Technical Guidelines for Electrical Services Over 400 Amperes

(Former Waterloo North Hydro Service Territory)

These guidelines are for property owners, developers, consultants, etc. ("Customer") to use when coordinating a new or upgraded electrical service to a property ("Service"). They must be used in conjunction with the Conditions of Service for Enova Power Corp. ("Enova") for the former Waterloo North Hydro Inc. service territory, Enova Metering Specifications, Enova Service Connection Process, the Ontario Building Code ("OBC"), the Ontario Electrical Safety Code ("OESC") and all other applicable regulations.

1. General

1.1 Contact Enova's Engineering Department prior to starting design to determine specific servicing requirements and service configuration type.

1.2 Customer to follow Enova specified design timelines and document submission requirements as per the Enova's *"Service Connection Process for Property Developments Requiring Site Plan Review"* document.

1.3 All materials, labour and trucking costs associated with the installation, relocation, removal, etc. of Enova-owned infrastructure for the purpose of the Service is 100% chargeable to the Customer, with the exception of transformation when supplied by Enova.

1.4 In most cases, Enova will provide and own transformer(s) and high voltage cables and the Customer will supply and install all required hydro civil work that may be required within the property. Refer to Appendix for installation details.

1.5 Enova may require multiple transformers and/or high voltage duct banks and/or switchgear on the property to provide a looped configuration of the Service if installation requires more than one transformer. This will minimize power outages and aid scheduled maintenance. Refer to Enova Conditions of Service for more details.

2. Typical Infrastructure Required

2.1 Underground high voltage duct bank(s), from a point of supply/supplies from Enova's distribution system to the transformer(s) and/or switchgear unit(s);

2.2 Pad-mounted transformer(s) located on the Customer's property complete with bollards, or electrical equipment vault room in the building containing transformers;

2.3 Pad-mounted or submersible switchgear unit(s) complete with bollards located on Customer's property, or electrical equipment vault room in the building containing switchgear unit(s);

2.4 An underground low voltage duct bank from the pad-mounted transformer(s) to the building(s);

2.5 Overhead infrastructure such as overhead primary conductors, load breaks, hydro poles, polemounted transformer(s), primary metering units and outdoor-rated enclosures for metering and SCADA equipment;

2.6 An electrical room in the building containing low voltage distribution, metering equipment and if required SCADA equipment.

3. Easement Requirements

3.1 Generally, Enova requires easement(s) for Enova owned high voltage infrastructure on private property. The easements are to be free of any structures, other underground utilities, tree roots, etc. The Customer shall provide easement(s) per the following:

3.1.1 A minimum of 3.0m wide easement over an underground high-voltage duct bank;

3.1.2 6.2m x 6.8m easement for the installation of an outdoor pad-mounted transformer;

3.1.3 7.0m x 7.0m easement for the installation of an outdoor switchgear unit;

3.1.4 Easement over entirety of electrical equipment vault rooms that contain Enova infrastructure;

3.1.5 Easement over guy anchors from Enova hydro poles.

4. Clearance Requirements

4.1 A building, or any other structure, shall not be constructed within 5 meters, measured horizontally, of a high voltage overhead distribution system pole line owned by Enova (OBC 3.1.19 and OESC 75-708). When planning building construction, Customer should consider additional space required for construction (i.e. skyjacks, scaffolding, etc.), and maintenance (i.e. window cleaning).

4.2 An object (crane, similar hoisting device, backhoe, power shovel or other vehicle or equipment) shall not be brought closer than 3 meters to an energized overhead conductor owned by Enova (O.Reg 213/91 – Section 188).

4.3 Enova will not provide nor permit a third party contractor to cover-up and/or provide isolation of its energized overhead conductors that lie along a construction site (O.Reg 213/91 – Section 189).

5. Space Requirements

5.1 A minimum of 3 meters on the access side of a pad-mounted transformer and a minimum of 1 meter on the non-access side and/or switchgear unit is

required free and clear of any obstructions for operational purposes. This area shall have a level grassed surface. If a curb runs through this area, it shall be dropped unless it is within 2 meters of the transformer and/or switchgear unit.

5.2 A minimum of 1 meter in front of Enova-owned metering equipment with a minimum ceiling height of 2.1m is required for working space inside the electrical room. Refer to Enova's Metering Specifications for additional requirements.

5.3 Where adequate land area cannot be provided for a pad-mounted transformer, the Customer shall provide Enova with an electrical equipment vault room at grade level accessible directly from outside. Refer to Enova's Vault Room Standards in Appendices for requirements.

5.4 To access pad-mounted transformer(s) or electrical equipment vault room(s), the Customer shall provide Enova with a maintained road that is minimum 4.0m wide, with a minimum 15m turning radius, clear of any obstructions and capable of sustaining a maximum load of 25,000 kg to access the transformer(s), switchgear unit(s) or vault room(s). Any canopy or other parts of the building above the access driveway must be minimum 5.0 m above roadway. An 8.5m wide space is required for truck outriggers at the transformer location. Furthermore, extra 2.5m is required between the transformer and the truck to accommodate minimum swing of the truck mounted crane.

6. Access Requirements

6.1 The Customer must provide or arrange free, safe and unobstructed access to any authorized representative of Enova for the purpose of Enova equipment maintenance, inspection, replacement etc.

6.2 The Customer shall be responsible for supplying Enova a key for the premises if required to access Enova-owned equipment. Enova may request that the lock be keyed to Enova specifications.

6.3 Meter rooms, for multi-unit metering, shall be accessible to Enova via an outside lockable door at grade level. The minimum door dimensions shall be 2000mm x 810mm (6'8" x 2'8"). The Customer shall be responsible for supplying a key to Enova. Lighting levels of at least 6 lux (65 footcandles) shall be maintained.

7. Installation Details

The Customer shall provide the required infrastructure in a location compliant with this document and approved by Enova, installed as per the following standards:

7.1 Transformer Installations:

7.1.1 Refer to Enova Standard 12-300A1 for the Brooklin Concrete Products Ltd. BCP-104SW transformer vault.

7.1.2 Refer to Enova Standard 12-300A2 for the Brooklin Concrete Products Ltd. BCP-104SW transformer vault grounding installation requirements.

7.2 Vault Room Installations:

7.2.1 Refer to Enova Standards 12-350A1 to 12-350A4 for installation requirements.

7.3 Switchgear Unit Installations:

7.3.1 Refer to Enova Standard 12-311A10 for Acton Precast Vista switchgear vault installation requirements.

7.3.2 Refer to Enova Standard 12-311A11 for Acton Precast Vista switchgear vault grounding installation requirements.

7.4 Duct Bank Installations:

7.4.1 Refer to Enova Standard 12-404A1 for branch duct bank installation requirements (1/0 concentric neutral cable primary duct banks).

7.4.2 Refer to Enova Standard 12-404A2 for trunk line duct bank installation requirements (750kcmil primary duct banks). Note: this standard may also be used if depth of cover is minimal.

7.5 Metering Installations:

7.5.1 Refer to the latest edition of the Enova Metering Specifications for former Waterloo North Hydro service territory and the site specific metering standards listed in the 'Offer to Connect' documentation for installation requirements.

7.5.2 If the site is fed from a customer owned distribution transformer the Customer must make provisions for bulk metering to accommodate a transformer discount meter. Refer to the latest edition of the Enova Metering Standard MS-30C found in the Enova Metering Specifications for former Waterloo North Hydro service territory for further details.

Appendices:

- 12-300A1 – Custom BCP-104SW 3 Phase Transformer Vault
- 12-300A2 – Custom BCP-104SW Vault and Ground Grid Installation Details
- 12-311A10 – Acton Precast 110"x121" Vault for Vista Switchgear
- 12-311A11 – Acton Precast 110"x121" Vault and Ground Grid Installation Details
- 12-350A1 – Transformer Vault Room Requirements
- 12-350A2 – Transformer Vault Room – Layout (Transformers up to 300kVA)
- 12-350A3 – Transformer Vault Room – Layout (Transformers greater than 300kVA)
- 12-350A4 – Transformer Vault Room – Secondary Transition Bus Details

- 12-404A1 – Typical Concrete Encased Duct Structures for 200A Installations (Rebar on the Bottom Only)
- 12-404A2 – Typical Concrete Encased Duct Structures for 200 or 600A Installations (Rebar Top and Bottom)

Note:

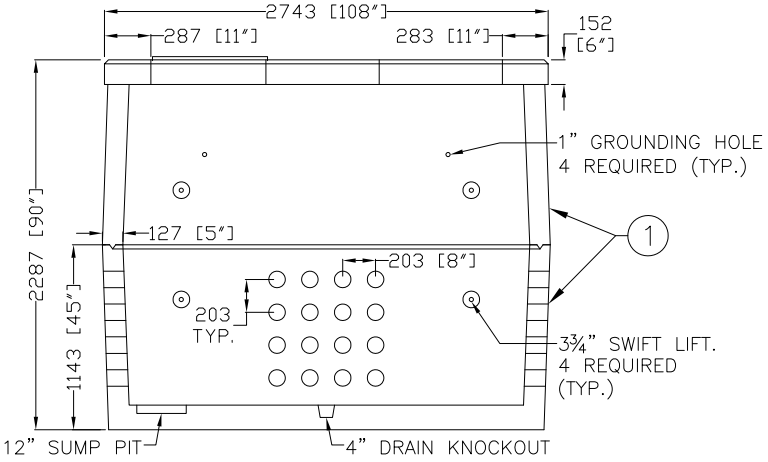
Any standards provided by Enova are the sole property of Enova Power Corp. and are provided for information purposes only. The standards may be used in preparation of construction plans and specifications concerning Enova owned equipment only. No other use is authorized without prior written consent of Enova.

