

TORONTO HYDRO CONDITIONS OF SERVICE
REQUIREMENTS FOR
THE DESIGN AND CONSTRUCTION
OF
CUSTOMER-OWNED STRUCTURES



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MANAGER, POLICY & STANDARDS

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| CERTIFICATE OF APPROVAL THIS TECHNICAL SPECIFICATION MEETS THE SAFETY REQUIREMENTS OF SECTION 4 OF ONTARIO REGULATION 22/04 | |
| <u><i>J. Daniel</i></u> PROFESSIONAL ENGINEER | <u>2011/12/06</u> DATE |

**CUSTOMER-OWNED STRUCTURES
DESIGN & CONSTRUCTION REQUIREMENTS**

1.0 PURPOSE

- 1.1 The purpose of this document is to provide guidance to Toronto Hydro Customers and their agents in the preparation of plans and proposals for the construction of Structures (i.e. Customer-owned cable chamber, cable pull room, conduit/ ductbank, pad, splice box or vaults including submersible-vaults where Toronto Hydro equipment will be present).
- 1.2 Nothing contained in this document shall prejudice or supersede various other codes or regulations published in the current edition of Ontario Electrical Safety Code.
- 1.3 It shall be the responsibility of the Customer to comply with Toronto Hydro requirements and all the other documents referred to in the Reference section of this document.

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| DISTRIBUTION CONSTRUCTION STANDARD Civil Construction | |  CUSTOMER-OWNED STRUCTURES DESIGN & CONSTRUCTION REQUIREMENTS | | | | |
|  | Approved by: <i>[Signature]</i> 2011/10/24 | | | Scale: | Rev. | |
| | Drafted by: H.M. | Designed by: J.D. | Original issue: C.P. 2003-11-27 | N.T.S. | 2 | 31-6000 1/10 |

2.0 DEFINITIONS

2.1 Cable Chamber

A reinforced concrete underground structure where ducts are terminated for the purpose of making cable connections or accommodating a change in cable direction or level.

2.2 Cable Pull Room

An enclosed structure with a walk-in entrance where ducts are terminated for the purpose of making cable connections or accommodating a change in cable direction or level.

2.3 Conduit

A cable duct or grouping of duct runs in parallel either direct buried or encased in concrete.

2.4 Customer

A person that has that has contracted for or intends to contract for connection to a building. This includes developers of residential or commercial subdivision.

2.5 Ductbank

Two or more conduits encased in concrete with accordance with Toronto Hydro Standard 31-1120.

2.6 Easement

The right to use the real property of another for a specific purpose other than for general use and occupation of land.

2.7 Pad

A precast reinforced concrete foundation on which pad-mounted transformers, switchgears etc. are installed.

2.8 Splice Box

A fiberglass enclosure used for the making of multiple cable connection or terminating ducts.

2.9 Submersible Vault



A precast reinforced concrete structure used for the purpose of housing transformers in residential sub-divisions.

2.10 Structure

A general term to refer to one or more of the Customer-owned cable chamber, cable pull room, conduit/ductbank, pad, splice box or vaults including submersible-vaults where Toronto Hydro equipment will be present.

2.11 Vault

A reinforced concrete structure used for the purpose of housing transformers, switchgear and other electrical distribution equipment.

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3.0 REFERENCES

The Customer shall conform to the latest issue in effect at the date of construction of referenced codes, standards, regulations and by-laws.

3.1 APPLICABLE CODES

- a. Canadian Electrical Code C22.1
- b. National Building Code of Canada
- c. National Fire Code of Canada
- d. National Plumbing Code of Canada
- e. Occupational Health & Safety Act and Regulation for Construction Project 1990 and Ontario Regulations 213/91
- f. Ontario Building Code
- g. Ontario Electrical Safety Code
- h. Canadian Highway Bridge Design Code, CAN/CSA-S6-06
- i. Ontario Fire Code

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3.2 REGULATIONS AND BY-LAWS

All local municipal and provincial regulations and by-laws shall apply.

3.3 OTHER REFERENCES


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3.3.1 Toronto Hydro Documents:

- a. Conditions of Service
- b. Offer to Connect
- c. Requirements for Design & Construction of Customer-Owned High Voltage Substation
- d. Technical Specification for Civil Construction Work, CV-CON-01
- e. Rule Book
- f. City of Toronto Municipal Consent Document- Requirements for the installation of services within the City of Toronto Road Allowance.



