30005997	DECA CABLES INC (21-9998H1) DECA CABLES INC (21-9998H1)
500KCMIL, 37 STRS	30005882	DECA CABLES INC (21-5011H1)
750KCMIL, 1 CONDUCTOR	30010720	DECA CABLES INC (21-7511H1) EPOXYLITE (705) INDUSTRY REFERENCE (TWU40)
4AWG, 1 CONDUCTOR	30006114	DECA CABLES INC (21-0401H1) DOMTECH COMPANY LTD (6504747)

**Type TEW, 600V (Stranded)**

Description	MM#	Manufacturers (Part Number)
#12, STRS, WHITE	30005938	COLEMAN CABLE CANADA (41104-WHITE) DECA CABLES INC (20-183) NEXANS CANADA INC (641449) SOUTHWIRE CANADA (65324630)
#12, STRS, BLACK	30005936	COLEMAN CABLE CANADA (41104-BLACK) DECA CABLES INC (20-183) NEXANS CANADA INC (081745) SOUTHWIRE CANADA (65323830)

**CONDUCTOR, INSULATED**

**600V Triplex**

Description	MM#	Manufacturers (Part Number)
SERVICE CABLE, COMPACT AL, U/GRND, 600V, 3/0, 3 COND.	30005908	GENERAL CABLE COMPANY LTD (376230M) NEXANS CANADA INC (663888) PRYSMIAN POWER CABLE & SYSTEMS (20367013) SOUTHWIRE CANADA (61590501)
SERVICE CABLE, COMPACT AL, U/GRND, 600V, 4/0, 3 COND.	30006112	NEXANS CANADA INC (663459)
SERVICE CABLE, COMPACT AL, U/GRND, 600V, 250, 3 COND.	30005915	NEXANS CANADA INC (433185) PIRELLI (203977C) PRYSMIAN POWER CABLE & SYSTEMS (20367081)
SERVICE CABLE, COMPACT AL, U/GRND, 600V, 500, 3 COND.	30005959	NEXANS CANADA INC (301093) PRYSMIAN POWER CABLE & SYSTEMS (20366937)

**600V Quadruplex**

Description	MM#	Manufacturers (Part Number)
SERVICE CABLE, COMPACT AL, U GRND, 600V, 4/0, 4 COND.	30036685	NEXANS CANADA INC (454751) PRIORITY WIRE AND CABLE INC (USEI-90 4/0, 4 CONDUCTOR)
SERVICE CABLE, COMPACT AL, U GRND, 600V, 500, 4 COND.	30036686	NEXANS CANADA INC (663676)

**15kV**

Description	MM#	Manufacturers (Part Number)
UGRND CAB-15KV-1/0AWG-CU-1 COND	30006049	NEXANS CANADA INC (603901) PRYSMIAN POWER CABLE & SYSTEMS (20163848)

**28kV**

Description	MM#	Manufacturers (Part Number)
TR-XLPE CABLE, U/GRND, 28kV, 2/0, COMPACT AL, 1 COND.	30010134	ALCATEL CANADA INC (652540) NEXANS CANADA INC (604106) PRYSMIAN POWER CABLE & SYSTEMS (20367053)
TR-XLPE CABLE, U/GRND, 28kV, 350KCMIL, COMPACT CU, 1 COND.	30006080	NEXANS CANADA INC (604101) PRYSMIAN POWER CABLE & SYSTEMS (20138275)
TR-XLPE CABLE, U/GRND, 28kV, 500KCMIL, COMPACT CU, 1 COND.	30006082	NEXANS CANADA INC (604102) PRYSMIAN POWER CABLE & SYSTEMS (20352454)
TR-XLPE CABLE, U/GRND, 28kV, 750KCMIL, COMPRESSED CU, 1 COND.	30006083	NEXANS CANADA INC (604287) PRYSMIAN POWER CABLE & SYSTEMS (20367552)
TR-XLPE CABLE, U/GRND, 28kV, 1000KCMIL, COMPRESSED CU, 1 COND.	30006085	NEXANS CANADA INC (604104) PRYSMIAN POWER CABLE & SYSTEMS (20339403) PRYSMIAN POWER CABLE & SYSTEMS (20372300)

15kV, ENCAP JACKET, SUBMARINE CABLE, 15kV, 1/0 AL SOL, 1000M/REEL	30031495	PRYSMIAN POWER CABLE & SYSTEMS (817074.1000M)
15kV, ENCAP JACKET, SUBMARINE CABLE, 15kV, 1/0 AL SOL, 500M/REEL	30031496	PRYSMIAN POWER CABLE & SYSTEMS (817074.500M)
15kV, ENCAP JACKET, SUBMARINE CABLE, 15kV, 1/0 AL SOL, 1500M/REEL	30031497	PRYSMIAN POWER CABLE & SYSTEMS (817074.1500M)
ENCAP JACKET, SUBMARINE CABLE, 28kV, 1/0 AL SOL, 1000M/REEL	30031498	NEXANS CANADA INC (12007862-606226-1000M) PRYSMIAN POWER CABLE & SYSTEMS (385348.1000M)
ENCAP JACKET, SUBMARINE CABLE, 28kV, 1/0 AL SOL, 500M/REEL	30031499	NEXANS CANADA INC (12007862-606226-500M) PRYSMIAN POWER CABLE & SYSTEMS (385348.500M)
ENCAP JACKET, SUBMARINE CABLE, 28kV, 1/0 AL SOL, 1500M/REEL	30031500	NEXANS CANADA INC (12007862-606226-1500M) PRYSMIAN POWER CABLE & SYSTEMS (385348.1500M)
TR-XLPE SUBMARINE CABLE, 28kV, 2/0, COMPACT CU, 1 COND.	30006090	PRYSMIAN POWER CABLE & SYSTEMS (PRYSMIAN-30006090)
TR-XLPE SUBMARINE CABLE, 28kV, 350KCMIL, COMPACT CU, 1 COND.	30006092	PRYSMIAN POWER CABLE & SYSTEMS (PRYSMIAN-30006092)

**46kV**

Description	MM#	Manufacturers (Part Number)
TR-XLPE CABLE, U/GRND, 46kV, 350, COMPACT CU, 1 COND.	10000252	NEXANS CANADA INC (604100) PRYSMIAN POWER CABLE & SYSTEMS (20367035)
TR-XLPE CABLE, U/GRND, 46kV, 500, COMPACT CU, 1 COND.	30013173	NEXANS CANADA INC (604288) PRYSMIAN POWER CABLE & SYSTEMS (20367091)
TR-XLPE CABLE, U/GRND, 46kV, 750KCMIL, COMPRESSED CU, 1 COND.	30006084	NEXANS CANADA INC (604103) PRYSMIAN POWER CABLE & SYSTEMS (20367009)
TR-XLPE CABLE, U/GRND, 46kV, 1000, COMPRESSED CU, 1 COND.	30006086	GENERAL CABLE COMPANY LTD (CSA C68.3) NEXANS CANADA INC (604105) PRYSMIAN POWER CABLE & SYSTEMS (20367458)
TR-XLPE SUBMARINE CABLE, 46kV, 350KCMIL, COMPACT CU, 1 COND.	30006094	PRYSMIAN POWER CABLE & SYSTEMS (PRYSMIAN-30006094)
TR-XLPE SUBMARINE CABLE, 46kV, 1000KCMIL, COMPACT CU, 1 COND.	30006095	PRYSMIAN POWER CABLE & SYSTEMS (PRYSMIAN-30006095)
TR-XLPE SUBMARINE CABLE, 46kV, 4/0 AWG, COMPACT AL, 1 COND.	30037711	PRYSMIAN POWER CABLE & SYSTEMS (PRYSMIAN-TBA)

**CONDUCTOR ACCESSORIES**

Description	MM#	Manufacturers (Part Number)
ARMOUR, PRF LENGTH 5.84M, FOR SUBMARINE CABLES 34.72mm NOMINAL DIA.	30034145	PREFORMED LINE PRODUCTS (ARMS-15306)
ARMOUR, PRF LENGTH 4.88M, FOR SUBMARINE CABLES 29.39mm NOMINAL DIA.	30034144	PREFORMED LINE PRODUCTS (ARMS-15305)

**CONDUIT & FITTINGS**

**Accessories**

Description	MM#	Manufacturers (Part Number)
NON-METALLIC, 3" DIA., FOR MECH. PROTECTION OF U/GRND CABLES, BLACK	30030235	DURA-LINE (1-908918) ILPEA INDUSTRIES (UC3-BLK-250)
4" DIA., BLACK	30031917	DURA-LINE (1-908939) DURA-LINE (10097946) ILPEA INDUSTRIES (UC4-BLK-250)

UNDERGROUND DISTRIBUTION STANDARDS

MATERIALS

COUPLER KIT, 3" FLEX TO 3" RIGID CONDUIT	30030236	DURA-LINE (1-403873)
COUPLER KIT, 3" FLEX TO 2" RIGID CONDUIT	30031161	DURA-LINE (1-403954)
COUPLER KIT, 3" FLEX TO 3" FLEX CONDUIT	30030238	DURA-LINE (1-403879)
COUPLER KIT, 3" FLEX TO 4" RIGID CONDUIT	30031163	DURA-LINE (1-403957)
COUPLER KIT, 4" FLEX TO 4" RIGID CONDUIT	30031918	DURA-LINE (1-403554)
3/4" X 10', WITH BELL ENDS, PVC	30007538	SCEPTER CORPORATION (RIGID PVC 3/4")
BEND,RIGID CONDUIT, 3/4" X 4-3/40 RADIUS", PVC, 90DEG	30007556	CANLET (2053007) CANRON INC EASTERN STRUCT (E780E) ROYAL PIPE CO. (REE1590) SCEPTER CORPORATION (EE1590)
RIGID CONDUIT, ELBOW, 4", DIA 4.5", RADIUS 16"PVC , 90DEG	30007687	ROYAL PIPE CO. (REE5590) SCEPTER CORPORATION (EE5590)
RIGID CONDUIT,ADAPT,PVC,MALE THD,2"	30007549	CANLET (2006020) CANRON INC EASTERN STRUCT (E943J) ROYAL PIPE CO. (RTA35) SCEPTER CORPORATION (TA35)
LOCKNUT, CONDUIT, 2", GALV	30007656	CSA (FIT1008)
DUCT, SPLIT, DB2, PVC, 4" DIA, 10' LONG	30031628	ROYAL PIPE CO. (DU04010S)
1PVC 1/2" BELL END 10'	30025578	ROYAL PIPE CO. (RC0050)
LOCKNUT, CONDUIT, 3/4", GALV	30007652	CSA (FIT1004)
COUPLER KIT, 2" FLEX TO 2" RIGID CONDUIT	30030348	DURA-LINE (1-403871)
NON-METALIC2" DIA., FOR MECH. PROTCTION OF U/GRND CABLES, BLACK	30030366	DURA-LINE (1-908840) ILPEA INDUSTRIES (UC2-BLK-250)
CONDUIT,PVC,4",SCHD 40,BELL END,10' LG	30007583	ROYAL PIPE CO. (RC0400) SCEPTER CORPORATION (032140)
COUPLER KIT, 2" FLEX TO 2" FLEX CONDUIT	30030237	DURA-LINE (1-403878)
1 1/4" PVC, THREADED, 1.395 ID	30034461	ROYAL PIPE CO. (RFA 25)
1 1/4" X 10', WITH BELL ENDS, PVC	30007540	CANRON INC EASTERN STRUCT (1 1/4" BELL END) ROYAL PIPE CO. (RC0125)
CONDUIT BOX, CONNECTOR, LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS,1/2" SIZE	30007938	CROUSE HINDS (LT50) ELLIOT ELECTRIC MFG (1150) IDEAL INDUSTRIES (75221) PYLE (CT1101) T&B (5232)
CONDUIT, FLEXIBLE LIQUID TITE, 1/2", 30 M LG	30024727	ANAMET CANADA INC (10061)
COUPLING, EXPANSION, PVC, 4", SCH40	30039991	ROYAL PIPE CO. (REJ55)

**Adaptor Female, Rigid Conduit**

Description	MM#	Manufacturer (Part Number)
1/2" PVC, THREADED, 0.62 ID	30024724	ROYAL PIPE CO. (44990-RFA10)

**Liquid Tight, Flexible**

Description	MM#	Manufacturer (Part Number)
1 1/4"	30007572	ANAMET CANADA INC (622620 10090 0)

**Riser Accessories**

Description	MM#	Manufacturers (Part Number)
STRAIGHT FITTING, NON-METALIC, 1" SIZE	30024684	T&B (CARLON LT43FNEW)
CLIP, 1", 2-HOLE 3/16" DIA., GALV.	30014459	IBERVILLE (CI1408) WESCO (RS2-10)
1 1/4", THREADED, TYPE "F"	30020497	TOPAZ LIGHTING CORP (741)

**CONNECTOR, BOX**

**Liquid Tight, STR**

Description	MM#	Manufacturer (Part Number)
1 1/4" HUB, FLEXIBLE LIQUID TIGHT, STRAIGHT FITTING	30007941	CROUSE HINDS (LT125) ELLIOT ELECTRIC MFG (11125) IDEAL INDUSTRIES (75224) PYLE (CT4101) T&B (5235)

**CONNECTOR, FOR COPPER CLAD STEEL (CCS) WIRE**

**For Grounding**

Description	MM#	Manufacturers (Part Number)
CU, C TAP, #6 AWG SOLID-2/0 AWG STRD CU TAP TO 300-500KCMIL CU RUN	30007027	BURNDY INC (CJC34C26)
RUN 300-500 TO TAP #6-2/0 AND GROUNDING, 2/0 CCS TO GRD ROD	30006370	BURNDY INC (YGHC34C26) T&B (CTP50020)

**CONNECTOR, GROUND ROD, SHEAR BOLT**

Description	MM#	Manufacturers (Part Number)
#4 & #3 CCS - 3/4" GALV. STEEL GROUND ROD	30006646	TYCO ELECTRONICS CANADA L (80408-5)
1/0 SOL OR STRS - 3/4" GALV. STEEL GROUND ROD	30021037	TYCO ELECTRONICS CANADA L (80408-6)

**CONNECTOR, LIVE LINE**

**Conductor to Bail**

Description	MM#	Manufacturers (Part Number)
CONNECTOR, LIVE LINE, LINE #8 - 2/0, TAP #8 - 2/0	30006195	CONNECTOR MANUFACTURING (C58701794) EPAC (BHT-820) HUBBELL (BC20)
CONNECTOR, LIVE LINE, LINE #6 - 400, TAP #6 - 4/0	30006186	BURNDY INC (HLB400R) EPAC (BHT640)

**Connector to stud, Pigtail Wedge**

Description	MM#	Manufacturers (Part Number)
1200A, PIGTAIL WEDGE, #4/0 - 500 TAP COND. TO 3/4" STUD	30006969	TYCO ELECTRONICS CANADA L (83471-1)