WATERLOO NORTH HYDRO INC.

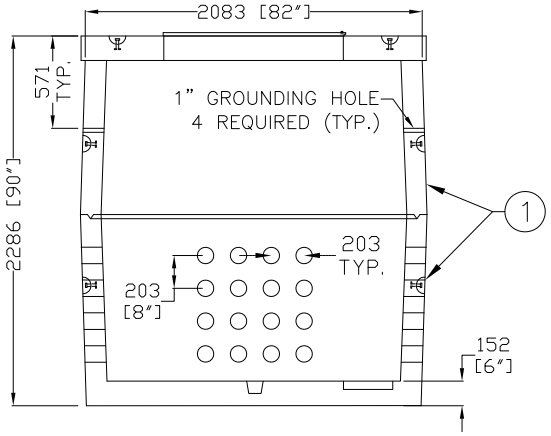
DATE:	SCALE:	REV.	DWG. NO.
2017-04-30	NTS	0	12-300A1

TITLE: **CUSTOM BCP-104SW 3 PHASE TRANSFORMER VAULT**

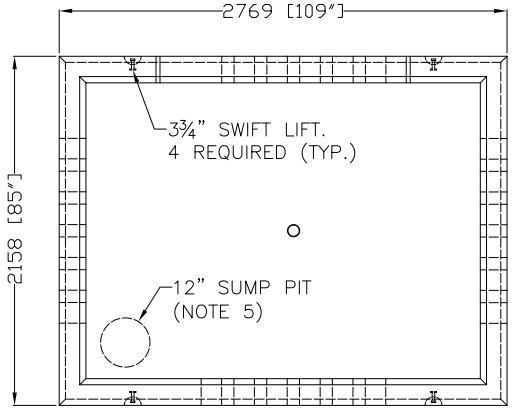
FRONT VIEW



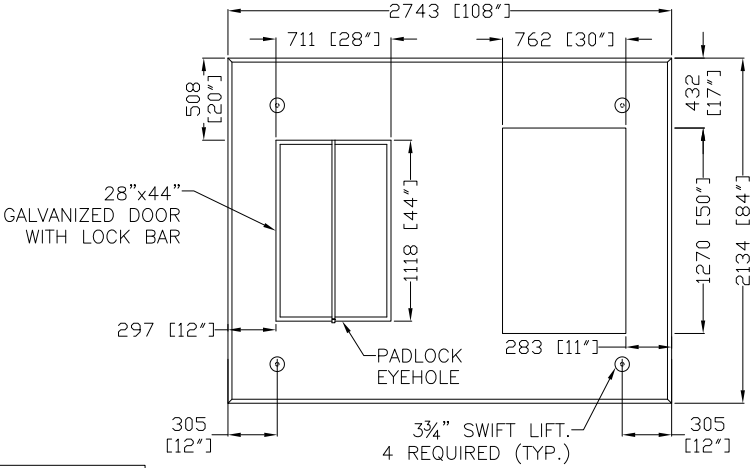
SIDE VIEW



TOP VIEW

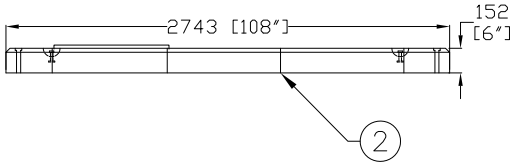


LID TOP VIEW



CONCRETE:	BCP104SW WEIGHT:
35MPa/500PSI AIR ENTRAINMENT: 6–8%	20,485LBS/9,290kg
	BCP104SW LID WEIGHT: 2929LBS/1327kg
REINFORCEMENT:	
STEEL TO CSA CAN A23.1/A23.3. G30.18 Fy=400MPa	MAX EQUIPMENT WEIGHT: 35,000 LBS.

LID FRONT VIEW



GENERAL NOTES:

1. CABLE ENTRY OPENINGS–PVC SEALS FOR MAX. 4" I.D. DUCT.
2. DELIVERY IS MADE BY CRANE–EQUIPPED TRUCKS, EXCAVATION MUST BE READY, SAFE AND ACCESSIBLE FOR UNLOADING FROM THE REAR OF THE TRUCK.
3. MIN OVERHEAD CLEARANCE OF 18FT IS REQUIRED.
4. ALL UNITS MUST BE HANDLED WITH PROPER LIFTING EQUIPMENT. (I.E. SPREADER BAR).
5. SUMP PUMP PIT TO BE UNDER THE GALVANIZED DOOR SIDE.
6. LID TO BE ROTATED AND INSTALLED AS PER THE WNH DRAWING.
7. WATER PRESSURE WAS NOT CONSIDERED IN THE STRUCTURAL DESIGN. REPORT WATER TABLE DURING CONSTRUCTION.
8. PLACE BACKFILL SIMULTANEOUSLY AROUND THE VAULT TO AVOID UNBALANCE LATERAL EARTH PRESSURES.
9. BACKFILL SHOULD BE UNIFORMLY COMPACTED TO A MINIMUM OF 98% MATERIALS SPMDD.

**ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED.

REV.	DESCRIPTION	DATE	INITIALS
1	UPDATED CUSTOM VAULT TO 3 PIECE BCP104SW.	2018-07-05	MS

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

Name _____ Date _____

Signature & Professional Designation _____

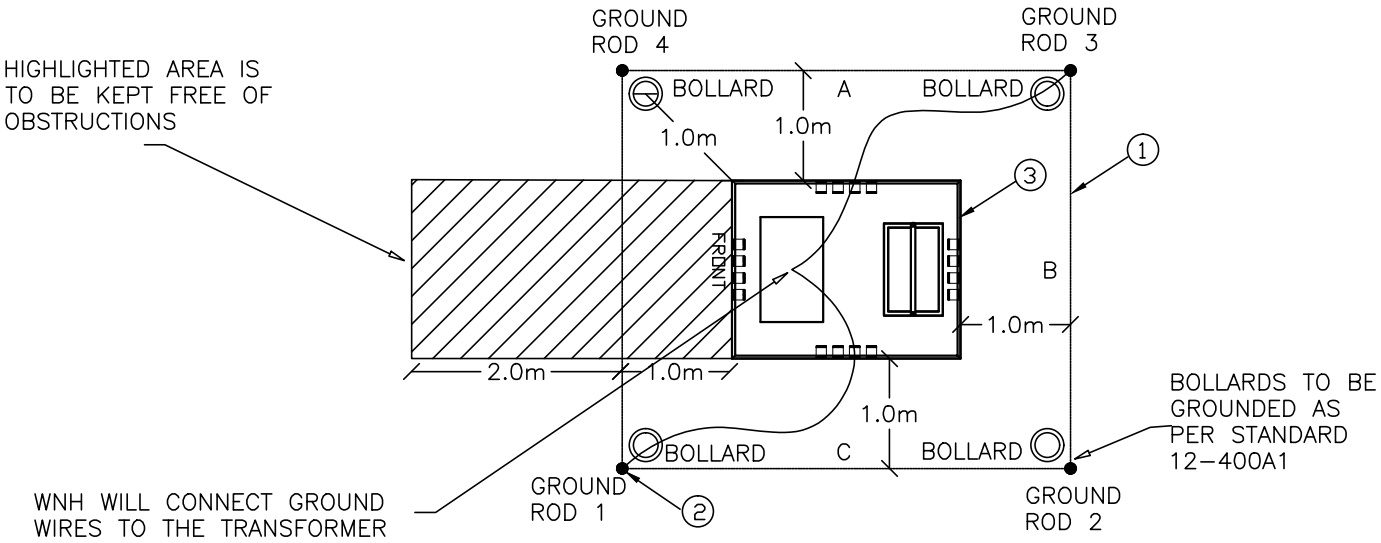
STANDARD **12-300A1**

Material List			
Item	Quantity	Description	HTE Part #
1	1	2 piece Foundation, Concrete BCP104SW	205 030 00015
2	1	BCP104SW Concrete lid	

WATERLOO NORTH HYDRO INC.