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3.3.2 City of Toronto Municipal Consent Document- Requirements for the installation of services within the City of Toronto Road Allowance.

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3.4 TORONTO HYDRO STANDARDS

| Standard # | Title |
|------------|---|
| 31-0100 | Underground Clearances |
| 31-1120 | Concrete Encased & Direct Buried Ducts |
| 31-1360 | Identification of Hydro Ducts in Building Complexes |
| 31-2130 | Cable Chamber Structural Details |
| 31-4030 | Three Phase Precast Padmount 1830 x 1830 x 1220mm Deep |
| 31-4080 | Padmount Guard Posts Protection from Vehicular Traffic |
| 31-5050 | Vaults:- Minimum Clearances |
| 31-6070 | Cable Pull Room - Typical Installation of Low & High Voltage Cables |
| 31-8210 | Cable Pulling Loop for Poured & Precast Concrete Walls |
| 31-8390 | Transformer Vault Ladder |
| 31-8410 | Caulking of Removing Slabs |
| 31-8470 | Sleeve – Lifting for Removable Concrete Slab |

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4.0 TORONTO HYDRO REQUIREMENTS

4.1 ENGINEERING DRAWINGS

4.1.1 The unit of measurement shall be metric.



4.1.2 The Customer shall submit fully dimensioned scaled drawings in digital file (Microstation.dgn format) and two hard copies of the following drawings to Toronto Hydro for review for compliance to Toronto Hydro requirements:

4.1.2.1 Site Service Plan showing:

- a. Location and grade levels of the building
- b. Location of the electrical equipment and vault
- c. Vehicle access route to the vault
- d. Personnel access route to the vault
- e. Grade levels at the vault
- f. Location of incoming ductbank
- g. References to the nearest intersecting streets
- h. Property lines
- i. Building lines with overhang
- j. Adjacent utilities such as gas, water, waste water, telecommunications etc.
- k. Any easements
- l. Surface and sub-surface features including any obstructions

4.1.2.2 Electrical Drawings showing:

- a. Site Plan
- b. Single line distribution drawings
- c. Shop drawings of customer HV/LV service entrance, equipment, transformers, and protection co-ordination study.
- d. Grounding details.
- e. On-site commissioning of transformer and cable testing results for Customer-owned HV service entrance equipment.

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4.1.2.3 Plan, elevation and section views of any proposed Structures.

4.1.2.4 Proposed drainage details from the proposed Structures according to latest Plumbing/Building codes.

4.1.3 All drawings must be reviewed and accepted by Toronto Hydro prior to commencement of construction.

4.1.4 If any drawings require revision, then the revised digital file and two hard copies shall be submitted to Toronto Hydro for further review and acceptance.

4.2 EASEMENT

4.2.1 Registered easements are required whenever Toronto Hydro's plant is to be located on private property to service a Customer other than the owner of the property where the plant is to be located.

4.2.2 When easement requirements have been identified for a particular project, the Customer shall be responsible for the following:

4.2.2.1 Preparation of a legal survey plan identifying the proposed easement for the underground hydro plant and also easements for access to the hydro plant where necessary. It may be necessary to identify the easements in three dimensions.



4.2.2.2 Prior to depositing the easement, the site survey plan should be reviewed and accepted by Toronto Hydro.

4.2.2.3 Preparation of a registrable easement in favor of Toronto Hydro comprising of:

- a) Transfer Land Title Deed
- b) Schedule 'A'
- c) Land Transfer Tax Affidavit

The documents shall be prepared to the satisfaction of Toronto Hydro's solicitor.

4.2.2.4 The Customer shall deposit the easement. The cost of preparing a reference plan, easement, its registration and any other associated cost is to be borne by the Customer as part of the consideration for the provisions of electrical power supply.

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4.3 STRUCTURES

- 4.3.1 The Structures shall be constructed in accordance with the Toronto Hydro Standard drawings. If it cannot be constructed to Toronto Hydro Standards, then detailed construction drawings shall be submitted to Toronto Hydro for review and acceptance. Construction must not commence until these drawings are accepted by Toronto Hydro.
- 4.3.2 When a Toronto Hydro Standard drawing is provided, the Customer shall be responsible for ensuring that a Registered Professional Engineer of Ontario does the structural design of the Structure to meet specific site conditions. The drawings shall be stamped by the Professional Engineer.
- 4.3.3 The Customer shall be responsible for ensuring that the Structure is constructed in accordance with the design criteria established by the Customer's Professional Engineer.
- 4.3.4 The Customer shall be responsible for the installation and maintenance of all the Structures.
- 4.3.5 During construction of a building, cranes shall not operate overhead in the vicinity of a Structure while Toronto Hydro personnel are working in or around the Structure.
- 4.3.6 If hoarding exists around a building under construction, a section of hoarding adjacent to the Structure shall be removed by the Customer on request to allow access for cranes, floats and other vehicles required to install Toronto Hydro equipment.