**CONNECTOR, STIRRUP**

Description	MM#	Manufacturers (Part Number)
200A, #4 - 4/0 ACSR COND., 1/0 CU BAIL	30006184	EPAC (ASB 6-4/0) HUBBELL (CBC-825) HUBBELL (AHLS024021ETBXB)
400A, 2/0 - 556.5 ASC COND., 2/0 (HD) CU BAIL	30006968	EPAC (AS-2/0-556XB) HUBBELL (CPBC-850-OH)

**CONNECTOR, TAP, BOLTED**

**Bolted**

Description	MM#	Manufacturers (Part Number)
1/0 - 4/0, TAP #8 - 4/0	30006155	BURNDY INC (KVSW28CG1) T&B (2B40W)
COND. TO COND. CU, RUN #6-#4, TAP #6-#4	30006509	BURNDY INC (YC4C4)
#6 - #2 RUN TO #6 - #2 TAP, DIRECT BURY	30028496	BURNDY INC (CJC2C2) T&B (CTP22)
#2 - 2/0 , CU STRAP TO STEEL GROUND ROD 19mm DIA.	30007021	BURNDY INC (CJR26C34) T&B (GR34202TP)
#1 - 2/0 RUN TO #1 - 2/0 TAP, DIRECT BURY	30007024	BURNDY INC (CJC26C26) T&B (CTP2020)
CONNECTOR, SPLIT BOLT, CU, #6-2 AWG RUN & TAP	30006154	BURNDY INC (KS23)

**Junction Block**

Description	MM#	Manufacturers (Part Number)
BOLTED, 14 PORTS, #4-250 CU/AL SEC. TO PADMOUNTED TRANSFORMER	30013232	CONNECTOR MANUFACTURING (LU250-14DI-PS)

**Insulated**

Description	MM#	Manufacturers (Part Number)
BOLTED, U/G SEC. DIST., 600V, 3 PORT, #14-350 CU/AL COND.	30031213	TYCO ELECTRONICS CANADA L (GPRT-350-3P)
BOLTED, U/G SEC. DIST., 600V, 5 PORT, ONE #6-500 & FOUR #14-350 CU/AL COND.	30031214	TYCO ELECTRONICS CANADA L (GPRT-350/4P-500/1P)
BOLTED, U/G SEC. DIST., 600V, 8 PORT, TWO #6-500 & SIX #14-350 CU/AL COND.	30031215	TYCO ELECTRONICS CANADA L (GPRT-350/6P-500/2P)

**CONNECTOR, TAP WEDGE**

**Non-Tension Parallel**

Description	MM#	Manufacturers (Part Number)
#4 STR (#2 SOL) RUN - #4 STR (SOL) TAP, AND #2 STR RUN TO #6 STR (#4 & 6 SOL) TAP	30007255	TYCO ELECTRONICS CANADA L (602283-3)
#2 STR/SOL RUN TO #4 STR (#2 SOL) TAP AND 1/0 STR/SOL RUN - #6 STR (#6,4 SOL) TAP	30007256	TYCO ELECTRONICS CANADA L (602283-2)
1/0 STR RUN - #2 STR	30007240	TYCO ELECTRONICS CANADA L (602283)
2/0 STR RUN - #2 STR TAP, AND 1/0 STR TO 1/0 STR	30007241	TYCO ELECTRONICS CANADA L (600403)
3/0 STR RUN - #6 STR TAP	30007277	TYCO ELECTRONICS CANADA L (600446)
3/0-#4 R/T & 2/0-#4 R/T, AND FOR CCS WIRE, GROUNDING, #3 CCS TO 1/0 ACSR	30007258	TYCO ELECTRONICS CANADA L (600447)

UNDERGROUND DISTRIBUTION STANDARDS

MATERIALS

3/0-#2 R/T & 2/0-1/0 R/T, AND FOR CCS WIRE, GROUNDING, #3 CCS TO 3/0 ACSR (3/0 AACSR)	30007242	TYCO ELECTRONICS CANADA L (600448)
4/0 STR RUN - #6 STR TAP	30007278	TYCO ELECTRONICS CANADA L (600455)
4/0 STR RUN - #4 STR TAP	30007237	TYCO ELECTRONICS CANADA L (600456)
4/0-#2 R/T & 3/0-1/0 R/T & 2/0-2/0 R/T, AND GROUNDING, 2/0 CCS TO 1/0 ACSR	30007243	TYCO ELECTRONICS CANADA L (600411)
4/0-1/0 R/T & 3/0-2/0 R/T, AND FOR CCS WIRE, GROUNDING, #3 CCS TO 1/0 ACSR, 3/0 ACSR, 3/0 AACSR OR 2/0 CCS TO 1/0 ACSR, 3/0 ACSR, 3/0 AACSR	30007245	TYCO ELECTRONICS CANADA L (600458)
4/0-2/0 R/T & 3/0-3/0 R/T, AND GROUNDING, 2/0 CCS TO 1/0 ACSR, 3/0 ACSR, 3/0 AACSR	10000355	TYCO ELECTRONICS CANADA L (600459)
4/0 STR RUN - 4/0 STR TAP	30007250	TYCO ELECTRONICS CANADA L (600466)
4/0 STR RUN - 3/0 STR TAP	30007248	TYCO ELECTRONICS CANADA L (600465)
266.8 STR RUN - #2 STR TAP	30007276	TYCO ELECTRONICS CANADA L (602046-3)
266.8 STR RUN - 2/0 STR TAP	30007280	TYCO ELECTRONICS CANADA L (602046-5)
266.8 STR RUN - 3/0 STR TAP	30007279	TYCO ELECTRONICS CANADA L (602046-6)
266.8 STR RUN - 4/0 STR TAP	30007281	TYCO ELECTRONICS CANADA L (602046-7)
350 AAC TO 2/0 & 4/0 R/T & 336.4 TO 2/0 R/T AND GROUNDING, 2/0 CCS TO 336.4 ASC	30007018	TYCO ELECTRONICS CANADA L (602380-4)
350 STR RUN - #6 STR TAP	30007014	TYCO ELECTRONICS CANADA L (602380)
350 STR RUN - #2 STR TAP	30007016	TYCO ELECTRONICS CANADA L (602380-2)
350 STR RUN - 1/0 STR TAP	30007017	TYCO ELECTRONICS CANADA L (602380-3)
350 STR RUN - 3/0 STR TAP	30007019	TYCO ELECTRONICS CANADA L (602380-5)
350 STR AAC RUN - 4/0 STR TAP	30006772	TYCO ELECTRONICS CANADA L (602380-6)
477 STR AAC RUN - #6 STR TAP	30007282	TYCO ELECTRONICS CANADA L (1-602031-0)
477 STR AAC RUN - #2 STR TAP	30007275	TYCO ELECTRONICS CANADA L (602031-8)
350 AAC RUN - 350 STR TAP	30007020	TYCO ELECTRONICS CANADA L (602380-7)
477, 500, 556.5-#4 R/T, AND FOR CCS WIRE, GROUNDING, #3 CCS TO 556.5 & 336.4 ASC	30007283	TYCO ELECTRONICS CANADA L (602031-9)
477-556.5 STR AAC RUN - #2-1/0 STR TAP AND GROUNDING, 2/0 CCS TO 336.4 ASC	30007246	TYCO ELECTRONICS CANADA L (1-602031-9)
447-556.5 TO #1-2/0 R/T AND GROUNDING, 2/0 CCS TO 556.5 ASC	30007284	TYCO ELECTRONICS CANADA L (1-602031-8)
556.5 STR RUN - 3/0 STR TAP	30007251	TYCO ELECTRONICS CANADA L (1-602031-6)
556.5 STR RUN - 4/0 STR TAP	30007285	TYCO ELECTRONICS CANADA L (1-602031-5)
556.5 STR RUN - 266.8 STR TAP	30007253	TYCO ELECTRONICS CANADA L (1-602031-4)
556.5 STR RUN - 336.4 STR TAP	30007254	TYCO ELECTRONICS CANADA L (1-602031-3)

556.5 STR RUN - 556.5 STR TAP	30027676	AMP (1-602031-2)
1000 STR RUN - 556.5 STR TAP	30017869	TYCO ELECTRONICS CANADA L (602180-5)

**Mini-Wedge**

Description	MM#	Manufacturers (Part Number)
266.8 STR RUN - #6 STR TAP	30026393	TYCO ELECTRONICS CANADA L (1-83623-5)
3/0 STR RUN - #10, 12, 14 STR TAP	30026394	TYCO ELECTRONICS CANADA L (83623-5)
1/0 STR RUN - #10, 12, 14 STR TAP	30026395	TYCO ELECTRONICS CANADA L (83630-1)
#2 STR RUN - #10, 12, 14 STR TAP	30026396	TYCO ELECTRONICS CANADA L (83630-3)
#4 STR RUN - #10, 12, 14 STR TAP	30030767	TYCO ELECTRONICS CANADA L (83630-5)
#6 STR RUN - #10, 12, 14 STR TAP	30031682	TYCO ELECTRONICS CANADA L (83630-7)
266.8 STR RUN - #10, 12, 14 STR TAP	30031683	TYCO ELECTRONICS CANADA L (1-83623-3)
4/0 STR RUN - #10, 12, 14 STR TAP	30031684	TYCO ELECTRONICS CANADA L (83623-9)

**CONNECTOR, TERMINAL**

**Bolted**

Description	MM#	Manufacturers (Part Number)
AL TN, 350-800 CU/AL COND. TO 1-HOLE 17/32" DIA. PAD	30007244	BURNDY INC (KA40U) ILSCO (TA-800)
AL TN, #4-500 CU/AL COND. TO 1-HOLE 13/32" DIA. PAD	30007239	BURNDY INC (KA36U) ILSCO (TA-500) T&B (ADR50)
#6 TO 250 AL COND., 1 HOLE 13/32" DIA.	30007238	BURNDY INC (KA29UG12) ETLIN (CA250Z) ILSCO (TA-250)
AL TN, 2X #6-250 CU/AL COND. TO 1-HOLE 25/64" DIA. PAD	30007272	BLACKBURN (ADR2521) BURNDY INC (K2A29U) ILSCO (AU-250)
AL TN, 2X #6-350 CU/AL COND. TO 1-HOLE, PAD SUITABLE FOR 1/2" BOLT	30035556	ILSCO (AU-350)
1/0-4/0 CU COND. TO 1-HOLE 13/32" DIA. PAD	30006145	BURNDY INC (KPA28)
#4-1/0 CU COND. TO 1-HOLE 0.33" DIA. PAD	30006144	BURNDY INC (KPA25) ETLIN (FT125Z)
#2 - 2/0 STRS (#2-1/0 SOL), 1/2" STUD SIZE	30006394	BURNDY INC (KC25) T&B (SP5SL)
#14 AWG SOL - #8 AWG STRS CU COND., 1-HOLE 9/16" DIA. RING PAD	30007163	BURNDY INC (QDA8CCG7)

**Compression**

Description	MM#	Manufacturers (Part Number)
AL, 4/0 COMPACT ASC, 1-HOLE FOR 1/2" BOLT	30006710	BURNDY INC (YJA4-0AT12TN) CICAME ENERGIE INC (HT-4-0-1CPRT-ALCAN)
TERMINAL, PAD, 1-HOLE FOR 1/2" BOLT, 250-266.8KCMIL COMPACT STRD ASC CONDUCTOR	30006405	BURNDY INC (YJA250AT12TN) CICAME ENERGIE INC (HT-25-1T_ALCAN) ILSCO (ACC-250)

TERMINAL, PAD, 1-HOLE FOR 9/16", 500KCMIL CU/AL CONDUCTOR	30032559	TYCO ELECTRONICS CANADA L (2182349-1)
#4 STRS ASC, 1 HOLE	30006788	BURNDY INC (YJA4CAT12TN) CICAME ENERGIE INC (HT-4-1T)
#2 STRS CU, 1 HOLE 9/16" DIA.	30006431	BURNDY INC (YJA2CT12) CICAME ENERGIE INC (LCN-3-C20-2-1-T) SLACAN INDUSTRIES INC (01-204-1)
AL, 250 ASC OR 250-266.8 COMPACT STR ASC, 2- HOLE FOR 1/2" BOLT	30006461	BURNDY INC (YJA250A2NTN)
350 STRS CU, 2 HOLE 9/16" DIA.	30006773	BURNDY INC (YJA3502N) CICAME ENERGIE INC (LCN-3-C26-350-2-T) SLACAN INDUSTRIES INC (01-240-2)
CU, 1000 CU, 4-HOLE FOR 9/16" BOLT	30006782	BURNDY INC (YJA10004N) SLACAN INDUSTRIES INC (01-280:4_MC80057)
CU, 1000 CU, 2-HOLE FOR 1/2" BOLT	30006783	BURNDY INC (YJA10002N) CICAME ENERGIE INC (LCN-3-C32-1000-2-T) SLACAN INDUSTRIES INC (01-280-2)
CU, 427 - 1000 EXTRA FLEX CU, 2-HOLE FOR 9/16" BOLT	30007054	CICAME ENERGIE INC (LCN-3-C32-1000-2) SLACAN INDUSTRIES INC (T937-5)
500 STRS CU, 1 HOLE 9/16" DIA.	30006780	BURNDY INC (YJA500T12) CICAME ENERGIE INC (LCN-3-C28-500-1-T) SLACAN INDUSTRIES INC (01-265-1)
CONN,TERM,PAD,COMP,AL,TN,500MCM ASC,2 HO	30006886	BURNDY INC (YJA500A2NTN)
AL, 3/0 COMPACT STR ASC, 1-HOLE FOR 1/2" BOLT	30006404	BURNDY INC (YJA3/0AT12TN) ILSCO (ACC-3/0HT)
#4 STRS CU, 1 HOLE 9/16" DIA.	30024855	BURNDY INC (YJA4CT12) TYCO ELECTRONICS CANADA L (1098099-1)
500 STRS CU, 2 HOLE 9/16" DIA.	30007321	BURNDY INC (YJA5002N) CICAME ENERGIE INC (LCN-3-C28-500-2-T) SLACAN INDUSTRIES INC (01-265-2)
CU, 750 CU, 2-HOLE FOR 9/16" BOLT	30023284	BURNDY INC (YAZ39-2N)

**COVER, CONNECTOR, INSULATING**

**Wedge Connector, 600V**

Description	MM#	Manufacturers (Part Number)
MINI-WEDGE, TYPE II, BLACK	30031685	TYCO ELECTRONICS CANADA L (83364-1)
TAP SIZE 266.8 - 350, HINGED TOP COVER STYLE BLUE/WHITE	30008395	AMP (602080)
TAP SIZE 336.4 - 556.5, YELLOW	30008398	AMP (602107)