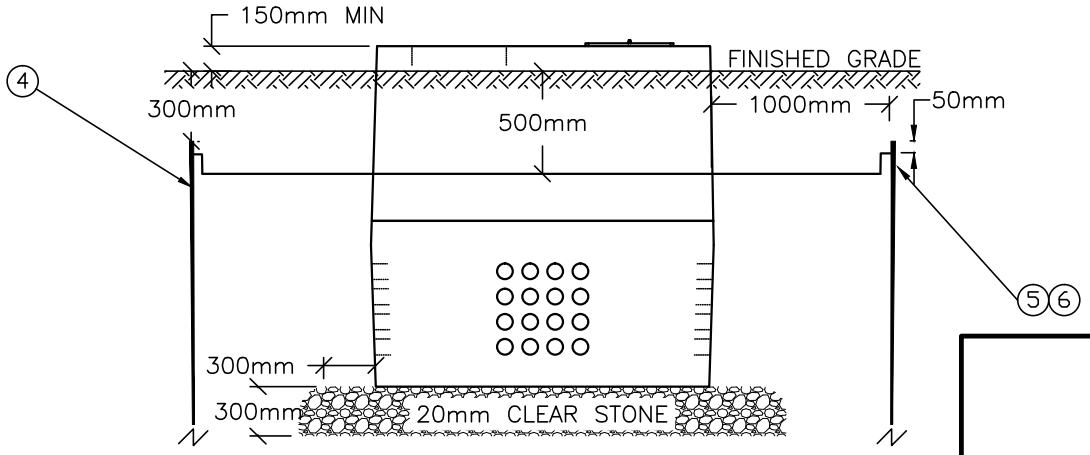
DATE:	SCALE:	REV.	DWG. NO.
2017-04-30	NTS	0	12-300A2

TITLE: **CUSTOM BCP-104S VAULT AND GROUND GRID INSTALLATION DETAILS**



BOLLARDS ARE TO BE INSTALLED ONLY IF THEY ARE REQUIRED TO PROTECT WNH EQUIPMENT FROM VEHICLE TRAFFIC. BOLLARD PLACEMENT SHOULD NOT INTERFERE WITH OPERATION, MAINTENANCE OR REPLACEMENT OF WNH EQUIPMENT.

ADDITIONAL BOLLARDS AT LOCATIONS A, B, C MAY BE REQUIRED FOR HIGH TRAFFIC AREAS



CUSTOMER TO INSTALL GROUNDING GRID PER WNH AND ESA STANDARDS:

1. FEED GROUNDING WIRE FROM INSIDE VAULT THROUGH LIFTING HOLE TO FASTEN TO GROUND ROD #1 WITH AMP TAP.
2. FASTEN GROUNDING WIRE TO GROUND RODS #2, #3 AND #4 WITH AMP TAPS MAINTAINING 500mm DEPTH FOR GROUNDING WIRE.
3. FASTEN GROUNDING WIRE TO GROUNDING WIRE AT GROUND ROD #1.
4. FEED GROUNDING WIRE FROM INSIDE VAULT THROUGH LIFTING HOLE TO FASTEN TO GROUND ROD #3 WITH AMP TAP.

*– DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED

REV.	DESCRIPTION	DATE	INITIALS

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

Name _____ **Date** _____

Signature & Professional Designation _____

STANDARD **12-300A2**

Material List			
Item	Quantity	Description	HTE Part #
1	28m	Conductor 2/O Bare Strand Copper	220 100 00020
2	2	Connector, C Type 2/O - 2/O Copper	230 030 00021
3	1	Foundation Concrete BCP-104S	205 030 00015
4	4	Ground Rod, Copper Clad 20mm x 3048mm	280 115 00006
5	4	Tap Wedge Blue 350 - 2/O	230 185 00061
6	4	Cartridge Blue Tap	230 120 00020

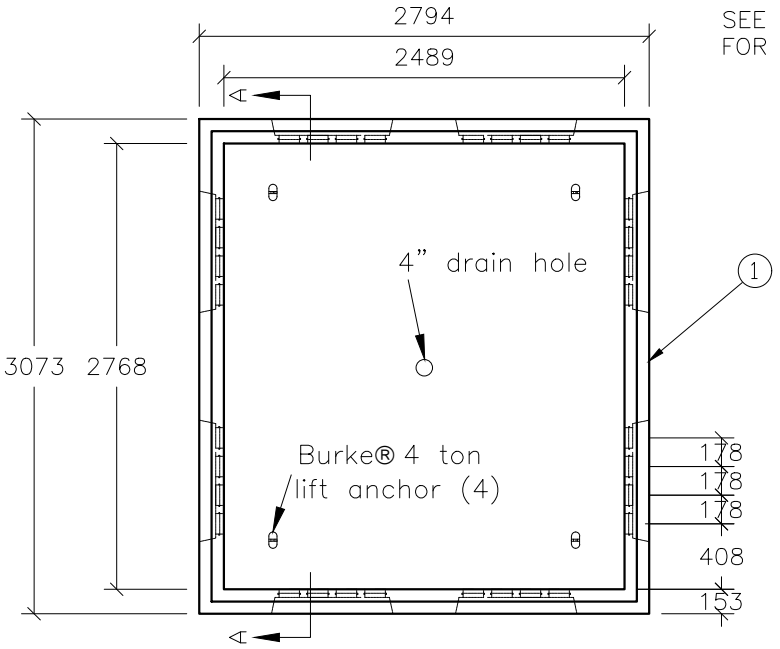
WATERLOO NORTH HYDRO INC.

DATE:	SCALE:	REV.	DWG. NO.
2019-04-25	NTS	1	12-311A10

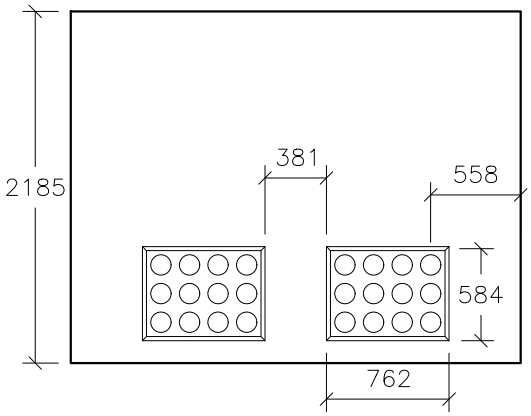
TITLE:

ACTON PRECAST 110"X121" VAULT FOR VISTA SWITCHGEAR

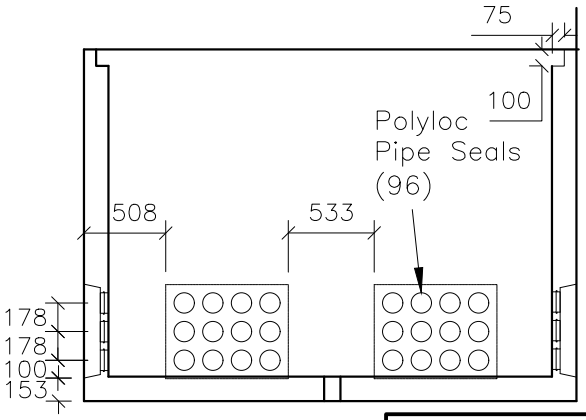
PLAN VIEW



FRONT VIEW



SECTION A-A



NOTES:
1. CONCRETE 32 Mpa MIN. AIR-7%
2. REINFORCING: 15m @12" c/c b.w.
3. FINISH: STEEL FORM SMOOTH
4. APPROX. WEIGHT: 11794kg
5. DELIVERY IS MADE BY CRANE EQUIPPED TRUCKS.
   EXCAVATION MUST BE READY AND ACCESSIBLE FROM THE TRUCK.
6. MINIMUM OVERHEAD CLEARANCE OF 18FT FOR DELIVERY IS REQUIRED.

*- DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED

REV.	DESCRIPTION	YY.MM.DD	INITIALS
1	Material List Updated	2019-04-25	C.M. R.J.