4.3.7 VAULTS


- 4.3.7.1 In addition to the requirements specified in this document, Transformer Vaults shall be designed in accordance with Standard 31-6010.

4.3.8 CABLE CHAMBERS

- 4.3.8.1 The cable chambers shall be designed in accordance with the Canadian Highway Bridge Design Code, CAN/CSA-S6-06, CL-625-ONT live loading.
- 4.3.8.2 Cable Chambers shall be made of precast or cast-in-situ concrete.
- 4.3.8.3 Cable chambers shall have a drainage system built in accordance with the latest applicable codes and by-laws.

△ 4.3.9 CABLE PULL ROOM

Cable pull rooms shall be built in accordance with Toronto Hydro Standard 31-6070.

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2 4.3.10 **PADS**

Pads shall be of precast concrete built in accordance with Toronto Hydro Standard 31-4030.

4.3.11 SUBMERSIBLE VAULTS

Submersible vaults shall be of precast concrete built in accordance with Toronto Hydro Standards.

2 4.3.12 **SPLICE BOX**

Splice/Tap boxes shall be of fiberglass in accordance with Toronto Hydro Standards 31-3120, 31-3125 & 31-3135.

4.3.13 CONDUITS

2 4.3.13.1 The underground conduits shall be constructed in accordance with Toronto Hydro Standards 31-1120.

4.3.13.2 The minimum depth of cover for conduits shall be as per standard 31-0300. This depth is measured from the top of the final grade to the top of the concrete encasement of the ductbank.


4.3.13.3 Bends in conduits shall not be less than 900mm radius. Where sweeping bends are necessary, 5° (degree) couplings or sections of long sweep bends should be used.

4.3.13.4 Unless otherwise specified ducts to terminate in Structures with bell end fittings flush with encasement 150mm above finished floor or flush with the inside surface of the wall as applicable.

4.3.13.5 The conduits shall be graded away from the Customer's building and Structures to prevent water entering the building.

4.3.13.6 Customer shall design and install rebars where the ducts enter the Structure/building. The duct entry installation shall also be made watertight.



4.3.13.7 All spare ducts shall be roped and plugged.

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4.3.13.8 It is the Customer's responsibility to build all the Structures in such a way that there is no water leakage into the Customers building and/or Structure. The Customer shall provide an undertaking to absolve Toronto Hydro from any damage to the building or equipment in the building due to water entering by means of conduit or excavation.

4.4 ACCESS REQUIREMENTS

- 4.4.1 Vehicle access routes to a Structure must be maintained 24-hours a day during the life of the Structure. Landscaping or other changes to an access route before or after installation of equipment shall not be made without prior approval of Toronto Hydro.
- 4.4.2 Access routes must be solely on the Customer's property containing the installation.
- 4.4.3 Customer shall maintain clean access wells for below-grade Structures at all times.
- 4.4.4 Hoarding or any other construction shall not be built over a Structure. If hoarding must encroach on below-grade Structure, it shall not block access to ladder way grids or personnel doors. A gate for access by Toronto Hydro personnel shall be provided in hoarding adjacent to the Structure. The gate shall be equipped with a hasp for a Toronto Hydro padlock.
- 4.4.5 Parking of vehicles is not permitted at any time on top of the below-grade Structures.
- 4.4.6 Landscaping of any kind is not permitted on top of below-grade Structures without the written approval from Toronto Hydro.
- 4.4.7 Access to a Structure located on Customer property shall be available to Toronto Hydro 24-hours daily.
- 4.4.8 The Customer shall provide Toronto Hydro with the appropriate access keys or magnetic cards to allow entry from the street to the Structure. The access keys or magnetic cards shall be placed in an accessible key box, which can be opened by Toronto Hydro's keys. Also, if a fence is erected around the Structure, it must be provided with Toronto Hydro padlock to allow Toronto Hydro personnel to gain access.
- 4.4.9 Any structure, tree, shrub, fence, landscaping or material shall not be built, planted or placed near the Structure that could obstruct the running of the distribution lines, endanger the equipment of Toronto Hydro or interfere with the proper and safe operations of Toronto Hydro's facilities or adversely affect compliance with any applicable legislation.
- 4.4.10 Vaults on Customer property will not be used as a driveway to getting into the customer building.