**CROSSARM, COMPOSITE**

Description	MM#	Manufacturer (Part Number)
COMPOSITE, TANGENT & HEAVY ANGLES, 9'6" LONG (92.2mm X 117.6mm X 2895mm)	30033547	GEOTEK/PUPI (TH20001140202)
COMPOSITE, DEAD-END, 9'6" LONG (92.2mm X 117.6mm X 2895mm)	30033546	GEOTEK/PUPI (DH3000114E20332)

**CUTOUT, FUSED (In-Line)**

**In-Line Type, SPST**

Description	MM#	Manufacturers (Part Number)
27kV, 100A, INTERRUPTING CAPACITY 12kA, POLYMERIC INSULATOR	30005718	ABB (AJ25TC2N13N0) FIRON METAL IND (IF27100N)
27kV, 200A, INTERRUPTING CAPACITY 12kA, POLYMERIC INSULATOR	30005720	ABB (X2JCBNVA22V) FIRON METAL IND (IF27200N)

**CUTOUT, FUSED, (Bracket Mount Porcelain)**

**Open Type, With Fuse Holder Less Mounting Bracket**

Description	MM#	Manufacturers (Part Number)
27kV, 200A, SMD-20 (HOUSING LESS MOUNTING BRACKET), 150kV BIL, 20kA ASYMMETRICAL INTERRUPTING CAPACITY, PORCELAIN	30005715	S&C (92123-P-D-S122)

**CUTOUT, FUSED, (Bracket Mount Polymer)**

**Open Type, With Fuse Holder Less Mounting Bracket**

Description	MM#	Manufacturers (Part Number)
15kV, 200A, COMPLETE WITH 200A FUSE HOLDER, 95kV BIL, 10kA ASYMMETRICAL INTERRUPTING CAPACITY, POLYMERIC	30030761	ABB (X2JCBNVA22V) ALUMAFORM (CSG15-200A-110-CN-12KA) COOPER POWER SYSTEMS (S4B2P0A) EATON ELECTRICAL (S4B2P1A) HUBBELL (CP710143PB) MACLEAN POWER SYSTEMS (SC15HG212D)
27kV, 100A, COMPLETE WITH 100A FUSE HOLDER, 95kV BIL, 12kA ASYMMETRICAL INTERRUPTING CAPACITY, POLYMERIC	30030762	ABB (AJ25TC2N13N0) ALUMAFORM (CSG27-100A-125-CN-12KA) COOPER POWER SYSTEMS (S9DAP0A) HUBBELL (CP710213PB) MACLEAN POWER SYSTEMS (SC27SG112D)

**Copper Blade Only, Fuse Holder Less**

Description	MM#	Manufacturers (Part Number)
27kV, 300A, DISCONNECT, TYPE L	30016541	ALUMAFORM (CSB27-300A) COOPER POWER SYSTEMS (LDC300A)

**CUTOUT, SOLID BLADE (Bracket Mount Polymer)**

**Open Type, With Fuse Holder Less Mounting Bracket**

Description	MM#	Manufacturers (Part Number)
27kV, 300A, 125 kV, POLYMER	30030773	ABB (AJ25TC2N3BN0) ALUMAFORM (CSG27-300A-125-CN) COOPER POWER SYSTEMS (S9D3P0A) HUBBELL (T710233T )

**DUCT & FITTINGS**

Description	MM#	Manufacturers (Part Number)
BEND, PVC, PLAIN, 3" X 36" RADIUS, 90 DEG ANGLE, FOR EB1 & DB2 USE	30003295	ROYAL PIPE CO. (90B3X36)
BEND, PVC, PLAIN, 4" X 36" RADIUS, 90 DEG ANGLE, FOR EB1 & DB2 USE	30003291	IPEX INC (904036)
BEND, PVC, PLAIN, 4" X 36" RADIUS, 90 DEG ANGLE, FOR DB2 USE	30013701	ROYAL PIPE CO. (90B4X36)
BEND, PVC, PLAIN, 5" X 42" RADIUS, 90 DEG LONG SWEEP, FOR DB1 & DB2 USE	30003512	ROYAL PIPE CO. ( 41608-90B5X42) SLACAN INDUSTRIES INC (T939)

UNDERGROUND DISTRIBUTION STANDARDS

MATERIALS

BEND, PVC, PLAIN, 4" X 36" RADIUS, 45 DEG LONG SWEEP, FOR DB2 USE	30003515	ROYAL PIPE CO. (45B4X36)
BEND, PVC, 4" x 36" RADIUS, 22.5 DEG LONG SWEEP, FOR DB2 USE	30018074	IPEX INC (224036)
BEND, PVC, 4" x 60" RADIUS, 45 DEG LONG SWEEP, FOR DB2 USE	30018079	IPEX INC (454060)
BEND, PVC, 4" x 60" RADIUS, 90 DEG LONG SWEEP, FOR DB2 USE	30027966	IPEX INC (904060)
BEND, PVC, 4" x 60" RADIUS, 90 DEG, SOLVENT WELD, FOR DB2 USE	30031613	ROYAL PIPE CO. (90B4X60)
BEND, PVC, 5" x 42" RADIUS, 22.5 DEG, SOLVENT WELD, FOR DB2 USE	30026099	ROYAL PIPE CO. (22B5X42)
BEND,SCH 40 PVC, 5" x 24" RADIUS, 22.5 DEG, SOLVENT WELD, FOR DB2 USE	30031622	ROYAL PIPE CO. (E097500)
COUPLING,PVC DCT,4",PUSH-FIT END,EBI&DB2	30003292	ROYAL PIPE CO. (PFC 04)
BEND, PVC, 5" X 42" RADIUS, 45 DEG ANGLE, BELL END, FOR EB1 & DB2 USE	30018310	ROYAL PIPE CO. (45B5X42)
BEND, PVC, 5" X 42" RADIUS, 90 DEG ANGLE, BELL END, FOR EB1 & DB2 USE	30018309	ROYAL PIPE CO. (90B5X42)
2" X 10', WITH BELL ENDS, PVC	30007542	ROYAL PIPE CO. (RC0200) SCEPTER CORPORATION (NO 211_CSA C22.2)
CONDUIT, BELL ENDS, 2" DIA., 20' LONG, PVC, FOR DIRECT BURIAL OR ENCASEMENT	30007707	PURSLEY (11562) ROYAL PIPE CO. (DU02020)
CONDUIT, RIGID, PVC, 3" DIA, 10' LONG, BELL END, 3.5" OD, 3.042 ID	30007544	ROYAL PIPE CO. (RC0300)
PVC, 4" DIA, 10' LONG, BELL ENDS, FOR ES2 & DB2	30007710	NEXT POLYMERS (113941-318) PRIME CONDUIT INC (48815C-010) PURSLEY (11565) ROYAL PIPE CO. (DU04010)
PVC, 4" DIA, 20' LONG, BELL ENDS, FOR DB2	30007713	NEXT POLYMERS (113911-312) PRIME CONDUIT INC (48815C-020) PURSLEY (11568) ROYAL PIPE CO. (DU04020)
PVC, 5" DIA, 10' LONG, BELL ENDS, FOR ES2 & DB2	30007708	ROYAL PIPE CO. (DU05020) SCEPTER CORPORATION (DB2)
BASE VERTICAL LOCK SPACER, 4" X 2"	30003513	ROYAL PIPE CO. (BS4020)
BASE INTERMEDIATE, VERTICAL LOCK SPACER, 4" X 2"	30003514	ROYAL PIPE CO. (IS4020)
BASE VERTICAL LOCK SPACER, 5" X 2"	30026944	IPEX INC (BS6035) ROYAL PIPE CO. ( 42112-BS5030)
BASE INTERMEDIATE VERTICAL LOCK SPACER, 5"	30026947	IPEX INC (IS6035)
BASE VERTICAL, SADDLE, 5" X 3"	30021534	SCEPTER CORPORATION (BS6045)
BASE INTERMEDIATE VERTICAL LOCK SPACER, SADDLE, 5" X 3"	30021533	IPEX INC (IS6045)
NON-METALLIC, 3" DIA., FOR MECH. PROTECTION OF U/GRND CABLES, BLACK	30030235	DURA-LINE (1-908918) ILPEA INDUSTRIES (UC3-BLK-250)
COUPLER KIT, 3" FLEX TO 4" RIGID CONDUIT	30031163	DURA-LINE (1-403957)
BEND,90 DEG, 4" X 16" RADIUS, SOLVENT WELD	30031609	ROYAL PIPE CO. (E021400)

CAP, PVC, 4"DIA., SOLVENT WELD	30031602	ROYAL PIPE CO. (RCAP55)
DUCT ADAPTER, SCHEDULE 40 TO DB2, SOLVENT WELD, PVC, 4" DIA	30031626	ROYAL PIPE CO. (ARIG04)
SEVICE ENTRANCE FITTING, 1 1/4"	30032544	ROYAL PIPE CO. (REF25)
SEVICE ENTRANCE FITTING, 1/2"	30024721	ROYAL PIPE CO. (REF10)
Duct Fitting-Bell End, 4", DB2 PVC	30037980	IPEX INC (IPEEATEMPWR297 - 029064 - BELL40) ROYAL PIPE CO. (ROY4BELLEND - BEL04 (M))
Duct Fitting-Bell End, 5", DB2 PVC	30038151	IPEX INC (IPEEATEMPWR299 - 029065 - BELL50) ROYAL PIPE CO. (ROY5BELLEND - BEL05 (F))
SPACER, MONOBLOC,4" DUCTS,3" SPACE,4-WAY	30033356	IPEX INC (29498)
SPACER, MONOBLOC,4" DUCTS,3" SPACE,2-WAY	30017789	GUILLEVIN INTERNATIONAL C (29469)

**EQUIPMENT FOUNDATIONS**

Description	MM#	Manufacturers (Part Number)
MICROPAD TRANSFORMER, RANCHRUNNER PAD MOUNT, ALUM BASE, 25kVA, UP TO 14kV	30011213	CONNOR INDUSTRIES (RR25)
MICROPAD TRANSFORMER, RANCHRUNNER PAD MOUNT, 1-PH, ALUM BASE, 50kVA, UP TO 16kV	30011214	CONNOR INDUSTRIES (CONV25)
MICROPAD 1-PH KIOSK, RANCHRUNNER PAD MOUNT, ALUM BASE, UP TO 28kV	30030442	CONNOR INDUSTRIES (SKW 28)
MICROPAD 1-PH PAD-MOUNTED SWITCHGEAR, ALUM BASE	30032806	CONNOR INDUSTRIES (SWG10)
LID (2 PIECE), KIOSK, PRECAST CONCRETE, 1-PH PAD MOUNT	30031412	BROOKLIN CONCRETE PRODUCTS (BCP 110HO1PM)
LID (2 PIECE), PRECAST CONCRETE, 1-PH PAD MOUNT SWITCHGEAR	30031414	BROOKLIN CONCRETE PRODUCTS (BCP 110HOE1PM)
BASE, 1-PH PADMOUNT SWITCHGEAR	30031415	ARMTEC LIMITED (BCP 110B)
1 PIECE, BASE, PRECAST CONCRETE, 1-PH SECONDARY JUNCTION KIOSK	30033083	ARMTEC LIMITED (BCP22PED CUSTOM) UTILICON (UP2022HO)
FOUNDATION (1 PIECE), PRECAST CONCRETE, 1-PH CONVENTIONAL PADMOUNT TRANSFORMER - 48" DEEP, 48 PORTS	30031403	BROOKLIN CONCRETE PRODUCTS (BCP 110PM) UTILICON (UW4058D)
FOUNDATION (1 PIECE), PRECAST CONCRETE, 1-PH CONVENTIONAL PADMOUNT TRANSFORMER - 42" DEEP, 40 PORTS	30037362	BROOKLIN CONCRETE PRODUCTS (BCP110PC) UTILICON (UW4058S)
BASE, PAD MOUNT TRANSFORMER, PRECAST CONCRETE, 1-PH	30031405	ARMTEC LIMITED (BCP 110B)
2 PIECE, PADMOUNT, PRECAST CONCRETE COLLAR TO RAISE 6", USED WHEN 100mm GRADE SEPARATION, MAINTENANCE ONLY	10008614	BROOKLIN CONCRETE PRODUCTS (BCP-110TC6)
2 PIECE, PADMOUNT, PRECAST CONCRETE COLLAR TO RAISE 12", USED WHEN 100mm GRADE SEPARATION, MAINTENANCE ONLY	10009051	BROOKLIN CONCRETE PRODUCTS (BCP-110TC12)
BASE, 3-PH PADMOUNT TRANSFORMER	30031407	ARMTEC LIMITED (BCP 114B)
LID (2 PIECES), PRECAST CONCRETE, 3-PH PADMOUNT TRANSFORMER, 150-500kVA	30031406	BROOKLIN CONCRETE PRODUCTS (BCP 114P, BCP 114T6) UTILICON (UT7272R6_UW7272S)

LID (2 PIECES), PRECAST CONCRETE, 3-PH, PAD MOUNT TRANSFORMER	30031408	ARMTEC LIMITED (BCP 114P, BCP 114TBB9) UTILICON (UA7272B2)
LID (2 PIECE), PRECAST CONCRETE, 3-PH PAD MOUNT (1500 - 3000 kVA), STEP TRANSFORMER (2500 kVA)	30034875	BROOKLIN CONCRETE PRODUCTS (BCP 400HO-01)
LID (2 PIECES), PRECAST CONCRETE, 3-PH METERING UNIT	30031631	ARMTEC LIMITED (BCP 330P, BCP 330TS)
COMPACT 3-PH 4-WAY PAD MOUNT KIOSK, ALUM BASE, UP TO 28kV	30030443	CONNOR INDUSTRIES (SKW 328)
LID (2 PIECE), PRECAST CONCRETE, 3-PH 3-WAY PAD MOUNT SWITCHGEAR	30031416	ARMTEC LIMITED (BCP 114P, BCP 114THO)
BASE, 3-WAY PADMOUNT SWITCHGEAR	30031417	ARMTEC LIMITED (BCP 114B)
LID (2 PIECE), PRECAST CONCRETE, 3-PH 4-WAY PAD MOUNT SWITCHGEAR	30031418	ARMTEC LIMITED (BCP111HO3P4W) UTILICON (UA6276J2)
BASE, 4-WAY PADMOUNT SWITCHGEAR	30031419	ARMTEC LIMITED (BCP 111B)
LID (2 PIECE), PRECAST CONCRETE, 3-PH 5-WAY OR RFI (4-WAY) PAD MOUNT SWITCHGEAR	30031420	ARMTEC LIMITED (BCP 400P, BCP 400TGWHO)
BASE, 3-PH SWITCHGEAR (5-WAY) OR RFI (4-WAY), AND 3-PH METERING UNIT, AND 3-PH PAD-MOUNTED TRANSFORMER, UP TO 2500 kVA	30031421	ARMTEC LIMITED (BCP 400B)
LID (2 PIECE), KIOSK, PRECAST CONCRETE, 2-PH PAD MOUNT	30031410	ARMTEC LIMITED (BCP111HO3P)
BASE, 3-PH PADMOUNT KIOSK	30031411	ARMTEC LIMITED (BCP 111B)