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

Name _____ **Date** _____

Signature & Professional Designation _____

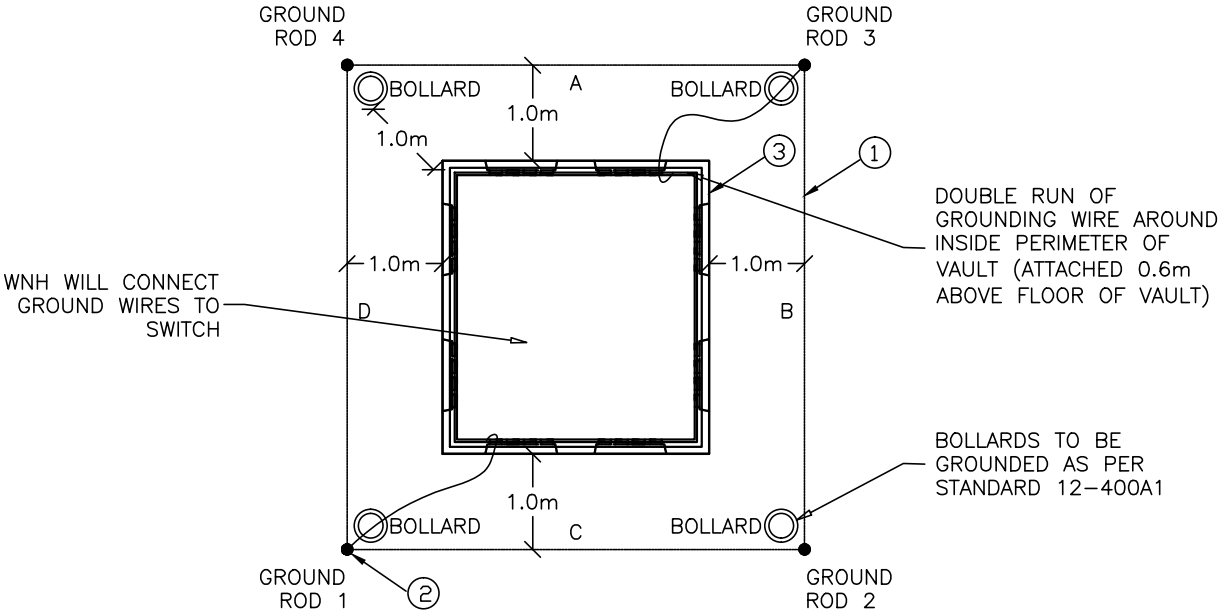
STANDARD 12-311A10

Material List			
Item	Quantity	Description	HTE Part #
1	1	Vault for Vista Switchgear (121" x 110")	205 010 00060
2	1	Vista Lid (121" x 110")	205 040 00018
3	1	Lock, 2" Shank Abus	280 090 00006

WATERLOO NORTH HYDRO INC.

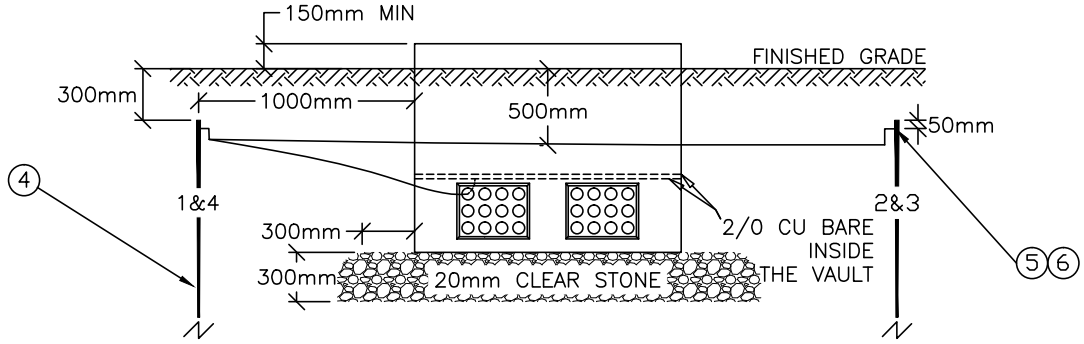
DATE:	SCALE:	REV.	DWG. NO.
2017-04-30	NTS	0	12-311A11

TITLE: **ACTON PRECAST 110" X 121" VAULT AND GROUND GRID INSTALLATION DETAIL**



BOLLARDS ARE TO BE INSTALLED ONLY IF THEY ARE REQUIRED TO PROTECT WNH EQUIPMENT FROM VEHICLE TRAFFIC. BOLLARD PLACEMENT SHOULD NOT INTERFERE WITH OPERATION, MAINTENANCE OR REPLACEMENT OF WNH EQUIPMENT.

** ADDITIONAL BOLLARDS AT LOCATIONS A, B, C, D MAY BE REQUIRED FOR HIGH TRAFFIC AREAS.



CUSTOMER TO INSTALL GROUNDING GRID PER WNH AND ESA STANDARDS:
ALSO SEE 12-311A6 FOR ADDITIONAL GROUNDING INFORMATION.

1. FEED GROUNDING WIRE FROM INSIDE VAULT THROUGH SPARE PIPE OPENING TO FASTEN TO GROUND ROD #1 WITH AMP TAP.
2. FASTEN GROUNDING WIRE TO GROUND RODS #2, #3 AND #4 WITH AMP TAPS MAINTAINING 500mm DEPTH FOR GROUNDING WIRE.
3. FASTEN GROUNDING WIRE TO GROUNDING WIRE AT GROUND ROD #1.
4. FEED GROUNDING WIRE FROM INSIDE VAULT THROUGH SPARE PIPE OPENING TO FASTEN TO GROUND ROD #3 WITH AMP TAP.
5. FOR ADDITIONAL VISTA GROUNDING INFORMATION REFER TO STANDARD 12-311A12.
6. INJECT SEALANT INTO THE LIFTING HOLES AND DUCT PENETRATIONS UPON COMPLETION OF THE GROUND WIRE AND CONDUIT INSTALLATION.

*- DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED

REV.	DESCRIPTION	DATE	INITIALS

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

Name _____ **Date** _____

Signature & Professional Designation _____

STANDARD **12-311A11**

Material List			
Item	Quantity	Description	HTE Part #
1	30m	Conductor 2/O Bare Strand Copper (Outside The Vault)	220 100 00020
2	2	Connector, C Type 2/O - 2/O Copper	230 030 00021
3	1	Acton Precast 110 x 121 Vault	205 010 00060
4	4	Ground Rod, Copper Clad 75mm x 3048mm	280 115 00006
5	4	Tap Wedge Blue 350 - 2/O	230 185 00061
6	4	Cartridge Blue Tap	230 120 00020

Additional Miscellaneous Parts (Not Depicted)			
Item	Quantity	Description	HTE Part #
7	20	2/O CU 2 Hole Lug NEMA	230 090 00016
8	54m	Conductor 2/0 Bare Strand Copper Inside The Vault	220 100 00020

WATERLOO NORTH HYDRO INC.

DATE:	SCALE:	REV.	DWG. NO.
2018-07-05	NTS	0	12-350A1

TITLE: **TRANSFORMER VAULT ROOM - CONSTRUCTION DETAILS**

THE CUSTOMER SHALL PROVIDE AT THEIR COST THE ITEMS LISTED BELOW IN COMPLIANCE WITH THE LATEST EDITIONS OF THE NATIONAL BUILDING CODE, ONTARIO BUILDING CODE, ONTARIO ELECTRICAL SAFETY CODE, NFPA80; WATERLOO NORTH HYDRO (WNH) CONDITIONS OF SERVICE AND SITE SPECIFIC REQUIREMENTS LISTED IN WNH'S OFFER TO CONNECT.

1. ACCESSIBILITY:
   - 1.1. ACCESSIBILITY MUST BE AT GRADE ON GROUND FLOOR WITH DIRECT OUTSIDE ACCESS AT ALL HOURS.
   - 1.2. MUST BE ACCESSIBLE BY WNH LINE TRUCKS OVER A HARD SURFACE SUCH AS CONCRETE, ASPHALT, CRUSHED STONE OR OTHER WNH APPROVED MATERIAL.
   - 1.3. THE VAULT ROOM SHALL NOT BE USED FOR STORAGE OR CONTAIN EQUIPMENT FOREIGN TO THE ELECTRICAL INSTALLATION.

2. VAULT WALLS, ROOF AND FLOORS:
   - 2.1. WALLS, ROOF AND FLOORS TO BE REINFORCED CONCRETE WITH MINIMUM OF 0.15m THICKNESS.
   - 2.2. CONCRETE FLOORS SHALL BE LIQUID TIGHT.
   - 2.3. VAULT MUST BE THOROUGHLY CLEANED PRIOR TO INSTALLATION OF GROUNDING AND OTHER WIRING.
   - 2.4. WALLS AND CEILING TO BE BARE CONCRETE OR PARGED FINISHED WITH A LIGHT GREY SURE–TRED RESILCRETE PAINT.
   - 2.5. OIL SUMP PIT MAY BE PROVIDED, CAPABLE OF HOLDING ALL OIL FROM THE LARGEST TRANSFORMER +10%.

3. INCOMING PRIMARY AND SECONDARY DUCTS:
   - 3.1. THE PRIMARY AND SECONDARY SHALL BE LOCATED IN OPPOSITE DIAGONAL CORNERS OF THE VAULT ROOM.
   - 3.2. DUCTS TO BE INSTALLED WITH BELL END FITTINGS FLUSH WITH RAISED ENCASEMENT 0.15m ABOVE FINISHED FLOOR.
   - 3.3. SECONDARY DUCTS OPTION IS ONLY AVAILABLE IN LARGE SIZE VAULT ROOM. THIS OPTION REQUIRES THE CUSTOMER TO PAY FOR MORE EXPENSIVE ELECTRICAL EQUIPMENT TO BE USED IN THE INSTALLATION, ADDITIONAL 11.0m OF SPARE SECONDARY CABLE PER RUN AND CUSTOMER SUPPLIED LUGS.