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4.5 COMPLETION DATE

- 4.5.1 Vaults must be completed and accepted by Toronto Hydro eight (8) weeks before the requested service date to allow sufficient time for scheduling construction of associated conduit and for installation and connection of Toronto Hydro transformers and other equipment.
- 4.5.2 Equipping of the vault shall not commence until the vault construction is completed in full and accepted by Toronto Hydro and the vault can be locked without further entry being required by the Customer or Customer's agents.

4.6 INSPECTION BY TORONTO HYDRO



- 4.6.1 Toronto Hydro must be given 48- hours notice so that the Structures can be inspected at the following stages of construction:
 - a. Before any concrete is poured and before ducts are covered
 - b. When formwork for the vault or cable chamber is completed
 - c. As soon as the construction is completed.

- 4.6.2 Toronto Hydro will inspect the Structures to ensure that the following items meet Toronto Hydro requirements:
 - a. Dimensions of Structures
 - b. Vault ventilation
 - c. Personnel access
 - d. Equipment access
 - e. Vault drainage
 - f. Location and elevation of primary and secondary conduits
 - g. Pulling eyes
 - h. Locations of ground rod, ground loops and bonding of all metallic hardware
 - i. Proper clearances of hatchways, grids, removable slabs and caulking (a trial lift must be arranged by the Customer to satisfy this requirement)
 - j. Adherence to Toronto Hydro safety requirements
 - k. Lighting and 120V supply receptacle

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TRANSFORMER VAULT DESIGN REQUIREMENTS**1. GENERAL**



- a. This document is to be read in conjunction with the following Standards for Customer-Owned Structures:

| Standard # | Title |
|------------|--|
| 31-6000 | Design & Construction Requirements |
| 31-6020 | On-Grade Vaults |
| 31-6030 | Below-Grade Vaults |
| 31-6040 | Stair & Access Well Details |
| 31-6050 | Louver Details For Vent Openings |
| 31-6060 | Bird Screen Details |
| 31-6080 | 13.8kV Radial System: Below-Grade Vaults |

- b. The vault sizes must comply with Toronto Hydro Standards and shall be suitable for oil-filled transformers.
- c. Nothing contained in this document shall prejudice or supersede various other codes or regulations published in the current edition of Ontario Electrical Safety Code.
- d. Based on the rating of the transformers, the vaults are classified as:
 Type 1 – up to 2000kVA, Single Phase Banks
 Type 2 – 2500 kVA, Three Phase Units

2. VAULT LOCATION

- a. The vault location, size and personnel access route shall be discussed with Toronto Hydro before the preparation of the formal drawings. The proposed final location of the vault shall be approved by Toronto Hydro.
- b. On-Grade Vault: Where the size of the Customer's electrical service warrants, the Customer shall, on the premises to be served, provide Toronto Hydro with a suitable vault at ground level.
- c. Below-Grade Vault: If a suitable ground level location is not available, Toronto Hydro may accept a below-grade vault with conditions specified in this document, provided the vault will be at the floor immediately below the ground level.
- d. The preferred location for a vault is on that part of the premises closest to Toronto Hydro's demarcation point of connection. Normally this will be adjacent to the street.
- e. The effect of sound (low frequency vibrations) produced by the transformers should be considered in the selection of a vault location, especially for a building having living accommodations. Any sound dampening material/equipment that will be used shall be approved by the Customer's Professional Engineer and shall be acceptable to Toronto Hydro. The cost of all such work shall be borne by the Customer


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Requirements for Customer-Owned Structures

- f. A vault on Customer's property shall be in a location accessible at all times to Toronto Hydro personnel and vehicles required for maintenance and installation of transformers and other equipment.
- g. A 6.0m wide paved driveway access is required to the vault.
- h. The vault must be accessible for a large tractor-float combination. There shall be no obstruction or overhang above the vault for safe handling of transformers and other equipment.
- i. A vault shall not be located close to a loading dock, storage areas or areas like restaurants, processing plants that have a potential of generating liquid waste.
- j. A vault shall not be located directly under building egress/exits, in parking lots or beneath garage ramps.
- k. Storage of any kind of materials or bins is not allowed on top of below-grade vaults at any time.