**FAULTED CIRCUIT INDICATOR (FCI)**

Description	MM#	Manufacturers (Part Number)
W/ LED, UNDERGROUND, CABLE & REMOTE FIBRE OPTIC, FOR URBAN LOCATIONS	30018800	HORSTMANN (29-6028-000 C/W 49-6007-206)
FOR 3-PH TRANSFORMERS & SWITCHGEARS, FOR URBAN LOCATIONS	30022812	HORSTMANN (49-6007-410 QTY 1) HORSTMANN (29-6028-000 QTY 3)
OH & U/G APPLICATIONS, 300A, CABLE	30013112	FISHER PIERCE=VERSATILE I (1547A-HWTD- NNN_1547)
LED, NAVIGATOR TYPE	30018799	HORSTMANN (41-2001-301_NAVIGATOR LM)

**FUSE**

Description	MM#	Manufacturers (Part Number)
CURRENT LIMITING, HV, 23kV, 25A, FOR PADMOUNTED TRANSFORMERS WITH DRYWELL CANISTERS	30005674	COOPER POWER SYSTEMS (3565025M11M)
CURRENT LIMITING, HV, 23kV, 18A, FOR PADMOUNTED TRANSFORMERS WITH DRYWELL CANISTERS	30005675	COOPER POWER SYSTEMS (3565018M11M_ELX)
CURRENT LIMITING, HV, 23kV, 8A, FOR PADMOUNTED TRANSFORMERS WITH DRYWELL CANISTERS	30005676	COOPER POWER SYSTEMS (3565008M11M)
CURRENT LIMITING, HV, 23kV, 6A, FOR PADMOUNTED TRANSFORMERS WITH DRYWELL CANISTERS	30005694	COOPER POWER SYSTEMS (3565006M11M_ELX)

CURRENT LIMITING, HV, 23kV, 12A, FOR PADMOUNTED TRANSFORMERS WITH DRYWELL CANISTERS	30005695	COOPER POWER SYSTEMS (3565012M11M)
STANDARD SPEED, HV, 14.4kV, 100A, SMU 20, 14kA SYMMETRICAL INTERRUPTING CAPACITY, OUTDOOR	30014154	S&C (612100_SMU-20)

**FUSE, ELBOW**

Description	MM#	Manufacturers (Part Number)
FUSE,ELBOW,17.2KV,10A,50KA,CLF, FUSE FOR 200A LOADBREAK FUSED ELBOW	30037841	T&B (EFX172010-E)
FUSE,ELBOW,17.2KV,12A,50KA,CLF, FUSE FOR 200A LOADBREAK FUSED ELBOW	30037842	T&B (EFX172012-E)
FUSE,ELBOW,17.2KV,20A,50KA,CLF, FUSE FOR 200A LOADBREAK FUSED ELBOW	30037843	T&B (EFX172020-E)
FUSE,ELBOW,17.2KV,25A,50KA,CLF, FUSE FOR 200A LOADBREAK FUSED ELBOW	30037844	T&B (EFX172025-E)
FUSE,ELBOW,17.2KV,30A,50KA,CLF, FUSE FOR 200A LOADBREAK FUSED ELBOW	30037845	T&B (EFX172030-E)
FUSE,ELBOW,17.2KV,40A,50KA,CLF, FUSE FOR 200A LOADBREAK FUSED ELBOW	30037846	T&B (EFX172040-E)
FUSE,ELBOW,17.2KV,45A,50KA,CLF, FUSE FOR 200A LOADBREAK FUSED ELBOW	30037847	T&B (EFX172045-E)

**FUSE LINK**

**Cable Type**

Description	MM#	Manufacturers (Part Number)
10A, TYPE T SPEED	30005619	COOPER POWER SYSTEMS (FL3T10) S&C (279010R1)
12A, TYPE K SPEED	30005620	COOPER POWER SYSTEMS (FL3K12) KEARNEY (12A) S&C (265012R1)
15A, TYPE K SPEED	30005621	COOPER POWER SYSTEMS (FL3K15) S&C (265015R1)
20A, TYPE K SPEED	30005622	COOPER POWER SYSTEMS (FL3K20) S&C (265020R1)
25A, TYPE K SPEED	30005623	COOPER POWER SYSTEMS (FL3K25) S&C (265025R1)
30A, TYPE K SPEED	30005624	COOPER POWER SYSTEMS (FL3K30) S&C (265030R1)
40A, TYPE K SPEED	30005625	COOPER POWER SYSTEMS (FL3K40) S&C (265040R1)
50A, TYPE K SPEED	30005626	COOPER POWER SYSTEMS (FL3K50) S&C (265050R1)
65A, TYPE K SPEED	30005627	COOPER POWER SYSTEMS (FL3K65) S&C (265065R1)
80A, TYPE K SPEED	30005628	COOPER POWER SYSTEMS (FL3K80) S&C (265080R1)
100A, TYPE K SPEED	30005632	COOPER POWER SYSTEMS (FL3K100) S&C (265100R1)

140A, TYPE K SPEED	30005633	COOPER POWER SYSTEMS (FL3K140) S&C (265140R4)
200A, TYPE K SPEED	30005634	COOPER POWER SYSTEMS (FL3K200) S&C (265200R4)

**GRIP, CABLE SUPPORT**

Description	MM#	Manufacturers (Part Number)
SINGLE EYE, SINGLE WEAVE, CLOSED MESH, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 1" - 1.24"	10011801	HUBBELL (2201017)
SINGLE EYE, SINGLE WEAVE, CLOSED MESH, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 1.25" - 1.49"	10011802	HUBBELL (2201018)
SINGLE EYE, SINGLE WEAVE, CLOSED MESH, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 1.5" - 1.74"	10011803	HUBBELL (2201019)
SINGLE EYE, SINGLE WEAVE, CLOSED MESH, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 1.75" - 1.99"	10011804	HUBBELL (2201020)
SINGLE EYE, SINGLE WEAVE, CLOSED MESH, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 2" - 2.49"	10011805	HUBBELL (2201021)
SINGLE EYE, SINGLE WEAVE, CLOSED MESH, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 2.5" - 2.99"	10011806	HUBBELL (02201022)
SINGLE EYE, SINGLE WEAVE, CLOSED MESH, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 3" - 3.49"	10011807	HUBBELL (2201023)
GRIP. CABLE SUPPORT, RISER POLES, CH CLAMPS-HANGER, FOR PVC JACKETED CABLES 1.12" - 1.5" OD, BLACK	30006959	FARGO (GJ8568)
GRIP. CABLE SUPPORT, RISER POLES, CH CLAMPS-HANGER, FOR PVC JACKETED CABLES 1.5" - 1.77" OD, PINK	30006960	FARGO (GJ8578)
GRIP. CABLE SUPPORT, RISER POLES, CH CLAMPS-HANGER, FOR PVC JACKETED CABLES 1.77" - 2" OD, BLACK	30006961	HUBBELL (GJ8588)
SINGLE EYE, SINGLE WEAVE, SPLIT MESH, LACE CLOSING, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 1.25" - 1.49"	30030444	HUBBELL (2202018)
SINGLE EYE, SINGLE WEAVE, SPLIT MESH, LACE CLOSING, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 1.50" - 1.74"	30002113	HUBBELL (02202019) LEWIS MANUFACTURING (55-1213)
SINGLE EYE, SINGLE WEAVE, SPLIT MESH, LACE CLOSING, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 1.75" - 1.99"	30030445	HUBBELL (2202020)
SINGLE EYE, SINGLE WEAVE, SPLIT MESH, LACE CLOSING, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 2" - 2.49"	30030446	HUBBELL (2202021)
SINGLE EYE, SINGLE WEAVE, SPLIT MESH, LACE CLOSING, CORROSION RESISTANCE, NON MAGNETIC, FOR CABLE DIA. 2.50" - 2.99"	30030447	HUBBELL (2202022)

**GRIP, CONDUCTOR, PREFORMED**

**Bare Conductors**

Description	MM#	Manufacturer (Part Number)
DEAD-END STRAIN, #2 ACSR, RED	30007334	HELIX UNIFORME LTD (31015) PAYER ELECTRIC (SPARROW-24-ADN)
DEAD-END STRAIN, 1/0 ACSR, YELLOW	30007335	HELIX UNIFORME LTD (31020) PAYER ELECTRIC (RAVEN-28ADN)
DEAD-END STRAIN, 3/0 ACSR, ORANGE	30007336	HELIX UNIFORME LTD (31030) PAYER ELECTRIC (PIGEON-35ADN)
DEAD-END STRAIN, COND. COVERED 3/0 ACSR OR 4/0 AL, DIA. 14.88-15.46mm, BLACK	30006446	HELIX UNIFORME LTD (31040)
DEAD-END STRAIN, COND. 4/0 ACSR OR 3/0 AACSR, DIA. 13.7-14.3mm, RED	30007400	HELIX UNIFORME LTD (30033) PAYER ELECTRIC (PENGUIN-37ADN)
DEAD-END STRAIN, 336.4 ASC OR COVERED 266.8, GREEN	30007337	HELIX UNIFORME LTD (31050) PAYER ELECTRIC (LINNETT-44ADN)
DEAD-END STRAIN, 556.5 ASC, BLUE	30006915	HELIX UNIFORME LTD (30070) PAYER ELECTRIC (DAHLIA-54ADN)

**Steel Conductor**

Description	MM#	Manufacturer (Part Number)
HELIX, LOOP TYPE, FOR 7/16" GUY CABLE, GREEN	10000044	HELIX UNIFORME LTD (40400) PREFORMED LINE PRODUCTS (GDE1508) PREFORMED LINE PRODUCTS (GDE1108)

**Service**

Description	MM#	Manufacturer (Part Number)
DEAD-END STRAIN, COND. #6 ASC/ACSR, DIA. 4.67-5.03mm, BLUE	30007235	HELIX UNIFORME LTD (60100) PAYER ELECTRIC (10SSG) PREFORMED LINE PRODUCTS (SG-4500)
DEAD-END STRAIN, #4 ASC/ACSR, COND. DIA. 5.89-6.35mm, ORANGE	30007176	HELIX UNIFORME LTD (60300) PREFORMED LINE PRODUCTS (SG-4502)
DEAD-END STRAIN, #2 ASC/ACSR, COND. DIA. 7.42-8.03mm, BLACK	30007196	HELIX UNIFORME LTD (60400) PAYER ELECTRIC (14SSG) PREFORMED LINE PRODUCTS (SG-4503)
DEAD-END STRAIN, 1/0 ASC/ACSR, COND. DIA. 9.35-10.11mm, YELLOW	30007177	HELIX UNIFORME LTD (60700) PAYER ELECTRIC (19SSG) PREFORMED LINE PRODUCTS (SG-4506-01)
DEAD-END STRAIN, 3/0 ACSR, GREEN	30006789	HELIX UNIFORME LTD (60900-OH) PAYER ELECTRIC (23SSG)

**Guy**

Description	MM#	Manufacturer (Part Number)
DEAD-END STRAIN, #6 - #4 CU, COVERED COND. DIA. 6.76-6.86mm	30007333	HELIX UNIFORME LTD (31012) PAYER ELECTRIC (SWAN-22-ADN)
HELIX, LOOP TYPE, FOR 3/8" GUY STEEL CABLE, ORANGE	30000774	HELIX UNIFORME LTD (40350) PAYER ELECTRIC (38-35GN) PREFORMED LINE PRODUCTS (40350)
HELIX, LOOP TYPE, FOR 1/2" GUY, 7 OR 19 WIRE, BLUE	30000841	CHANCE (12GSBG) HELIX UNIFORME LTD (40450)

**GROUND ENHANCING MATERIAL**

Description	MM#	Manufacturers (Part Number)
GROUND ENHANCING MATERIAL, REDUCED DUST GROUNDING CEMENT	30025402	ELECTRIC MOTION COMPANY INC (EM-M5C-GDS) SAE (PC25-PRO)

**GROUND PLATE**

Description	MM#	Manufacturers (Part Number)
GALV. STEEL, WITH 0.25" X 10" X 16" GROUND PLATE & GROUND ROD STUB	30025401	SLACAN INDUSTRIES INC (61078_MC84200)

**GROUND ROD**

Description	MM#	Manufacturers (Part Number)
GROUND ROD, ONE PIECE, GALV., 3/4" X 10' LONG	30014142	ALMAT METAL (K61-5) HYDEL (3410G) SLACAN INDUSTRIES INC (9340S_MC83225)

**GUARD AND MOULDING**

Description	MM#	Manufacturers (Part Number)
GUARD, GROUND WIRE, WOOD MOULDING, 8' - 12' LENGTH	30034591	BOLTON MANUFACTURING DIVISION (9119900) JAN WOODLANDS [2001] INC. (2011)
CABLE, AL OR GALV. STEEL, 3.25" X TO 8' (80mm X 2.4m)	30000732	ALMAT METAL (K48-9) HYDEL (8314UC) SLACAN INDUSTRIES INC (7535-MC11119)
GUARD, CABLE, 60mm X 2.5M (2 1/4" X 6 1/2'), GALV. STEEL OR ALUMINUM	30000733	ALMAT METAL (K48-7) HYDEL (8214UCM) SLACAN INDUSTRIES INC (7533-MC11117)
CABLE, AL OR GALV. STEEL 1.25" X TO 8' (30mm X 2.4m)	30000871	HYDEL (8114UC) RUDDY ELECTRIC WHOLESale (8114UC) SLACAN INDUSTRIES INC (22258-MC11113)
GUARD, CABLE, 30mm X 1m, GALV. STEEL	30000873	HYDEL (3114UC) SLACAN INDUSTRIES INC (22522_MC15584)
CABLE, AL OR GALV. STEEL 3.75" X TO 8' (100mm X 2.4m)	30000897	SLACAN INDUSTRIES INC (22260_MC11121)
CABLE, FLARED, 2.25" X TO 8' (60mm X 2.4m)	30023782	ALMAT METAL (K48-7F) HYDEL (8214UCF)
CABLE, FLARED, 3.25" X TO 8' (80mm X 2.4m)	30023781	ALMAT METAL (K48-9F) HYDEL (8314UCF)
CABLE, FLARED, 4.25" X TO 8' (120mm X 2.4m, WILL FIT OVER U/G DUCT WITHOUT ADAPTER	30024858	HYDEL (8414UCF)

**INSULATOR, DEAD-END (Polymeric)**

Description	MM#	Manufacturer (Part Number)
CLEVIS TONGUE FITTINGS, 15kV, POLYMERIC, DS15	30008404	K-LINE INSULATORS LTD (KL15ASCTF) MACLEAN POWER SYSTEMS (DS15M)
CLEVIS TONGUE FITTINGS, 28kV, POLYMERIC, DS28	30008411	K-LINE INSULATORS LTD (KL28ASCTM) K-LINE INSULATORS LTD (KL28ASCTF) MACLEAN POWER SYSTEMS (DS28M)