4. VENTILATION:
   - 4.1. OPENINGS TO BE SIZED ACCORDING TO THE ONTARIO ELECTRICAL SAFETY CODE: 0.002m²/kVA.
   - 4.2. HEIGHT TO WIDTH RATIO MUST NOT EXCEED 3:2.
   - 4.3. THE BOTTOM OF THE AIR INTAKE VENT IS TO BE LOCATED AT A MINIMUM OF 0.45m AND A MAXIMUM OF 1.0m ABOVE OUTSIDE GRADE.
   - 4.4. AIR EXHAUST VENT IS TO BE LOCATED AS CLOSE AS POSSIBLE TO VAULT CEILING.
   - 4.5. IF THE AIR INTAKE AND THE AIR EXHAUST ARE LOCATED ON THE SAME WALL THEY SHALL BE SEPARATED IN DIAGONAL ALIGNMENT ON THE WALL.
   - 4.6. OPENINGS SHALL BE EQUIPPED WITH BACK TO BACK LOUVRES SEPARATED BY A BIRD SCREEN WITH A MINIMUM 1/2" MESH AND HAVE 60mm SPACING.
   - 4.7. ALL MATERIALS TO BE 16 ga. GALVINIZED STEEL.

5. FIRE DOORS:
   - 5.1. TWO CLASS 'A' 3 HOUR RATED FIRE DOORS WITH MIN. DIMENSIONS OF 1.0m x 3.0m PER DOOR.
   - 5.2. DOORS COMPLETE WITH A 10" PAD BOLT CAPABLE OF ACCEPTING A 5/16" PADLOCK, A HASP AND TANG ARRANGEMENT FOR A WNH PADLOCK AND A HEAVY DUTY LOCKING PASSAGE KNOBSET.
   - 5.3. TO PREVENT REMOVAL OF DOORS EXTERNALLY, DOOR PINS ARE TO BE WELDED TO HINGE UNLESS DOOR PINS HAVE SET SCREW LOCKS AND HINGE PLATES THAT ARE CONCEALED OR WELDED.
   - 5.4. A KEY TO CUSTOMER'S LOCK MUST BE PROVIDED TO WNH, AN ADDITIONAL KEY MAY BE REQUESTED WHEN REQUIRED.
   - 5.5. A 100mm CONCRETE DOOR SILL WITH IS A LIQUID BARRIER IN BOTH DIRECTIONS MUST BE PROVIDED.

6. FIRE PROTECTION AND ALARM:
   - 6.1. 3 HOUR FIRE RATED CONSTRUCTION IS REQUIRED OF ALL VAULTS, INCLUDING AIRWAYS.
   - 6.2. A CEILING MOUNTED SMOKE DETECTOR ACTUATE THE BUILDING FIRE ALARM SYSTEM IN CASE OF A FIRE.

7. GROUNDING:
   - 7.1. SUPPLY AND INSTALL FOUR 3/4" x 10' GROUND RODS IN THE FOUR CORNERS OF THE VAULT ROOM, PROTRUDING NO MORE THAN 300mm ABOVE GRADE.
   - 7.2. CONNECT DOORS AND LOUVRES TO THE GROUND LOOP USING #2/0 EXTRA FLEX STRANDED COPPER FOR THE DOORS AND MIN. #4 STRANDED COPPER FOR THE LOUVRES.

8. ACCESSORIES:
   - 8.1. SUPPLY, INSTALL AND WIRE TWO LIGHT SOCKETS AND A 15A RECEPTACLE. SOCKETS ARE NOT TO BE INSTALLED DIRECTLY ABOVE TRANSFORMERS.
   - 8.2. SUPPLY AND INSTALL PULLING EYES CAPABLE OF SUPPORTING 2500KG IN THE CEILING AT A POINT 0.6m FROM VAULT WALL, CENTERED ON THE DOORWAY AND ROTATED TOWARDS PRIMARY DUCTS.

REV.	DESCRIPTION	DATE	INITIALS

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

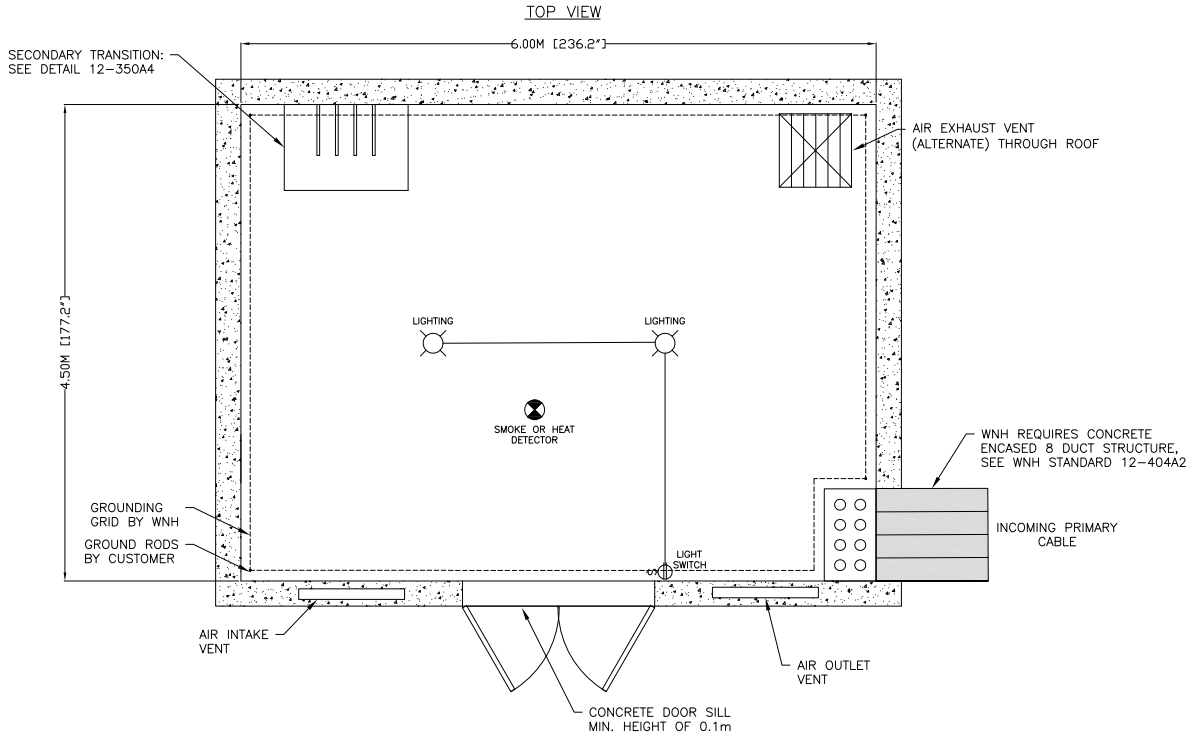
Date

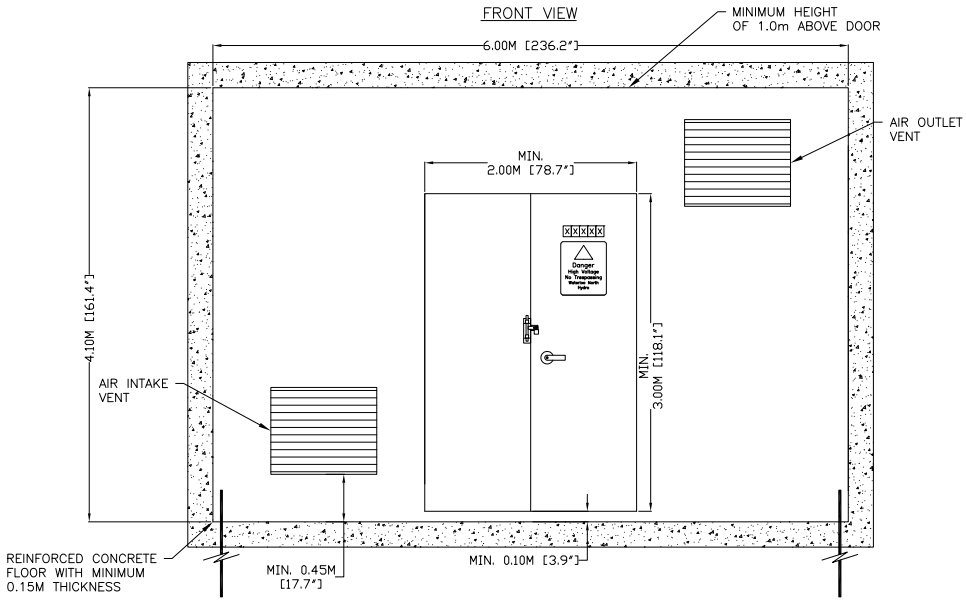
Signature & Professional Designation

WATERLOO NORTH HYDRO INC.