3. DESIGN & CONSTRUCTION

- a. Vault shall be constructed in accordance with the latest editions of the applicable codes, standards and by-laws referred in Standard 31-6000.
- b. Where vaults will be subject to vehicular loading, they shall be designed in accordance with the Canadian Highway Bridge Design Code CAN/CSA-S6-06, CL-625-ONT live loading.
- c. The thickness of walls, floor and roof slabs of the vault shall not be less than 150mm.
- d. The access route shall also be designed permanently for crane loadings. The design load for crane shall be to suit the Customer's equipment and location.
- e. The grading around the below-grade vault shall be such that water will flow away from the vault roof.
- f. No materials may be attached to any of the inside wall, ceiling or floor surfaces of the vault unless specified and/or installed by Toronto Hydro.
- g. The inside walls, ceiling and floor to be painted with 2 coats acrylic latex white waterproof and non-flammable paint.
- h. Pulling eyes to be installed on the wall or ceiling inside the cable entry room directly opposite to the duct entry, as specified by Toronto Hydro. Also, a pulling eye to be installed on the ceiling at door entrance for lifting of transformer into the vault. Pulling eye to be installed as per standard 31-8210.
- i. Ductbank to be installed as per standard 31-1120. Preferred location of Ductbank entry are shown on the drawings. Ductbank to terminate in vault with bell end fittings flush with encasement 150mm above finished floor or flush with the inside surface of the wall as applicable.

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4. GROUNDING



- a. All metal parts to be grounded. Ground rods shall be taken to the last level of the building into the ground.
- b. Four 19mm x 3.0m long galvanized steel ground rods are to be supplied and installed by the Customer. Connect a 2/0 stranded Cu. ground to the main service ground leaving a 3.0m long coil in the vault. Cable to be clipped at every 600mm.
- c. Alternative grounding methods to be used only when ground rods cannot be placed within 150mm of inside vault wall and with prior approval of Toronto Hydro.
- d. 48-hours notice required by Toronto Hydro to inspect grounding before floor is poured.
- e. Doors and gate hinges are not considered good conductors. Therefore, all metal doors and gates should be connected to the grounded body of the enclosure or to the adjacent ground bus by a flexible copper conductor. 2/0 extra flex is used for that purpose.

5. LIGHTING

- a. Lighting system incandescent bulbs (4 x 200W in Type 1 vault and 6 x 200W in Type 2 vault) and power outlets to be supplied and installed in the vault by the owner
- b. A 200W weatherproof incandescent bulb and a 30A 120V receptacle to be supplied and installed by the owner along with a suitable switch in the Access Well as per the Ontario Electrical Safety Code and connected to the building emergency lighting system unless otherwise approved by Toronto Hydro. This circuit to be supplied separately from the circuit feeding the vault.
- c. For on-grade vault, 1-70W HPS amber light must be installed on the outside wall 300mm above center of doors and connected to building emergency and security lighting systems.
- d. 2 x 200W incandescent bulbs along with a suitable switch are to be supplied and installed by the owner in the Air Intake Chamber as per the Ontario Electrical Safety Code.
- e. A separate 120V/ 30A service is to be installed in the vault.

6. VENTILATION

- a. The combined NET area of inlet and outlet openings for ventilation shall not be less than 19 sq. cm per kVA of maximum projected transformer capacity with a minimum of 930 sq. cm. The net area is based on the reduction in airflow due to louvers, bird screens and security bars.
- b. Natural cross-ventilation is the best-suited way to ventilate the transformer vault. Inlet and outlet vents to be located in such a way as to provide maximum separation.
- c. Mechanically assisted ventilation, if required, shall be approved by a Professional Engineer of Ontario hired by the Customer. A letter signed by the Professional Engineer that the ventilation meets the minimum requirements shall be submitted to Toronto Hydro prior to commencement of the vault construction.