**INSULATOR, LINE POST (Polymeric)**

Description	MM#	Manufacturer (Part Number)
UNIVERSAL LINE FITTING, 15kV, POLYMERIC, LP15	30008431	HUBBELL (80S0150K09) K-LINE INSULATORS LTD (KL15SK) MACLEAN POWER SYSTEMS (H0 40 U0 004 MX SS 002)
UNIVERSAL LINE FITTING, 28kV, POLYMERIC, LP28	30008430	HUBBELL (80S0280K09) K-LINE INSULATORS LTD (KL35SK) MACLEAN POWER SYSTEMS (H0 40 U0 008 MX SS 004)

**INSULATOR, STANDOFF**

Description	MM#	Manufacturers (Part Number)
15kV, CLAMP STUD, POLYMERIC, 384mm LK, 389mm LG	30008434	K-LINE INSULATORS LTD (KL15ARSIU)
28kV, CLAMP STUD, POLYMERIC, 590mm LK, 500mm LG	30008425	K-LINE INSULATORS LTD (KL28ARSIU)
46kV, CLAMP STUD, POLYMERIC, 988mm LK, 619mm LG	10000412	K-LINE INSULATORS LTD (KL46SRSIU)

**KIOSK  
Single Phase**

Description	MM#	Manufacturers (Part Number)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 1-PH, 3-WAY, 15kV, 200A	30010815	CAM TRAN COMPANY LIMITED (NLP007-1)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 4-WAY, 15kV, 200A	30011283	CAM TRAN COMPANY LIMITED (NLP007-2)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 3-WAY, 28kV, 200A	30011280	CAM TRAN COMPANY LIMITED (NLP007-3)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 4-WAY, 28kV, 200A	30011101	CAM TRAN COMPANY LIMITED (NLP007-4)

**Three Phase**

Description	MM#	Manufacturers (Part Number)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 3-WAY, 15kV, 200A	30011246	CAM TRAN COMPANY LIMITED (NLP006-1)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 4-WAY, 15kV, 200A	30011260	CAM TRAN COMPANY LIMITED (NLP006-2)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 3-WAY, 28kV, 200A	30014366	CAM TRAN COMPANY LIMITED (NLP006-3)
PADMOUNTED, DEADFRONT, LOAD BREAK ELBOW SWITCHING, 4-WAY, 28kV, 200A	30010863	CAM TRAN COMPANY LIMITED (NLP006-4)

**Junction, Secondary**

Description	MM#	Manufacturers (Part Number)
PAD-MOUNTED, 600A, 600 V, 3-WIRE, METAL ENCLOSED. 20" X 18" X 42	30033171	PEDESTAL SOLUTIONS INC. (LVTC42-1P-3W)

**LUBRICANT**

Description	MM#	Manufacturers (Part Number)
COMPOUND CABLE PULLING, 5 GAL. PAIL	30009052	IDEAL INDUSTRIES (31355)

**LUMBER**

Description	MM#	Manufacturers (Part Number)
PRESSURE TREATED, 4"X8"X10'LONG	30015087	HANFORD LUMBER LTD (41943_PRESSURE TREATED)

**MARKER, SIGN AND NUMBER**

**Numbers**

Description	MM#	Manufacturers (Part Number)
NUMBER "1", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001635	3M (PRAC3270) ELECTROMARK (20001635)
NUMBER "2", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001636	3M (PRAC3290) ELECTROMARK (20001636)
NUMBER "3", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001637	3M (PRAC3270) ELECTROMARK (20001637)
NUMBER "4", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001638	3M (PRAC3270) ELECTROMARK (20001638)
NUMBER "5", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001639	3M (PRAC3270) ELECTROMARK (20001639)
NUMBER "6", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001640	3M (PRAC3270) ELECTROMARK (20001640)
NUMBER "7", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001641	3M (PRAC3270) ELECTROMARK (20001641)
NUMBER "8", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001642	3M (PRAC3270) ELECTROMARK (20001642)
NUMBER "9", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001643	3M (3270) ELECTROMARK (20001643)
NUMBER "0", PRESSURE SENSITIVE ADHESIVE, SILVER, REFLECTIVE, 127mm	20001644	3M (PRAC3270) ELECTROMARK (20001644)
NUMBER "0", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001791	ALPINE GRAPHIC PRODUCTION (13201) ELECTROMARK (20001791)
NUMBER "1", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001792	ALPINE GRAPHIC PRODUCTION (13202) ELECTROMARK (20001792)
NUMBER "2", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001793	ALPINE GRAPHIC PRODUCTION (13203) ELECTROMARK (20001793)
NUMBER "3", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001794	ALPINE GRAPHIC PRODUCTION (13204) ELECTROMARK (20001794)
NUMBER "4", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001795	ALPINE GRAPHIC PRODUCTION (13205) ELECTROMARK (20001795)
NUMBER "5", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001796	ALPINE GRAPHIC PRODUCTION (13206) ELECTROMARK (20001796)
NUMBER "6" OR "9", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001797	ALPINE GRAPHIC PRODUCTION (13207) ELECTROMARK (20001797)
NUMBER "7", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001798	ALPINE GRAPHIC PRODUCTION (13208) ELECTROMARK (20001798)
NUMBER "8", POLYETHYLENE, MOULDED, BRIGHT YELLOW PIGMENTED WITH 2 HOLES, 32mm	20001799	ALPINE GRAPHIC PRODUCTION (13209) ELECTROMARK (20001799)
NUMBER "1", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030351	ALPINE GRAPHIC PRODUCTION (NBR-3SR-1)
NUMBER "2", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030352	ALPINE GRAPHIC PRODUCTION (NBR-3SR-2)

NUMBER "3", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030353	ALPINE GRAPHIC PRODUCTION (NBR-3SR-3)
NUMBER "4", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030354	ALPINE GRAPHIC PRODUCTION (NBR-3SR-4)
NUMBER "5", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030355	ALPINE GRAPHIC PRODUCTION (NBR-3SR-5)
NUMBER "6", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030356	ALPINE GRAPHIC PRODUCTION (NBR-3SR-6)
NUMBER "7", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030357	ALPINE GRAPHIC PRODUCTION (NBR-3SR-7)
NUMBER "8", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030358	ALPINE GRAPHIC PRODUCTION (NBR-3SR-8)
NUMBER "9", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030359	ALPINE GRAPHIC PRODUCTION (NBR-3SR-9)
NUMBER "0", PRESSURE SENSITIVE, ADHESIVE, SILVER, REFLECTIVE, 76mm	30030360	ALPINE GRAPHIC PRODUCTION (NBR-3SR-0)

Description	Phase	
	MM#	Manufacturers (Part Number)
VISUAL SIGN, PHASE, RED, PRESSURE SENSITIVE, 3 1/8" DIA.	20001694	ELECTROMARK (PHASEA1RIRED) IMAGE LABELS LTD (13098) R&M PLASTIC PRODUCTS LTD (RMRPD-3)
VISUAL SIGN, PHASE, WHITE, PRESSURE SENSITIVE, 3 1/8" DIA.	20001695	ELECTROMARK (PHASEA1RISIL) IMAGE LABELS LTD (13099) R&M PLASTIC PRODUCTS LTD (RMWPD-3)
VISUAL SIGN, PHASE, BLUE, PRESSURE SENSITIVE, 3 1/8" DIA.	20001696	ELECTROMARK (PHASEA1RIBLU) IMAGE LABELS LTD (13100) R&M PLASTIC PRODUCTS LTD (RMBPD-3)
VISUAL SIGN, PHASE, RED, REFLECTIVE ALUMINUM BACK, 2 3/4" DIA.	20002981	ELECTRIC POWER ACCESSORIE (PM-1AR_DGB002RED)
VISUAL SIGN, PHASE, WHITE, REFLECTIVE ALUMINUM BACK, 2 3/4" DIA.	20002982	ELECTRIC POWER ACCESSORIE (PM-2AR_DGB003WHT)
VISUAL SIGN, PHASE, BLUE, REFLECTIVE ALUMINUM BACK, 2 3/4" DIA.	20002983	ELECTRIC POWER ACCESSORIE (PM-3AR_DGB004BLUE)
VISUAL SIGN, PHASE, RED, REFLECTIVE ADHESIVE BACK, 2 3/4" DIA.	20002984	ELECTRIC POWER ACCESSORIE (PM-PS1AR_DGB002REDA)
VISUAL SIGN, PHASE, WHITE, REFLECTIVE ADHESIVE BACK, 2 3/4" DIA.	20002985	ELECTRIC POWER ACCESSORIE (PM-PS2AR_DGB003WHTA)
VISUAL SIGN, PHASE, BLUE, REFLECTIVE ADHESIVE BACK, 2 3/4" DIA.	20002986	ELECTRIC POWER ACCESSORIE (PM-PS3AR_DGB004BLUEA)
PLATE, PHASE, RED, ANODIZED ALUMINUM, 80mm DIA.	20001538	ALPINE GRAPHIC PRODUCTION (12934) ELECTROMARK (20001538)
PLATE, PHASE, WHITE, ANODIZED ALUMINUM, 80mm DIA.	20001540	ALPINE GRAPHIC PRODUCTION (12936) ELECTROMARK (20001540)
PLATE, PHASE, BLUE, ANODIZED ALUMINUM, 80mm DIA.	20001541	ALPINE GRAPHIC PRODUCTION (20001541) ELECTROMARK (20001541)

Miscellaneous Stickers/Labels

Description	MM#	Manufacturers (Part Number)
"CAUTION LOOP FEED", 175mm X 65mm	20001595	ALPINE GRAPHIC PRODUCTION (12996)
"DO NOT ENERGIZE", 150mm X 100mm	20002006	FLEXCON INC (ELV400)
"DO NOT DIG OR DRIVE STAKES", 68mm X 140mm	20002125	ALPINE GRAPHIC PRODUCTION (13541) ELECTROMARK (20002125)
"DANGER HIGH VOLTAGE KEEP OFF", 110mm X 205mm	20002130	ALPINE GRAPHIC PRODUCTION (20002130) ELECTROMARK (20002130)
"DO NOT OPEN YOU CAN BE HURT", FOR USE ON PADMOUNTS	20002119	ALPINE GRAPHIC PRODUCTION (13535)
MARKER, DG IDENTIFICATION, PROV. LINES CONTROLLING AUTHORITY, 103mm X 103mm	30029842	ALPINE GRAPHIC PRODUCTION (HO-PL)
MARKER, DG IDENTIFICATION, NETWORK OPER. DIVISION CONTROLLING AUTHORITY, 103mm X 103mm	30029843	ALPINE GRAPHIC PRODUCTION (HO-NOD)
INDICATING ARROW, 140mm LONG, FOR USE WITH "FIRST AID KIT HERE" MARKER	20001800	ALPINE GRAPHIC PRODUCTION (13211)
"CAUTION BURIED ELECTRIC LINE BRADY", ROLL BLACK LETTERS ON RED TYPE	20002181	BRADY (91295)
"CAUTION DO NOT OPERATE FUSE TO ENERGIZE OR ISOLATE TRANSFORMER", 50 X 75mm	20002182	ALPINE GRAPHIC PRODUCTION (20002182) IMAGE LABELS LTD (13604)
"CAUTION NO PLANTING WITHIN 3M", 5.81" X 2.43"	30029830	ELECTROMARK (30029830)
DANGER, NO DIG/PLANT	30036463	SETON MARKHAM (30036463)

Signs/Placards

Description	MM#	Manufacturers (Part Number)
"DANGER SUBMARINE CABLE", 455mm W X 605mm L	20002699	ALPINE GRAPHIC PRODUCTION (SUB CABLE SIGN)
STEEL STAKE, U/G CABLE, 1 1/2" PIPE X 60" (1525mm), 6"X4" (150mm X 100mm) SUPPORT	10000425	SLACAN INDUSTRIES INC (T613)
"CAUTION SEPARATED NEUTRAL SYSTEMS", 7" X 10", 0.090	20002317	ALPINE GRAPHIC PRODUCTION (15486)
"WARNING STAY CLEAR - HIGH VOLTAGE CABLE", AL, 340mm X 450mm	30024552	ALPINE GRAPHIC PRODUCTION (SUB CABLE SIGN) ELECTROMARK (30024552)
UWPC TAG, CAUTION, GREEN	30019389	AVANT IMAGING & INFORMATI (CAUTION TAG - NO NUMBERING) IMAGEON PRINT INC (UWPC TAG, CAUTION)

Miscellaneous/Markers

Description	MM#	Manufacturers (Part Number)
3M BALL MARKER - V, CABLE, U/G	30015374	3M (1402-XR)
MARKER, METAL DISK, SCREW-IN TYPE	20001548	IDENTIFAB INDUSTRIES LIMI (12945)

Sign Accessories

Description	MM#	Manufacturers (Part Number)
GROUT, FOR ROCK ANCHOR	30013957	MASTER BUILDERS TECHNOLOG (T 545)

**METERING UNIT, PRIMARY, PADMOUNTED**

Description	MM#	Manufacturers (Part Number)
OUTDOOR, 170kV BIL, 3EL, 16/27.6kV, w/ 200 BUSHING, c/w 3VTs 16800:120 & 3CTs 200:5A	20008318	JESSTEC INDUSTRIES INC (16800-120V, 200:5A HAER, 200A BUSHINGS)
OUTDOOR, 170kV BIL, 3EL, 16/27.6kV, w/ 600A BUSHING, c/w 3VTs 16800:120 & 3CTs 300:5A	20008319	JESSTEC INDUSTRIES INC (16800-120V, 300:5A, PADMOUNT)

**NEUTRAL ISOLATOR**

Description	MM#	Manufacturers (Part Number)
NEUTRAL ISOLATOR VTNI	30021907	DAIRYLAND ELECTRICAL (VT/NI)

**NUT**

Description	MM#	Manufacturers (Part Number)
SILICON-BRONZE, BOLT DIA. SIZE #3/8" - PITCH 16 UNC	30001498	BURNDY INC (38CHENBOX) NIAGARA FASTENERS INC (BZFN38NC)
SILICON-BRONZE, BOLT DIA. SIZE #1/2" - PITCH 13 UNC	30001499	NIAGARA FASTENERS INC (BZFN12NC)

**PADLOCK, LOCK AND KEY**

Description	MM#	Manufacturers (Part Number)
PADLOCK, LOCK AND KEY, BRASS 5 PIN TUMBLER 50mm CASE	30000346	ABUS (8550)
PADLOCK KEY, 5 PIN TUMBLER, PADLOCK SERIES KA NO. 1	30000345	CISA (SERIES KA NO 1)