DATE:	SCALE:	REV.	DWG. NO.
2018-07-05	NTS	0	12-350A2

TITLE: **TRANSFORMER VAULT ROOM - LAYOUT (TRANSFORMERS UP TO 300kVA)**





*– DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED

REV.	DESCRIPTION	DATE	INITIALS

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

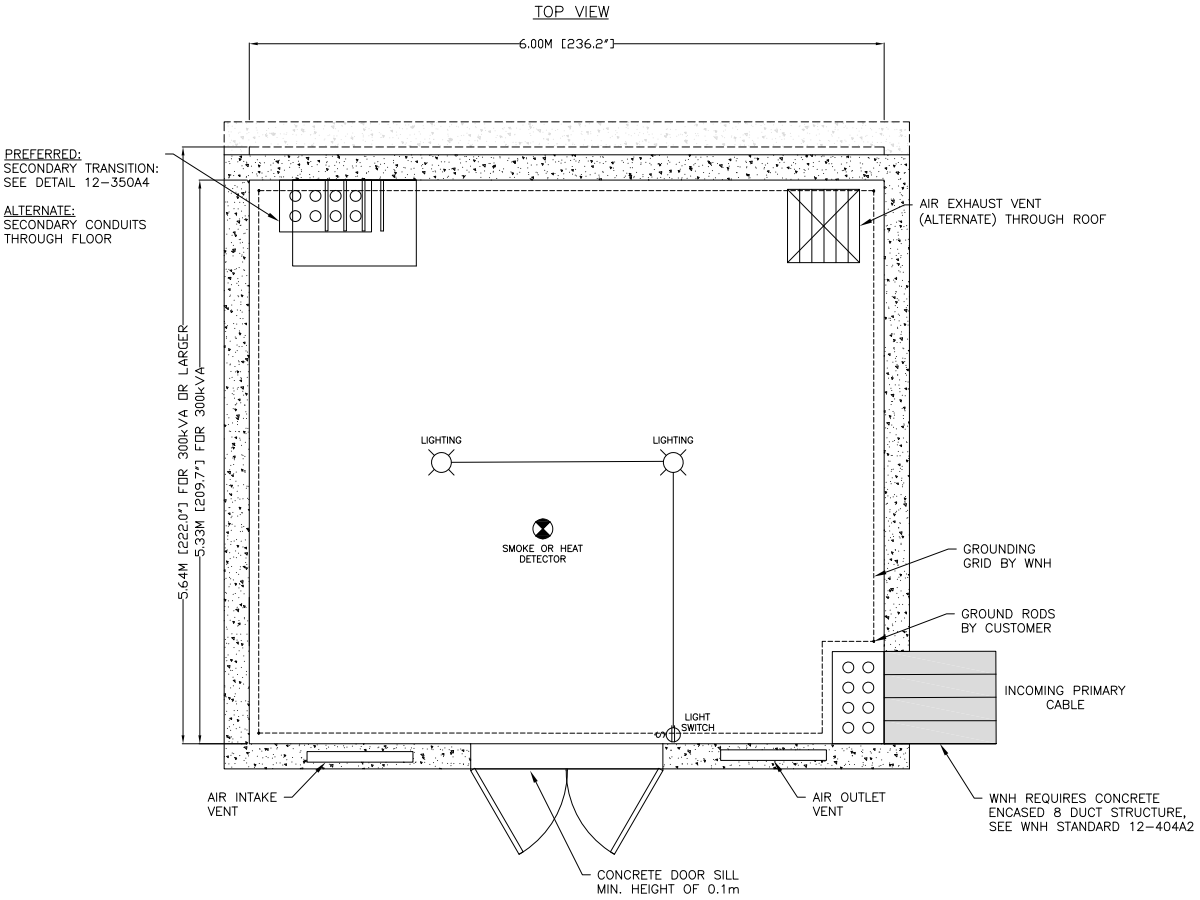
Date

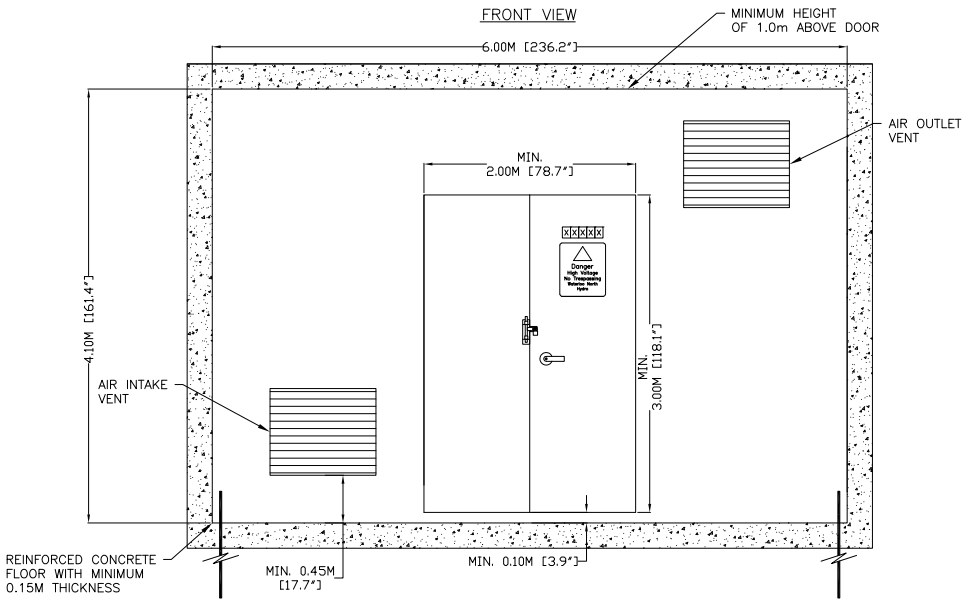
Signature & Professional Designation

WATERLOO NORTH HYDRO INC.

DATE:	SCALE:	REV.	DWG. NO.
2018-07-05	NTS	0	12-350A3

TITLE: **TRANSFORMER VAULT ROOM - LAYOUT (TRANSFORMERS GREATER THAN 300kVA)**





*- DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED

REV.	DESCRIPTION	DATE	INITIALS

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

Date

Signature & Professional Designation

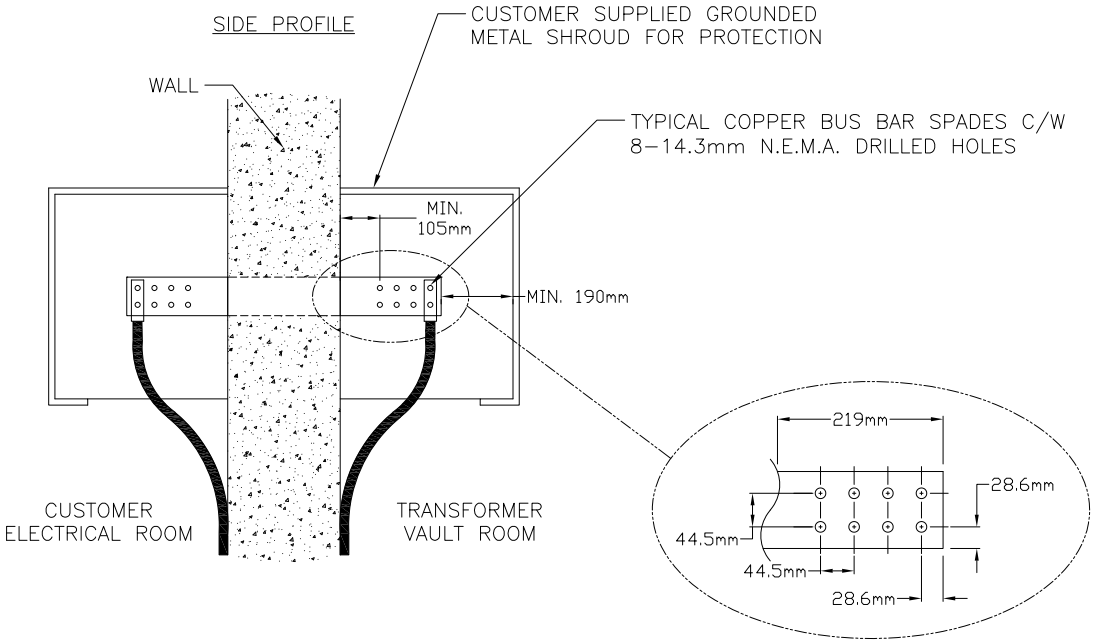
WATERLOO NORTH HYDRO INC.