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Requirements for Customer-Owned Structures


- a. Where mechanical ventilation is installed, the Customer shall routinely inspect and maintain the mechanical ventilation.
- b. All ventilation openings shall be covered with double-louvers, bird screens and security bars, constructed of durable materials. They shall be installed in such a way that they are tamper proof.
- c. The Customer shall be responsible to keep the ventilation openings clean in order to have adequate ventilation at all times

7. FIRE PROTECTION

- a. Fire protection/damper shall be built in accordance with the latest applicable codes and by-laws.
- b. The Customer shall own and maintain at all times the fire protection/dampening systems.
- c. If smoke detectors are installed, they must be located in the ceiling above the door. No other location in the vault will be accepted. Control wires and/or conduit must not enter the vault except at the smoke detector. Smoke detectors shall meet applicable Building Code requirements and shall be connected to the building fire alarm system.
- d. The transformer vault shall be totally enclosed by a fire separation of solid masonry or concrete having a fire rating of not less than 3 hours.
- e. No sprinkler system is allowed inside the transformer vault.
- f. All vault doors must be hollow metal fire doors having a fire separation rating of 3 hours. A free sliding pad, tamper proof pad bolt and Mortise strike to be installed. Pad bolt must be fastened to door and frame with tamper proof bolts. All metal parts including doors, hinges and pad bolts must be rust proofed. Astragal strips and Cadmium plated cane bolts (top & bottom of stationary door) are required on double door installations.
- g. All door hinges must be stainless steel, i.e. Mortise type rust proof hinge with non-removable pin and ball bearings or equivalent.
- h. An emergency door is required, location of which is to be approved by Toronto Hydro. This emergency door is in addition to the doors shown on Standards 31-6020 and 31-6030. Emergency door to have panic hardware installed to allow door to open from the inside. There shall be no method of opening an emergency door from the outside.

8. VAULT DRAINAGE

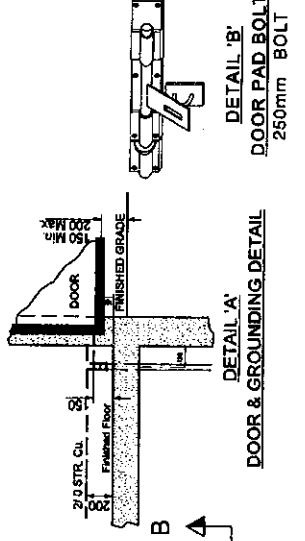
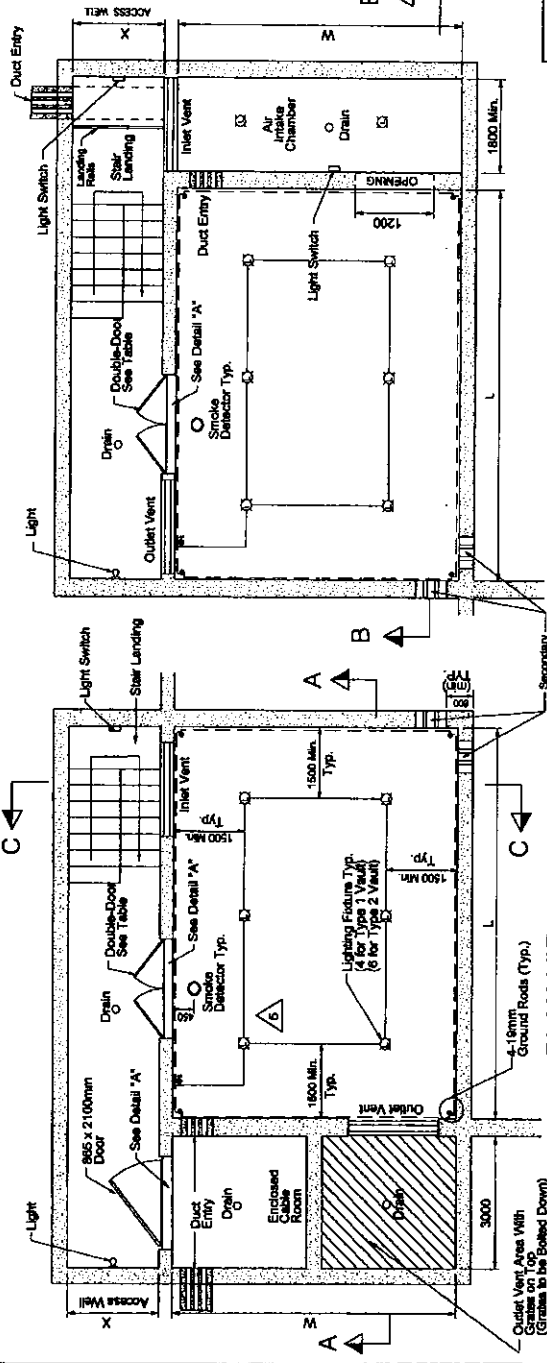
The transformers are oil-filled and therefore the Customer shall provide the drainage to the vault, where applicable, according to the latest codes and by-laws.