**PEDESTAL**

Description	MM#	Manufacturers (Part Number)
DISTRIBUTION TRANSFORMER, ABOVE GRADE, SECONDARY, 14" X 18" X 9"	30010810	NORDIC FIBREGLASS (PRMC-190-MG)

**RECLOSER, G&W, VIPER**

**Three Phase**

Description	MM#	Manufacturers (Part Number)
RCL-L-SCDA CLMT-L 3Ø38kV800A12.5kA6LVS	30035261	G&W ELECT (VIP398ER-12-1-ST-CM-6VS)
RCL-L-SCDA CLMT-L 3Ø27kV800A12.5kA6LVS	30035614	G&W ELECT (VIP388ER-12-1-ST-CM-6VS)
RCL-L-SCDA CLMT-L 3Ø27kV800A12.5kA3LVS	30035615	G&W ELECT (VIP388ER-12-1-ST-CM)
RECL CONT CBL:SEL651R-VIPER-ST,32PIN-18M	30031494	G&W ELECT (B1341 5264 G00)
CLUSTER MOUNT, 38kV, 800A, 12.5kA	10011324	G&W ELECT (VIP398ER-12-1-ST-CM)
CLUSTER MOUNT, 27kV, 800A, 12.5kA	10011325	G&W ELECT (VIP388ER-12-1-ST-CM)

**ROOFING NAIL**

Description	MM#	Manufacturers (Part Number)
G STL,1-3/4" LG, 9-10 GAUGE	30001734	CHARLES JONES INDUSTRIAL (25420290_DELHI HOME BLDG P/N 2031)

**SCREW**

Description	MM#	Manufacturers (Part Number)
WOOD STEEL RD HEAD, SQ SOC, #8, 1-1/4	30001874	H PAULIN & COMPANY LIMITE (198-143) NIAGARA FASTENERS INC (STWSRR8X0114)
HEX WASHER HEAD, 3" LENGTH	30032211	FASTENAL (11544524)

**SEALANT**

Description	MM#	Manufacturers (Part Number)
SEALANT, COMPOUND DUCT SEALING	30009051	IBERVILLE (14053)

**SMART GRID**

**Antennas & Mounts**

Description	MM#	Manufacturer (Part Number)
OMNI, C/W PIPE ATTACHEMENT, N-FEMALE, 50 OHM WIDE BAND	30034706	WILSON (314422)

**Miscellaneous, Scada-enablement**

Description	MM#	Manufacturer (Part Number)
COAX, 6M, N-MALE TO TNC-MALE, LMR-400	30034804	PRIORITY ELECTRONICS LTD (P97-17462-06)
COAX, 8M, N-MALE TO TNC-MALE, LMR-400	30034805	PRIORITY ELECTRONICS LTD (P97-17462-08)
COAX, 12M, N-MALE TO TNC-MALE, LMR-600	30034806	PRIORITY ELECTRONICS LTD (P97-17461-12)

**SPLICE**

Description	MM#	Manufacturers (Part Number)
COLD SHRINK, 28kV, AL, 2/0 COMPACT STR COND.	30008012	3M (5456A-C-CSA-1-0STR-2-0CMPT)
CONNECTOR, SPLICE, 2/0, AL COMPACT STR COND.	30037383	CICAME ENERGIE INC (7100017984 C-CSA 1/0 STR 2/0 COMPT)
CONNECTOR, SPLICE, 15 X #14 AWG, CU STR COND.	30037384	CICAME ENERGIE INC (1000003428 CQCU-CSA-2)
COLD SHRINK, 28kV, CU, 350 COMPACT STR COND.	30008020	3M (5457A-CQCU-CSA-350)
COLD SHRINK, 28kV, CU, 500 COMPACT STR COND.	30008022	3M (5457A-CQCU-CSA-500)
COLD SHRINK, 28kV, CU, 750 COMPACT STR COND.	30017197	3M (5458A-CQCU-CSA-750)
COLD SHRINK, 28kV, CU, 1000 COMPACT STR COND.	30008016	3M (5458A-CQCU-CSA-1000)
COLD SHRINK, 46kV, CU, 500 STR/COMP/CMPT COND.	30019505	3M (5477A-CQCU-CSA-500)
COLD SHRINK, 46kV, CU, 750 COMPRESSED COND.	30016917	3M (5477A-CQCU-CSA-750)
COLD SHRINK, 46kV, CU, 1000 COMPRESSED COND.	30017255	3M (5477A(L)-CQCU-CSA-1000)
COLD SHRINK, 28kV, AL, 1/0 SOL COND.	30019268	3M (5456A-1/0SOL AL SUB)
SUB CABLE, 15kV, AL, 1/0 SOL, FOR JOINING 15kV ENCAPSULATED JACKETED TO ENCAPSULATED JACKETED CABLE	30031922	3M (5415A-1/0SOL AL SUB)
COLD SHRINK, SUB CABLE, CU, 28kV, 2/0 COMPACT STR CU	10012410	3M (5456A-2-0-CMPT-CU-SUB)

COLD SHRINK, SUB CABLE, CU, 28kV, 350 COMPACT STR CU	30031794	3M (5457A-350CMPT-CU-SUB)
COLD SHRINK, SUB CABLE, CU, 46kV, 350 COMPACT STR CU	10011691	3M (5477A-350 CU SUB)
COLD SHRINK, SUB CABLE, CU, 46kV, 1000 COMPACT STR CU	30032442	3M (5477A(L)-1000 CU SUB)
COLD SHRINK, WITHOUT CONNECTOR, 11", 600V, FOR 2/0 - 250 1-COND	30008346	3M (8426-11)
COLD SHRINK, WITHOUT CONNECTOR, 12", 600V, FOR 450 - 800 1-COND.	30013875	3M (8428-12) TYCO ELECTRONICS CANADA L (RVS-13)
CONNECTOR, LV SPLICE, COMPRESSION, NON-TENSION, AL-AL, 3/0	30006695	BURNDY INC (YJS3/0A) CICAME ENERGIE INC (CA-3-C24-3/0) ILSCO (ASC-3/0)
CONNECTOR, LV SPLICE, COMPRESSION, NON-TENSION, AL-AL, 4/0	30006456	BURNDY INC (YJS4/0A) ILSCO (ASC-4/0)
CONNECTOR, LV SPLICE, COMPRESSION, NON-TENSION, AL-AL, 250 (OR 268.8 KCMIL)	30006455	BURNDY INC (YJS250A) CICAME ENERGIE INC (ATHV-25C) ILSCO (ASC-250)
CONNECTOR, LV SPLICE, COMPRESSION, NON-TENSION, AL-AL, 500	30006397	BURNDY INC (YJS500A) CICAME ENERGIE INC (ATHV-50C_ALCAN)
COLD SHRINK, INSULATOR, 600V, #10-1/0AWG	10010780	3M (8424-8)
COLD SHRINK, UGRND SPLICE KIT-15KV-1/0AWG-	30026960	3M (5415A/CQCU-CSA-1/0)
INSUL SLEEVE, COLD SHRINK, 600V, 900-1000KCMIL	10010716	3M (8429-12)
CONNECTOR, SPLICE JOINT SLEEVE, COMPRESSION, NON TENSION, CU, 1000KCMIL	30006800	BURNDY INC (YJS1000) SLACAN INDUSTRIES INC (80055)

**STAPLE**

Description	MM#	Manufacturers (Part Number)
GENERAL USE, GALV., 3" LENGTH, 5/8" WIDTH	30001735	STELCO INC STELCO TOWER (2033)
GROUND WIRE, GALV., 1 1/2" LENGTH, 3/8" WIDTH	30013881	LARSON CONSTRUCTION DIVIS (350334)
STAPLE, GENERAL USE GALV, 3" LG,1-1/16"W, MOULDING	30013378	LARSON CONSTRUCTION DIVIS (321312_CJ P/N ST3)

**STRAP**

Description	MM#	Manufacturers (Part Number)
1/2", 2-HOLE 3/16" DIA., GALV.	30024726	IBERVILLE (CI 1504)
AL OR GALV. STEEL, 60mm	30000744	ALMAT METAL (K48-22) HYDEL (214SUC)
AL OR GALV. STEEL, 30mm	30000745	HYDEL (114SUC)
AL OR GALV. STEEL, 80mm	30000746	ALMAT METAL (K48-23)
AL OR GALV. STEEL, 100mm	30000923	ALMAT METAL (K48-24) HYDEL (334SUC)
3/4", 2-HOLE 3/16" DIA., GALV.	30003210	IBERVILLE (1506) MUELLER FLOW CONTROL (231) T&B (CI-1506) TEKMET LTD (ST75)

1 1/4", 2-HOLE 1/4" DIA., GALV.	30003211	IBERVILLE (1510) MUELLER FLOW CONTROL (231) T&B (CI-1510) TEKMET LTD (ST125)
1 1/2", 2-HOLE 1/4" DIA., GALV.	30003212	MUELLER CANADA (231_GRINNELL) T&B (CI-1512) TEKMET LTD (ST150_FIT3507)
2", 2-HOLE 9/32" DIA., GALV.	30003213	IBERVILLE (1516) MUELLER FLOW CONTROL (231) T&B (CI-1516) TEKMET LTD (ST200)
GUARD,CABLE,120MMX2.4 M, ALUM OR STEEL	30000830	ALMAT METAL (K48-14) SLACAN INDUSTRIES INC (60656_MC80983)
STRAP, CABLE GUARD, 120MM	30000831	ALMAT METAL (K48-25)

**STUD, INSULATOR**

**Line Post**

Description	MM#	Manufacturer (Part Number)
SHORT	30000905	ALMAT METAL (K59-1) DOWNEY METAL PROD (DMP-211-OH)
LONG	30000906	ALMAT METAL (K59-2H) DOWNEY METAL PROD (DMP-211-7-OH)

**SUPPORT, CABLE TIE, SELF LOCKING**

**Plastic, Nylon, Tefzel**

Description	MM#	Manufacturers (Part Number)
0.3" WIDE X 14.6" LENGTH	30030842	PANDUIT (PLT4H-L76)

**SWITCH, DISCONNECT**

Description	MM#	Manufacturers (Part Number)
28kV, 900A	30011045	FIRON METAL IND (SM28900S/BF3380) MINDCORE (DHSL27)

**SWITCH, LINE-TAP**

Description	MM#	Manufacturers (Part Number)
28KV, 600A, 40KA, LINE-TAP SWITCH, HOOKSTICK	30038451	EATON CUTLER HAMMER (D73LT36S0H5)

**SWITCHGEAR**

**Single Phase**

Description	MM#	Manufacturers (Part Number)
SOLID INSULATION, PAD MOUNT, 4-WAY, 28kV, 1 X 200A VACUUM SW, 3 X 200A VACUUM RFI	30020254	T&B (ESP124-SJJJ-2222-CS1332)
SOLID INSULATION, PAD MOUNT, 4-WAY, 28kV, 4 X 200A VACUUM SW	10009881	T&B (ESP124-SSSS-2222-CS1332)

**Three Phase**

Description	MM#	Manufacturers (Part Number)
28kV, 3-WAY, 2 X 200A GANGED SW, 3 X 200A 1-PH VACUUM RFI	30017712	CANADA POWER PRODUCTS (PRG61/3-33-29.3/32_2T2/783A)
15kV, 4-WAY, 1 X 600A 3-PH GANGED SW, 3 X 200A 3-PH VACUUM RFI	10009882	CANADA POWER PRODUCTS (PG6-44-15/32//6222/783)

15kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 2 X 200A 3-PH GANGED SW	10009883	CANADA POWER PRODUCTS (PG6-44-15/32//6622/783)
15kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 2 X 200A 3-PH VACUUM RFI	10009884	CANADA POWER PRODUCTS (PRG6-44-15/32//66TT/783A)
15kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 6 X 200A 1-PH VACUUM RFI	10009885	CANADA POWER PRODUCTS (PRG61/3-44-15/32//6TT6/783B)
15kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 6 X 200A 1-PH SW	10009886	CANADA POWER PRODUCTS (PG61/3-44-15/32//6622/783)
28kV, 4-WAY, 4 X 200A GANGED SW	10009887	CANADA POWER PRODUCTS (PG6-44-15/32//2222/783)
15kV, 4-WAY, 6 X 200A 1-PH SW, 6 X 200A 1-PH VACUUM RFI	10009888	CANADA POWER PRODUCTS (PRG61/3-44-15/32//2TT2/783B)
15kV, 4-WAY, 2 X 200A 3-PH GANGED SW, 6 X 200A 1-PH SW	10009889	CANADA POWER PRODUCTS (PG61/3-44-15/32//2222/783)
28kV, 4-WAY, 4 X 600A 3-PH GANGED SW	10009890	CANADA POWER PRODUCTS (PG6-44-15/32//6666/783)
28kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 2 X 200A 3-PH GANGED VACUUM RFI	10009895	CANADA POWER PRODUCTS (PRG6-44-29.3/32//6TT6/783A)
28kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 6 X 200A 1-PH GANGED VACUUM RFI	10009896	CANADA POWER PRODUCTS (PRG61/3-44-29.3/32//6TT6/783A)
28kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 6 X 200A 1-PH SW	10009897	CANADA POWER PRODUCTS (PG61/3-44-29.3//6226/783)
28kV, 4-WAY, 2 X 200A 3-PH GANGED SW, 6 X 200A 1-PH VACUUM RFI	10009898	CANADA POWER PRODUCTS (PRG61/3-44-29.3//2TT2/783B)
28kV, 4-WAY, 2 X 200A 3-PH GANGED SW, 6 X 200A 1-PH SW	10009899	CANADA POWER PRODUCTS (PG61/3-44-29.3//2222/783)
28kV, 4-WAY, 2 X 600A 3-PH GANGED SW, 2 X 200A 3-PH GANGED SW	30015870	CANADA POWER PRODUCTS (PG-44-29.3_6622/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 4-WAY, 1 X 600A 3-PH GANGED SW, 3 X 200A 3-PH GANGED SW	30015891	CANADA POWER PRODUCTS (PG6-44-29.3_6222/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 4-WAY, 4 X 200A 3-PH GANGED SW	30016194	CANADA POWER PRODUCTS (PG6-44-29.3_2222/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 4-WAY, 4 X 600A 3-PH GANGED SW	30016964	CANADA POWER PRODUCTS (PG6-44-29.3/32//6666/783)
PUFFER PAK LOAD BREAK SW, SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 4-WAY, 2 X 600A, 2 X 200A	30019976	CANADA POWER PRODUCTS (PRG6-44-29.3/32_6TT6/783A)
SF6 INSULATION, PAD MOUNT, 3-PH, 15kV, 5-WAY, 2 X 600A 3-PH GANGED SW, 3 X 200A 3-PH GANGED SW	10009891	CANADA POWER PRODUCTS (PG6-55-15/32//66222/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 15kV, 5-WAY, 2 X 600A 3-PH GANGED SW, 3 X 200A 3-PH GANGED VACUUM RFI	10009892	CANADA POWER PRODUCTS (PRG6-55-15/32//66TTT/783A)
SF6 INSULATION, PAD MOUNT, 3-PH, 15kV, 5-WAY, 3 X 600A 3-PH GANGED SW, 2 X 200A 3-PH GANGED SW	10009893	CANADA POWER PRODUCTS (PG6-55-15/32//66622/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 15kV, 5-WAY, 5 X 200A 3-PH GANGED SW	10009894	CANADA POWER PRODUCTS (PG6-55-15/32//22222/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 5-WAY, 3 X 600A 3-PH GANGED SW, 2 X 200A 3-PH GANGED SW	10008632	CANADA POWER PRODUCTS (PG6-55-29.3/32_66622/783)

SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 5-WAY, 2 X 600A 3-PH GANGED SW, 3 X 200A 3-PH GANGED SW	30016965	CANADA POWER PRODUCTS (PG6-55-29.3/32_66222/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 5-WAY, 5 X 200A 3-PH GANGED SW	30018797	CANADA POWER PRODUCTS (PG6-55-29.3/32_22222/783)
SF6 INSULATION, PAD MOUNT, 3-PH, 28kV, 5-WAY, 2 X 600A 3-PH GANGED SW, 3 X 200A 3-PH GANGED VACUUM RFI	30019078	CANADA POWER PRODUCTS (PRG6-55-29.3/32_6TTT6/783A)

**TAPE**

Description	MM#	Manufacturers (Part Number)
PVC BLACK FOR COLD TEMPERATURE, ELECTIRCAL INSULATION, 20mm WIDE	30008340	3M (37-3/4X66FT-1.5D)
ELECTRICAL INSULATION, PVC BLACK, VINYL, ADHESIVE, 2" WIDE	30008332	ROTUNDA (2501)
ELECTRICAL INSULATION, PVC BLACK, LINERLESS ETHYLENE PROPYLENE MATERIAL, ADHESIVE, 2" WIDE	30008386	3M (130C-2X30FT)
ELECTRICAL INSULATION, PVC BLACK, VINYL, ADHESIVE, 1" WIDE	30008334	3M ( 2155-1-1/2X22FT) PLYMOUTH RUBBER (T976) ROTUNDA (2504)
PVC BLACK FOR COLD TEMPERATURE, ELECTIRCAL INSULATION, 20mm WIDE	30008340	3M (37-3/4X66FT-1.5D)
EMBOSS PRESSURE SENSITIVE, 12mm BLUE	30010060	DYMO (15858) DYMO (410458) PCM LTD (ROTEX)
FIBERGLASS, MECHANICAL PROTECTION, STRUCTURAL MATERIAL, 15' LENGTH	30026374	CORNING INC ELECTRONIC (80611622582)
FOR PULLING CABLE , FLAT MULETAPE, NON-POWERED, 5/8" WIDE	20000007	GREENLEE TOOL (4436)
ELECTRICAL, SEMI CONDUCTIVE, 25.4mm WIDE X 4572mm LENGTH	30008333	3M (SCOTCH 13) PLYMOUTH RUBBER (2104) ROTUNDA (2520)
VINYL, PHASING, 3/4" WIDE BLUE	30020814	3M (80610833925_3M-66-BL)
VINYL, PHASING, 3/4" WIDE RED	30020815	3M (80610833909_3M-66-RD)
VINYL, PHASING, 3/4" WIDE WHITE	30020816	3M (80610833982_3M-66-WH)

**TERMINATION**

Description	MM#	Manufacturers (Part Number)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 1/0 SOL AL	30007446	3M (7663-S-8-SC0010) 3M (7663-S-8-SC1)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 2/0 COMPACT AL	30007447	3M (7663-S-8-SC10)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 2/0 COMPACT CU	10012411	3M (7663-S-8-SC20C)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 350 COMPACT CU	30007461	3M (7665-S-8-LCT-CSA-2-350STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 4/0 COMPACT CU	30007484	3M (7664-S-8-LCT-CSA-2-4/0STR)

COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 500 COMPACT CU	30007487	3M (7665-S-8-LCT-CSA-2-500STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 750 COMPACT CU	30007488	3M (7665-S-8-LCT-CSA-2-750STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 28kV, 1000 COMPACT CU	30007485	3M (7666-S-8-LCT-CSA-4-1000STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 46kV, 500 COMPACT CU	30007496	3M (4604N-LCT-CSA-2-500STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 46kV, 750 COMPRESSED CU	30007459	3M (4605N-LCT-CSA-2-750STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 46kV, 1000 COMPRESSED CU	30007458	3M (4605N-LCT-CSA-4-1000STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 46kV, 350 COMPACT CU	30007442	3M (4604N-LCT-CSA-2-350STR)
COLD SHRINK, U/G & SUBMARINE XLPE CABLE, 15kV, 1/0 SOL AL	30031793	3M (7652S-4-SC1) 3M (7652-S-4-SC0010 )

**TRANSFORMER, PADMOUNTED**

**Single Phase**

Description	MM#	Manufacturers (Part Number)
25kVA, 2.4kV-120/240V, 2 PRIMARY SW	30004860	CAM TRAN COMPANY LIMITED (M1BC02BB211CHY0100)
25kVA, 4.8kV-120/240V, NO PRIMARY SW	30004846	ABB (ABB-30004846) CAM TRAN COMPANY LIMITED (M1BE02DD202CHY0100)
25kVA, 2.4kV-120/240V, 2 PRIMARY SW	30004850	CAM TRAN COMPANY LIMITED (M1BC02DD201CHY0100) CES TRANSFORMERS (MINI-25-4800-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26551) ULS CORPORATE INC (ULS-SYA4-1084)
25kVA, 7.2kV-120/240V, NO PRIMARY SW, MICROPAD	30004847	ABB (ABB-30004847) CAM TRAN COMPANY LIMITED (M1BE02FF202CHY0100) ULS CORPORATE INC (ULS-SYA4-1082)
25kVA, 7.2kV-120/240V, 2 PRIMARY SW	30004849	CAM TRAN COMPANY LIMITED (M1BC02FF201CHY0100) CES TRANSFORMERS (MINI-25-7200-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26549) ULS CORPORATE INC (ULS-SYA4-1083)
25kVA, 8.0kV-120/240V, 2 PRIMARY SW	30011255	ABB (ABB-30011255) CAM TRAN COMPANY LIMITED (M1BC02GG201CHY0100)
25kVA, 14.4kV-120/240V, NO PRIMARY SW, MICROPAD	30004848	ABB (Y14B1Z6NK1) CAM TRAN COMPANY LIMITED (M1BE02LL202CHY0100)
25kVA, 14.4kV-120/240V, 2 PRIMARY SW	30010604	ABB (ABB-30010604) CAM TRAN COMPANY LIMITED (M1BC02LL201CHY0100)
25kVA, 16.0kV-120/240V, 2 PRIMARY SW	30004807	CAM TRAN COMPANY LIMITED (M1BC02MM201CHY0100) CES TRANSFORMERS (MINI-25-16000-120-240-DS-26-001-R9)

50kVA, 2.4kV-120/240V, 2 PRIMARY SW	30014627	CAM TRAN COMPANY LIMITED (CAMTRAN-30014627) CES TRANSFORMERS (MINI-50-2400-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26554)
50kVA, 4.8kV-120/240V, 2 PRIMARY SW	30004851	CAM TRAN COMPANY LIMITED (M1BC05DD201CHY0100) CES TRANSFORMERS (MINI-50-4800-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26547) ULS CORPORATE INC (ULS-SYA4-1085)
50kVA, 7.2kV-120/240V, 2 PRIMARY SW	30004852	ABB (ABB-30004852) CAM TRAN COMPANY LIMITED (M1BC05FF201CHY0100) CES TRANSFORMERS (MINI-50-7200-120-240-DS-26-001-R9)
50kVA, 8.0kV-120/240V, 2 PRIMARY SW	30011256	CAM TRAN COMPANY LIMITED (CAMTRAN-30011256) CES TRANSFORMERS (MINI-50-8000-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26556)
50kVA, 14.4kV-120/240V, 2 PRIMARY SW	30004758	ABB (ABB-30004758) CAM TRAN COMPANY LIMITED (M1BC05LL201CHY0100)
50kVA, 16.0kV-120/240V, 2 PRIMARY SW	30004871	CAM TRAN COMPANY LIMITED (M1BC05MM201CHY0100) CES TRANSFORMERS (MINI-50-16000-120-240-DS-26-001-R9)
50kVA, 4.8/16.0kV-120/240V, 2 PRIMARY SW	30033724	CAM TRAN COMPANY LIMITED (M1BC05MD201CHY0100)
75kVA, 2.4kV-120/240V, 2 PRIMARY SW	30014628	ABB (ABB-30014628) CAM TRAN COMPANY LIMITED (M1BC07BB211CHY0100)
75kVA, 4.8kV-120/240V, 2 PRIMARY SW	30004853	CAM TRAN COMPANY LIMITED (M1BC07DD201CHY0100) CES TRANSFORMERS (MINI-75-4800-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26552) ULS CORPORATE INC (ULS-SYA4-1086)
75kVA, 7.2kV-120/240V, 2 PRIMARY SW	30004854	CAM TRAN COMPANY LIMITED (M1BC07FF201CHY0100) CES TRANSFORMERS (MINI-50-8000-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26553)
75kVA, 8.0kV-120/240V, 2 PRIMARY SW	30011257	CAM TRAN COMPANY LIMITED (CAMTRAN-30011257) CES TRANSFORMERS (MINI-75-8000-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26555)
75kVA, 14.4kV-120/240V, 2 PRIMARY SW	30010809	CAM TRAN COMPANY LIMITED (M1BC07LL201CHY0100) CES TRANSFORMERS (MINI-75-14400-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26558)

75kVA, 16.0kV-120/240V, 2 PRIMARY SW	30004872	CAM TRAN COMPANY LIMITED (M1BC07MM201CHY0100) CES TRANSFORMERS (MINI-75-16000-120-240-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC26548) ULS CORPORATE INC (ULS-SYA4-1087)
100kVA, 2.4kV-120/240V, 2 PRIMARY SW	30014795	ABB (ABB-30014795) CAM TRAN COMPANY LIMITED (M1BC10BB211CHY0100)
100kVA, 4.8kV-120/240V, 2 PRIMARY SW	30004856	ABB (ABB-30004856) CAM TRAN COMPANY LIMITED (M1BC10DD201CHY0100) CES TRANSFORMERS (MINI-100-4800-120-240-DS-26-001-R9)
100kVA, 7.2kV-120/240V, 2 PRIMARY SW	30004857	ABB (ABB-30004857) CAM TRAN COMPANY LIMITED (M1BC10FF201CHY0100)
100kVA, 8.0kV-120/240V, 2 PRIMARY SW	30011258	ABB (ABB-30011258) CAM TRAN COMPANY LIMITED (M1BC10GG201CHY0100)
100kVA, 14.4kV-120/240V, 2 PRIMARY SW	30010975	ABB (D14B5Z6NK6) CAM TRAN COMPANY LIMITED (M1BC10LL201CHY0100)
100kVA, 16.0kV-120/240V, 2 PRIMARY SW	30004873	CAM TRAN COMPANY LIMITED (M1BC10MM201CHY0100) CES TRANSFORMERS (MINI-100-16000-120-240-DS-26-001-R9)
50kVA, 4.8/16.0kV-120/240V, 2 PRIMARY SW	30033724	CAM TRAN COMPANY LIMITED (M1BC05MD201CHY0100)
167kVA, 2.4kV-120/240V, 2 PRIMARY SW	30014035	ABB (DB3B6Z6NKF) CAM TRAN COMPANY LIMITED (M1BC16BB211CHY0100)
167kVA, 4.8kV-120/240V, 2 PRIMARY SW	30010751	ABB (ABB-30010751) CAM TRAN COMPANY LIMITED (M1BC16DD201CHY0100)
167kVA, 7.2kV-120/240V, 2 PRIMARY SW	30004865	ABB (ABB-30004865) CAM TRAN COMPANY LIMITED (M1BC16FF201CHY0100)
167kVA, 8.0kV-120/240V, 2 PRIMARY SW	30011259	ABB (ABB-30011259) CAM TRAN COMPANY LIMITED (M1BC16GG201CHY0100)
167kVA, 14.4kV-120/240V, 2 PRIMARY SW	30014030	ABB (ABB-30014030) CAM TRAN COMPANY LIMITED (M1BC16LL100CHY0100)
167kVA, 16.0kV-120/240V, 2 PRIMARY SW	30013994	ABB (ABB-30013994) CAM TRAN COMPANY LIMITED (M1BC16MM100CHY0100)

**Three Phase**

Description	MM#	Manufacturers (Part Number)
150kVA, 4.16/2.4kV-120/208V, LOOP FEED, WITH TAPS	30013233	ABB (ABB-30013233) CAM TRAN COMPANY LIMITED (M1DJ15BB111CHY0100)
150kVA, 4.16/2.4kV-347/600V, LOOP FEED, WITH TAPS	30014626	CAM TRAN COMPANY LIMITED (M1DJ15BB211CHY0100)

150kVA, 8.32/4.8kV-120/208V, LOOP FEED, NO TAPS	30004812	ABB (ABB-30004812) CAM TRAN COMPANY LIMITED (M1DJ15EE101CHY0100) HYUNDAI CANADA INC (GA2305-003-01)
150kVA, 8.32/4.8kV-347/600V, LOOP FEED, WITH TAPS	30004824	ABB (ABB-30004824) CAM TRAN COMPANY LIMITED (M1DJ15EE211CHY0100) HYUNDAI CANADA INC (GA2305-003-05)
150kVA, 12.47/7.2kV-120/208V, LOOP FEED, NO TAPS	30004813	ABB (ABB-30004813) CAM TRAN COMPANY LIMITED (M1DJ15JJ101CHY0100)
150kVA, 12.47/7.2kV-347/600V, LOOP FEED, WITH TAPS	30004825	CAM TRAN COMPANY LIMITED (M1DJ15JJ211CHY0100)
150kVA, 13.8/8.0kV-120/208V, LOOP FEED, NO TAPS	30011261	CAM TRAN COMPANY LIMITED (M1DJ15MM101CHY0100)
150kVA, 13.8/8.0kV-347/600V, LOOP FEED, WITH TAPS	30011262	ABB (ABB-30011262) CAM TRAN COMPANY LIMITED (M1DK15GG211CHY01003)
150kVA, 24.9/14.4kV-347/600V, LOOP FEED, WITH TAPS	30004826	ABB (V9RW496NPM) CAM TRAN COMPANY LIMITED (M1DK15QQ211CHY0100)
150kVA, 24.9/14.4kV-120/208V, LOOP FEED, NO TAPS	30004814	CAM TRAN COMPANY LIMITED (M1DK15QQ101CHY0100)
150kVA, 27.6/16.0kV-120/208V, LOOP FEED, NO TAPS	30004815	ABB (ABB-30004815) CAM TRAN COMPANY LIMITED (M1DK15RR101CHY0100)
150kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30004827	ABB (ABB-30004827) CAM TRAN COMPANY LIMITED (M1DK15RR211CHY0100)
300kVA, 4.16/2.4kV-120/208V, LOOP FEED, WITH TAPS	30004859	ABB (ABB-30004859) CAM TRAN COMPANY LIMITED (M1DJ30BB111CHY0100)
300kVA, 4.16/2.4kV-347/600V, LOOP FEED, WITH TAPS	30014141	ABB (ABB-30014141) CAM TRAN COMPANY LIMITED (M1DJ30BB211CHY0100)
300kVA, 8.32/4.8kV-120/208V, LOOP FEED, NO TAPS	30004816	ABB (ABB-30004816) CAM TRAN COMPANY LIMITED (M1DJ30EE101CHY0100)
300kVA, 8.32/4.8kV-347/600V, LOOP FEED, WITH TAPS	30004828	ABB (ABB-30004828) CAM TRAN COMPANY LIMITED (M1DJ30EE211CHY0100) HYUNDAI CANADA INC (GA2305-003-06)
300kVA, 12.47/7.2kV-120/208V, LOOP FEED, NO TAPS	30004817	ABB (ABB-30004817) CAM TRAN COMPANY LIMITED (M1DJ30JJ101CHY0100)
300kVA, 12.47/7.2kV-347/600V, LOOP FEED, WITH TAPS	30004829	ABB (ABB-30004829) CAM TRAN COMPANY LIMITED (M1DJ30JJ211CHY0100)
300kVA, 13.8/8.0kV-120/208V, LOOP FEED, NO TAPS	30011263	CAM TRAN COMPANY LIMITED (M1DJ30MM101CHY0100)