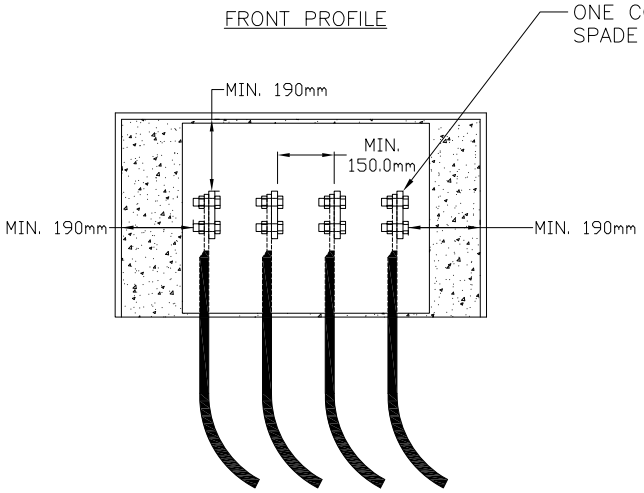
DATE:	SCALE:	REV.	DWG. NO.
2018-07-05	NTS	0	12-350A4

TITLE: **TRANSFORMER VAULT ROOM - SECONDARY TRANSITION BUS DETAILS**

NOTES:

1. CUSTOMER TO SUPPLY AND INSTALL SECONDARY TRANSITION BUS AS PER THE ONTARIO ELECTRICAL SAFETY CODE AND THE ONTARIO BUILDING CODE REQUIREMENTS.
2. SECONDARY TRANSITION BUS TO BE AT A HEIGHT OF 2.1m FROM FINISHED VAULT ROOM FLOOR LEVEL AND MUST HAVE A GROUNDED METAL SHROUD IF LOWER.
3. SECONDARY TRANSITION COPPER BUS BAR SPADES TO BE SIZED AS PER ESA BY CUSTOMER WITH 8–14.3mm N.E.M.A. DRILLED HOLES.
4. MINIMUM CLEARANCE BETWEEN LIVE PARTS (METAL–TO–METAL BETWEEN BOLTS) SHALL BE NO LESS THAN 150mm.





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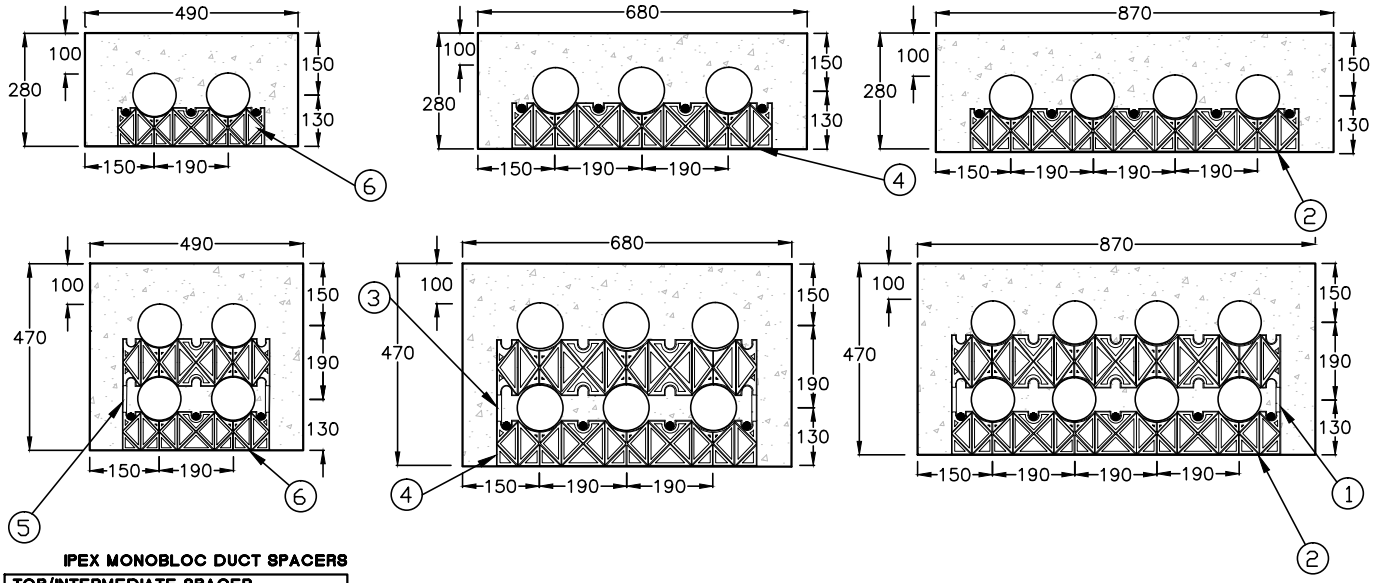
Date

Signature & Professional Designation

WATERLOO NORTH HYDRO INC.

DATE:	SCALE:	REV.	DWG NO.
2017-04-30	NTS	0	12-404A1

TITLE: **TYPICAL CONCRETE ENCASED DUCT STRUCTURES FOR 200 AMP INSTALLATIONS (REBAR ON THE BOTTOM ONLY)**



IPEX MONOBLOC DUCT SPACERS

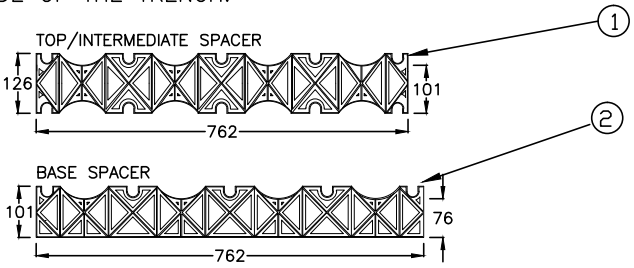
TOP/INTERMEDIATE SPACER
PRODUCT CODE – 2 WAY – 29469
PRODUCT CODE – 3 WAY – 29497
PRODUCT CODE – 4 WAY – 29498
BASE SPACER
PRODUCT CODE – 2 WAY – 29466
PRODUCT CODE – 3 WAY – 29488
PRODUCT CODE – 4 WAY – 29489

IPEX MONOBLOC BELL ENDS
PRODUCT CODE – BELL END – 029064

*– DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED

NOTES

1. DUCT BANK TO HAVE MINIMUM 1.0m COVER AND BE PLACED ON MINIMUM BEARING CAPACITY OF 95kPa ULS SOIL.
2. DUCT TO BE 100mm TYPE II P.V.C IPEX SUPERDUCT DB2 PVC UNDERGROUND CONDUIT. ALL HORIZONTAL BENDS ARE TO HAVE A MINIMUM 1.5m RADIUS.
3. ALL DUCT JOINTS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS.
4. DUCT JOINTS TO BE STAGGERED A MINIMUM OF 0.2m & SECURED WITH AN APPROVED COUPLING.
5. SPACERS ARE TO BE RIGID NON BENDABLE TYPE AS PER IPEX PRODUCTS SHOWN. SPACERS TO BE PLACED UNDER EACH DUCT LAYER WITH MAXIMUM CENTER TO CENTER DISTANCE OF 1.5m AND LOCATED WITHIN 600mm EACH SIDE OF COUPLERS ALONG ENTIRE LENGTH OF DUCT BANK.
6. #15 M REBAR TO BE PLACED ON BOTTOM OF THE DUCT BANK ONLY UNLESS OTHERWISE INDICATED. REINFORCING STEEL SHALL BE GRADE 400 AND SHALL CONFORM TO THE LATEST VERSION OF CSA G30.12.
7. LAP SPLICES IN REINFORCING STEEL SHALL BE 450mm MINIMUM.
8. NON METALLIC ROPE OR BANDING SHALL BIND DUCTS & SPACERS EVERY 3m. DUCT BANK IS TO BE ANCHORED TO PREVENT FLOATING. DO NOT ALLOW CONCRETE TO ENTER THE DUCTS DURING CONCRETE PLACEMENT.
9. ALL DUCTS ARE TO BE ENCASED WITH A MINIMUM 75mm CONCRETE UNLESS OTHERWISE INDICATED.
10. ALL BOTTOM DUCTS TO HAVE A MINIMUM 80mm CONCRETE UNDERNEATH.
11. CONCRETE TO BE 20MPa MINIMUM AT 28 DAYS, 10mm PEASTONE, 80mm SLUMP. REQUIRED. CONCRETE MATERIALS AND METHODS OF INSTALLATION SHOULD CONFORM TO THE LATEST VERSION OF CAN/CSA A23.1 AND CAN/CSA A23.2. WINTER HANDLING WHEN REQUIRED.
12. BELL ENDS ARE TO BE USED ON ALL DUCTS ENTERING PULLING PITS OR CONCRETE ENCLOSURES. BELL ENDS MUST BE INSTALLED FLUSH WITH THE INSIDE WALL OF THE BUILDING OR CONCRETE ENCLOSURE.
13. EACH DUCT TO BE CLEANED & 2000 lb FLAT MULE ROPE INSTALLED.
14. ENDS OF DUCTS TO BE CAPPED & MARKED WITH ELECTRONIC MARKERS.
15. RED CAUTION TAPE TO BE INSTALLED 300mm ABOVE THE DUCT BANK, ONE STRIP ON EACH SIDE OF THE TRENCH.



Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

Name _____ Date _____

Signature & Professional Designation _____

REV.	DESCRIPTION	DATE	INITIALS

STANDARD 12-404A1

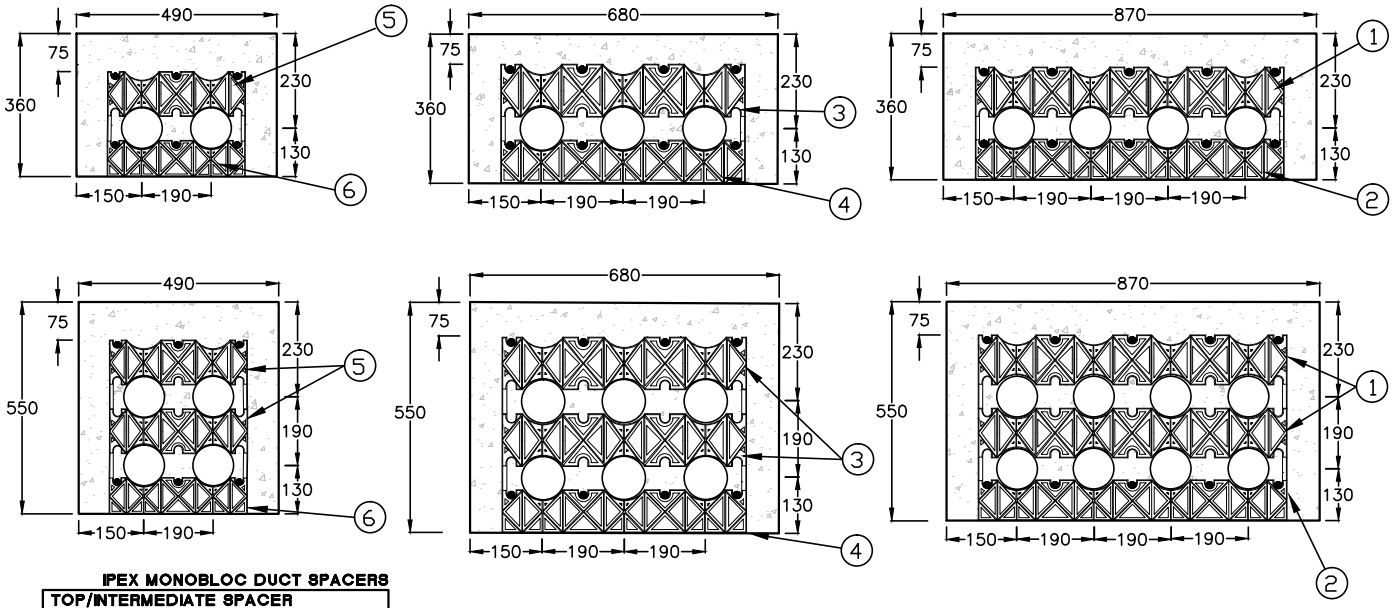
Material List			
Item	Quantity	Description	HTE Part #
1	As Required	Duct Spacer 4" - 4 Way PVC Intermediate	250 020 00071
2	As Required	Duct Spacer 4" - 4 Way PVC Base Type	250 020 00091
3	As Required	Duct Spacer 4" - 3 Way PVC Intermediate	250 020 00066
4	As Required	Duct Spacer 4" - 3 Way PVC Base Type	250 020 00086
5	As Required	Duct Spacer 4" - 2 Way PVC Intermediate	250 020 00056
6	As Required	Duct Spacer 4" - 2 Way PVC Base Type	250 020 00081
7	As Required	Bell Ends (Not Shown)	250 020 00051

FORMERLY WNH STANDARD U2-4A

WATERLOO NORTH HYDRO INC.

DATE:	SCALE:	REV.	DWG NO.
2017-04-30	NTS	0	12-404A2

TITLE: **TYPICAL CONCRETE ENCASED DUCT STRUCTURES FOR 200 AMP OR 600 AMP INSTALLATIONS (REBAR TOP AND BOTTOM)**



IPEX MONOBLOC DUCT SPACERS

TOP/INTERMEDIATE SPACER	BASE SPACER	IPEX MONOBLOC BELL ENDS
PRODUCT CODE – 2 WAY – 29469 PRODUCT CODE – 3 WAY – 29497 PRODUCT CODE – 4 WAY – 29498	PRODUCT CODE – 2 WAY – 29466 PRODUCT CODE – 3 WAY – 29488 PRODUCT CODE – 4 WAY – 29489	PRODUCT CODE – BELL END – 029064

NOTES

1. DUCT BANK TO HAVE MINIMUM 0.9m COVER.
2. DUCT TO BE 100mm TYPE II P.V.C IPEX SUPERDUCT DB2 PVC UNDERGROUND CONDUIT. ALL HORIZONTAL BENDS ARE TO HAVE A MINIMUM 1.5m RADIUS.
3. ALL DUCT JOINTS SHALL BE SOLVENT WELDED (GLUED) AS PER DUCT MANUFACTURER'S RECOMMENDATIONS.
4. DUCT JOINTS TO BE STAGGERED A MINIMUM OF 0.2m & SECURED WITH AN APPROVED COUPLING.
5. SPACERS ARE TO BE RIGID NON BENDABLE TYPE AS PER IPEX PRODUCTS SHOWN. SPACERS TO BE PLACED UNDER EACH DUCT LAYER WITH MAXIMUM CENTER TO CENTER DISTANCE OF 1.5m AND LOCATED WITHIN 600mm EACH SIDE OF COUPLERS ALONG ENTIRE LENGTH OF DUCT BANK.
6. #15 M REBAR TO BE PLACED ON BOTTOM OF THE DUCT BANK ONLY UNLESS OTHERWISE INDICATED. REINFORCING STEEL SHALL BE GRADE 400 AND SHALL CONFORM TO THE LATEST VERSION OF CSA G30.12.
7. LAP SPLICES IN REINFORCING STEEL SHALL BE 450mm MINIMUM.
8. NON METALLIC ROPE OR BANDING SHALL BIND DUCTS & SPACERS EVERY 3m. DUCT BANK IS TO BE ANCHORED TO PREVENT FLOATING. DO NOT ALLOW CONCRETE TO ENTER THE DUCTS DURING CONCRETE PLACEMENT.
9. ALL DUCTS ARE TO BE ENCASED WITH A MINIMUM 75mm CONCRETE UNLESS OTHERWISE INDICATED.
10. ALL BOTTOM DUCTS TO HAVE A MINIMUM 80mm CONCRETE UNDERNEATH.
11. CONCRETE TO BE 20MPa MINIMUM AT 28 DAYS, 10mm PEASTONE, 80mm SLUMP. REQUIRED. CONCRETE MATERIALS AND METHODS OF INSTALLATION SHOULD CONFORM TO THE LATEST VERSION OF CAN/CSA A23.1 AND CAN/CSA A23.2. WINTER HANDLING WHEN REQUIRED.
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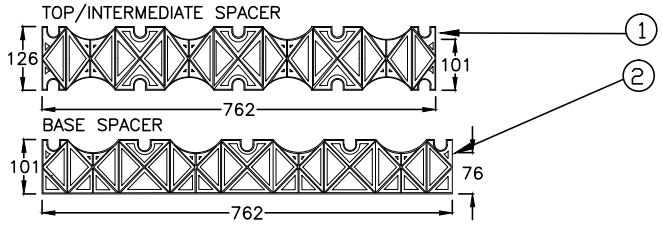

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REV.	DESCRIPTION	DATE	INITIALS

Certificate of Approval

The installation work covered by this document meets the safety requirements of Section 4 of Regulation 22/04

Name _____ **Date** _____

Signature & Professional Designation _____

STANDARD **12-404A2**

Material List			
Item	Quantity	Description	HTE Part #
1	As Required	Duct Spacer 4" - 4 Way PVC Intermediate	250 020 00071
2	As Required	Duct Spacer 4" - 4 Way PVC Base Type	250 020 00091
3	As Required	Duct Spacer 4" - 3 Way PVC Intermediate	250 020 00066
4	As Required	Duct Spacer 4" - 3 Way PVC Base Type	250 020 00086
5	As Required	Duct Spacer 4" - 2 Way PVC Intermediate	250 020 00056
6	As Required	Duct Spacer 4" - 2 Way PVC Base Type	250 020 00081
	As Required	Bell Ends (Not Shown)	250 020 00051

FORMERLY WNH STANDARD U2-4B