| | | | | | | | |
|--|---|--|------------------------------------|------------------|--------|---------|-----|
| DISTRIBUTION CONSTRUCTION STANDARD Civil Construction | | 3 CUSTOMER-OWNED STRUCTURES TRANSFORMER VAULT DESIGN REQUIREMENTS | | | | | |
|  | Approved by: <i>David</i> 2011/10/24 | | Original issue: C.P. 2003-11-27 | Scale: N.T.S. | Rev. 3 | 31-6010 | 4/4 |
| | Drafted by: H.M. | Designed by: J.D. | | | | | |

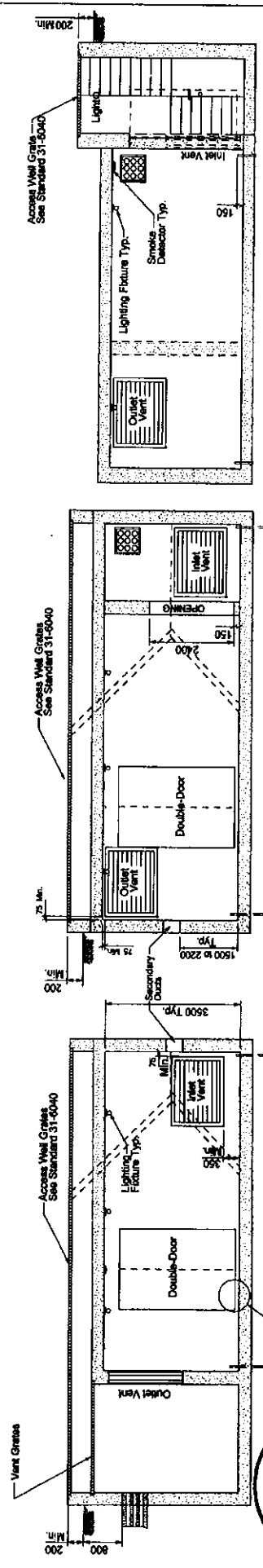
Requirements for Customer-Owned Structures

General Notes:

- 1) All dimensions are in millimeters unless noted otherwise.
- 2) This drawing shall be used in conjunction with Standards 31-6000 and 31-6010.
- 3) An emergency door is required, location of which is to be approved by Toronto Hydro. This door is in addition to those shown on this drawing.
- 4) Emergency door to have panic hardware installed to allow door to open from the inside. There shall be no method of opening an emergency door from the outside.



| BELOW-GRADE VAULT SIZES | | | | | | |
|-------------------------|----------------|-------|-------|-------|-----------------------|--|
| TYPE | TX. RATING | L (m) | W (m) | X (m) | DOUBLE-DOOR SIZE (mm) | |
| 1 | up to 2000 kVA | 8.0 | 6.0 | 1.9 | 1200 x 2400 High | |
| 2 | 2500 kVA | 10.0 | 8.0 | 3.0 | 1200 x 3000 High | |



LICENSED PROFESSIONAL ENGINEER
 J. DANIEL
 90441460
 2017/10/13
 PROVINCE OF ONTARIO

REFERENCE
 DESIGN AND CONSTRUCTION REQUIREMENTS
 TRANSFORMER VAULT DESIGN REQUIREMENTS
 STAIR & ACCESS WELL DETAILS
 LOUVER DETAILS FOR VENT OPENING
 BRD SCREEN DETAILS

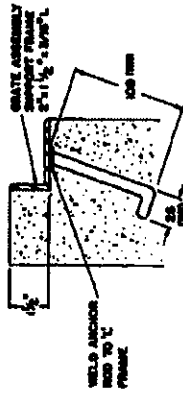
STANDARD
 31-6000
 31-6070
 31-6040
 31-6020
 31-6080

DISTRIBUTION CONSTRUCTION STANDARD
 Civil Construction
 Approved By: [Signature] 2017/10/13
 Drawn By: [Signature]
 Checked By: [Signature]
 H. N. J. D.