300kVA, 13.8/8.0kV-347/600V, LOOP FEED, WITH TAPS	30011265	ABB (V81W536P4L) CAM TRAN COMPANY LIMITED (M1DJ30MM211CHY0100)
300kVA, 24.9/14.4kV-120/208V, LOOP FEED, NO TAPS	30004818	ABB (ABB-30004818) CAM TRAN COMPANY LIMITED (M1DK30QQ101CHY0100)
300kVA, 24.9/14.4kV-347/600V, LOOP FEED, WITH TAPS	30004830	CAM TRAN COMPANY LIMITED (M1DK30QQ211CHY0100)
300kVA, 27.6/16.0kV-120/208V, LOOP FEED, NO TAPS	30004819	ABB (ABB-30004819) CAM TRAN COMPANY LIMITED (M1DK30RR101CHY0100) HYUNDAI CANADA INC (GA2305-003-02)
300kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30004831	ABB (ABB-30004831) CAM TRAN COMPANY LIMITED (M1DK30RR211CHY0100) HYUNDAI CANADA INC ( GA2305-003-07)
500kVA, 4.16/2.4kV-120/208V, LOOP FEED, WITH TAPS	30010681	ABB (JC23268) CAM TRAN COMPANY LIMITED (M1DK50BB111CHY0100) CES TRANSFORMERS (LOOP-500-4160Y-208Y-DS-26-001-R9) HYUNDAI CANADA INC (GA2305-003-10)
500kVA, 4.16/2.4kV-347/600V, LOOP FEED, WITH TAPS	30010680	ABB (ABB-30010680) CAM TRAN COMPANY LIMITED (M1DK50BB211CHY0100)
500kVA, 8.32/4.8kV-120/208V, LOOP FEED, NO TAPS	30004820	CAM TRAN COMPANY LIMITED (M1DK50EE101CHY0100) HITACHI ENERGY CANADA INC (JC23267) HYUNDAI CANADA INC (GA2305-003-03)
500kVA, 8.32/4.8kV-347/600V, LOOP FEED, WITH TAPS	30004832	ABB (JC23266) CAM TRAN COMPANY LIMITED (M1DK50EE211CHY0100) CES TRANSFORMERS (LOOP-500-8320Y-600Y-DS-26-001-R9) HYUNDAI CANADA INC (GA2305-003-08)
500kVA, 12.47/7.2kV-120/208V, LOOP FEED, NO TAPS	30004821	ABB (JC23269) CAM TRAN COMPANY LIMITED (M1DK50JJ101CHY0100) CES TRANSFORMERS (LOOP-500-12470Y-208Y- DS-26-001-R9) HYUNDAI CANADA INC (GA2305-003-04)
500kVA, 12.47/7.2kV-347/600V, LOOP FEED, WITH TAPS	30004833	ABB (ABB-30004833) CAM TRAN COMPANY LIMITED (M1DK50JJ211CHY0100)
500kVA, 13.8/8.0kV-120/208V, LOOP FEED, NO TAPS	30011266	ABB (VJ9A566P4M) CAM TRAN COMPANY LIMITED (3PHPAD500-8-208-NT)
500kVA, 13.8/8.0kV-347/600V, LOOP FEED, WITH TAPS	30011267	ABB (JC23270) CAM TRAN COMPANY LIMITED (CAMTRAN-30011267) HYUNDAI CANADA INC (GA2305-003-11)
500kVA, 24.9/14.4kV-120/208V, LOOP FEED, NO TAPS	30004822	CAM TRAN COMPANY LIMITED (M1DK50QQ101CHY0100)
500kVA, 24.9/14.4kV-347/600V, LOOP FEED, WITH TAPS	30004834	ABB (V19W566P7Q) CAM TRAN COMPANY LIMITED (M1DK50QQ211CHY0100)

500kVA, 27.6/16.0kV-120/208V, LOOP FEED, NO TAPS	30004823	ABB (ABB-30004823) CAM TRAN COMPANY LIMITED (M1DK50RR101CHY0100)
500kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30004835	CAM TRAN COMPANY LIMITED (M1DK50RR211CHY0100) HITACHI ENERGY CANADA INC (JC23265)
750kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30004875	CAM TRAN COMPANY LIMITED (M1DN75RR211CHY0100) HYUNDAI CANADA INC (GA2305-003-14)
1000kVA, 7.2/12.47kV-347/600V, LOOP FEED, WITH TAPS	30034850	ABB (JC23306) CAM TRAN COMPANY LIMITED (M1DN97JJ211CHY0100) CES TRANSFORMERS (LOOP-1000-12470Y-600Y-DS-26-001-R9) HYUNDAI CANADA INC (GA2305-003-12)
1000kVA, 8.32/4.8kV-347/600V, LOOP FEED, WITH TAPS	30004870	CAM TRAN COMPANY LIMITED (M1DN97EE211CHY0100) CES TRANSFORMERS (LOOP-1000-8320Y-600Y-DS-26-001-R9) HITACHI ENERGY CANADA INC (JC23263) HYUNDAI CANADA INC (GA2305-003-13)
1000kVA, 13.8/8kV-347/600V, LOOP FEED, WITH TAPS	30036432	CAM TRAN COMPANY LIMITED (M1DN97MM211CHY0100) HITACHI ENERGY CANADA INC (JC23271)
1000kVA, 24.9/14.4kV-347/600V, LOOP FEED, WITH TAPS	30004864	CAM TRAN COMPANY LIMITED (M1DN97QQ211CHY0100) HITACHI ENERGY CANADA INC (JC23307)
1000kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30004866	ABB (JC22995) CAM TRAN COMPANY LIMITED (M1DN97RR211CHY0100) CES TRANSFORMERS (LOOP-1000-27600Y-600Y-DS-26-001-R9) HYUNDAI CANADA INC (GA2305-003-09)
1500kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30037283	CAM TRAN COMPANY LIMITED (M1DN98RR211CHY0100) CES TRANSFORMERS (LOOP-1500-27600Y-600Y-DS-26-001-R9)
2000kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30037284	CAM TRAN COMPANY LIMITED (M1DN95RR211CHY0100) CES TRANSFORMERS (LOOP-2000-27600Y-600Y-DS-26-001-R9)
2500kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30037129	CAM TRAN COMPANY LIMITED (M1DN96RR211CHY0100) CES TRANSFORMERS (LOOP-2500-27600Y-600Y-DS-26-001-R9)
3000kVA, 27.6/16.0kV-347/600V, LOOP FEED, WITH TAPS	30037130	CAM TRAN COMPANY LIMITED (M1DN99RR211CHY0100) CES TRANSFORMERS (LOOP-3000-27600Y-600Y-DS-26-001-R9)

**TRANSFORER, PARTS**

Description	MM#	Manufacturers (Part Number)
GALVANIZED STEEL COVER FOR 1PH TF 150kVA	30041391	EJ (688007)

**TIE, CABLE**

Description	MM#	Manufacturers (Part Number)
SELF-LOCK, 1/16" - 5/8" DIA, 0.091" WIDE, 3.62" LONG	10000374	BURNDY INC (CT18075M0) PANDUIT (PLT1MMO) T&B (TY23MX) WIELAND (ET3M)
SELF-LOCK, 1/16" - 1 1/4" DIA, 0.14" WIDE, 5.5" LONG	30008033	BURNDY INC (CT30125MO) PANDUIT (PLT15IMO) T&B (TY24MX) WIELAND (ET5M)
1/16" - 1 3/4" DIA., 7 1/2" LENGTH	30008071	BURNDY INC (CT50175MO) PANDUIT (PLT2SMO) T&B (TY25MX) WIELAND (ET7M)
SELF-LOCK, 1/16" - 3" DIA, 0.14" WIDE, 11.1" LONG	30007966	BURNDY INC (CT50300C00) PANDUIT (PLT3SMO) T&B (TY526MX)
SELF-LOCK, 1/16" - 4" DIA, 0.184" WIDE, 14.2" LONG	30008034	BURNDY INC (CT50400CO) PANDUIT (PLT4SMO) T&B (TY28MX) WIELAND (ET14MX)
SELF-LOCK, 3/16" - 3 1/2" DIA, 0.27" WIDE, 13.4" LONG	30007873	BURNDY INC (CT120400DO) PANDUIT (PLT4HDO) T&B (TY27MX) WIELAND (ET13MX)
SELF-LOCK, 4" DIA, 0.187" WIDE, 14.2" LONG	30007949	T&B (TY528M)
SELF-LOCK, 1 1/8" DIA, 0.14" WIDE, 5.5" LONG	30007955	T&B (TY524M)
Secondary UG Cable Tie, White, 12" LONG	30040974	TYTON CORP (T5019C2)

**VAULT**

**Primary**

Description	MM#	Manufacturers (Part Number)
LID (2 PIECES), VAULT, PRECAST CONCRETE, 6' X 6' ELECTRICAL MANHOLE VAULT	30033979	ARMTEC LIMITED (BCP114PBH20 BASE C/W BCP114T9H20 LID)
LID (2 PIECES), PRECAST CONCRETE, ROADWAY RATED, 8' X 12' ELECTRICAL MANHOLE VAULT	30033407	ACTON PRECAST CONCRETE LTD (APC 8-12 MANHOLE) UTILITY STRUCTURES INC (USI E-812(HO))
LID (2 PIECE) + FOUNDATION, PRECAST CONCRETE, FOR 1-PH PRIMARY METERING UNIT, COMPLETE WITH PVC/PE SEALS	30038212	BROOKLIN CONCRETE PRODUCTS (BCP 112T6THO AND BCP 112P)

**Secondary, vault**

Description	MM#	Manufacturers (Part Number)
UG CABLE CONNECTION, LOACKABLE, LIGHT DUTY, TOP 32" X 19", HEIGHT 18"	30007456	OLDCASTLE ENCLOSURE SOLUTIONS (17301020) PENCELL (PE30HDXCL841)
UG CABLE CONNECTION, BELOW GRADE, LOACKABLE, 41" L X 29" W X 36" DEPTH	30007486	CHANNELL COMMERCIAL (BULKU2436360062322)
PAD-MOUNTED, 600A, 600 V, 3-WIRE, METAL ENCLOSED. 20" X 18" X 42	30033171	PEDESTAL SOLUTIONS INC. (LVTC42-1P-3W)

**WASHER**

Description	MM#	Manufacturers (Part Number)
12.7mm BOLT HOLE, 34.9mm OD, 14.8mm ID	30001591	NIAGARA FASTENERS INC (BSFW12-G-C-83) PAULIN, MS ELAINE (B856-418_CJI P/N HDGFW-9)
1/4" BOLT, 9/16" O.D.	30001623	CHARLES JONES INDUSTRIAL (BFW-4_COOK FAST P/N 23RC#14) NIAGARA FASTENERS INC (BRFW14)
ROUND, 1/2" BOLT, 0.562" ID, 1.375" OD, 0.109" THK	30001681	NIAGARA FASTENERS INC (BZFW12) SPAENAUR INC (W557)
GALV. STEEL, 1/2" BOLT HOLE, 0.903" (23mm) O.D.	30001605	NIAGARA FASTENERS INC (RELW12-G) SLACAN INDUSTRIES INC (22333_MC23291) STELFAST FASTENERS INC (DMLGA05000_CJI P/N GLW-8)
WASHER, ROUND STAINLESS, FLAT, FOR 3/4" BOLT	30014464	BURNDY INC (75FWSS) NIAGARA FASTENERS INC (SSFW34-S1)
WASHER-LOCK, SPRING-19MM Bolt-32.5MM-OD	10000108	NIAGARA FASTENERS INC (RELW34-G-83) SLACAN INDUSTRIES INC (22336_MC23293)
SILICON BRONZE, 1/2" BOLT HOLE, 0.879" (22.3mm) O.D.	30001611	CHARLES JONES INDUSTRIAL (SBLW-8_GENERIC) H PAULIN & COMPANY LIMITE (5458-022) NIAGARA FASTENERS INC (BZLW12) RN COLVILLE & SON LIMITED (1212-023SB)
SILICON BRONZE, 3/8" BOLT HOLE, 0.689" (17.5mm) O.D.	30001610	NIAGARA FASTENERS INC (BZLW38)
GALV. STEEL, 3/8" BOLT HOLE, 0.703" (17.9mm) O.D.	30001628	NIAGARA FASTENERS INC (RELW38-G)
3/8" BOLT HOLE, 1.2" OD, 0.437" ID	30001674	KEY BELLEVILLES INCORPORA (K0750-C076-ZC_CJ P/N BELW-6) NIAGARA FASTENERS INC (1964-0) SLACAN INDUSTRIES INC (TP5044_MC22907)
9.5mm BOLT HOLE, 25.4mm OD, 11.1mm ID, 2mm THICK	30031199	NIAGARA FASTENERS INC (BSFW38-G-83)
13/16" BOLT, 2" X 2"	30001595	SLACAN INDUSTRIES INC (81721_MC81721)

**WASHER, CURVED**

Description	MM#	Manufacturers (Part Number)
13/16" BOLT HOLE, DIMENSION 4" X 5"	30001613	SLACAN INDUSTRIES INC (63834F_MC82005F)