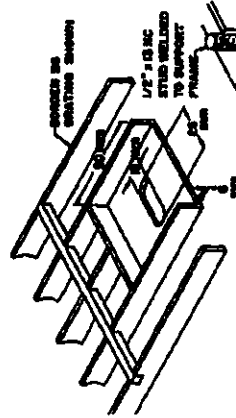
CUSTOMER-OWNED STRUCTURES
 BELOW-GRADE TRANSFORMER VAULT

Original Issue: 2003-11-27
 Scale: N.T.S.
 Rev: 6
 31-6030
 1/1

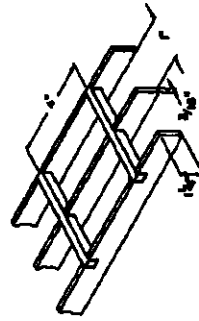
- NOTES:**
1. ALL METAL COMPONENTS TO BE HOT DIPPED GALVANIZED AS PER CAN SPEC. C-104. CLEANED, PRIMED AND PAINTED AFTER WELDING.
 2. DETAILS WHICH ARE NOTED TO BE TYPICAL, MANUFACTURERS ONLY SHOP DRAWINGS MUST BE APPROVED BY TORONTO HYDRO BEFORE CONSTRUCTION.
 3. ACCESS WELLS TO BE COMPLETE WITH STAIRWELL GRATING TYPE APPROVED EQUIVALENT.
 4. LOCKING HASPS FOR GRATING TO BE SUPPLIED BY OWNER AS PER BARBAM. LOCKS WILL BE SUPPLIED BY TORONTO HYDRO.
 5. PENTA-HEAD NUTS FOR GRATING WILL BE SUPPLIED BY TORONTO HYDRO.
 6. BEAMS IN TRAC BE SET IN A SUITABLE MEDIUM (I.E. METAL, CONCRETE) WITH NO REINFORCING DEVICES. (I.E. BOLTS).
 7. STAIRS, HANDRAILS & RAILINGS TO BE CONSTRUCTED TO CANADIAN BUILDING CODE REGULATIONS FOR ALL STEPS AND RAILS. ALL DETAILS MUST BECOME FINISHED.
 8. STAIRS, HANDRAILS & RAILINGS TO BE OF ALL METAL CONSTRUCTION WITH VISIBLE JOINTS AND SHALL BE HOT DIPPED GALVANIZED AS PER CAN SPEC. C-104.
 9. STAIR TREADS & LANDING TO BE U.S.S. SAFETY GRIP GRATING OR APPROVED EQUIVALENT.
 10. STAIRS TO BE GRADED AS PER LOCATION FOR LOCATION OF ACCESS WELLS. WIDTH OF GRATING TO SUIT THE WIDTH OF ACCESS WELLS.
 11. ALL GRATING TO BE BOLTED DOWN.



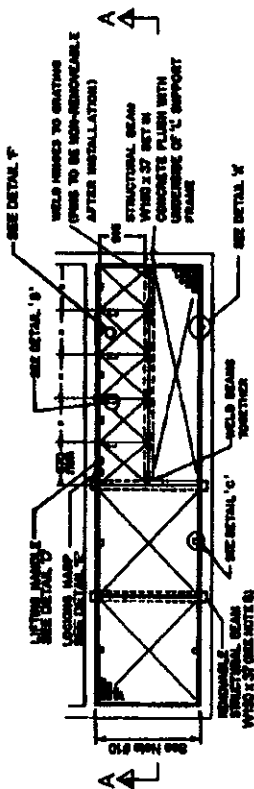
DETAIL 'A'
ANCHOR ROD



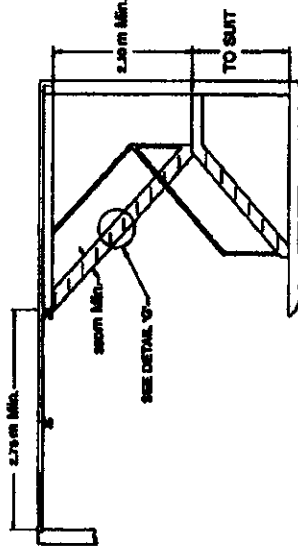
DETAIL 'C'
BOLT PAD FOR STUD & PENTA-HEAD NUT
(IN AREAS SUBJECT TO PEDESTRIAN TRAFFIC)



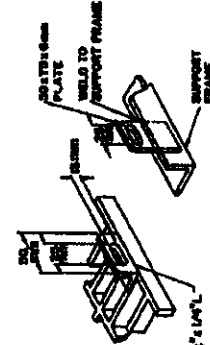
DETAIL 'T'
TYPICAL GRATING



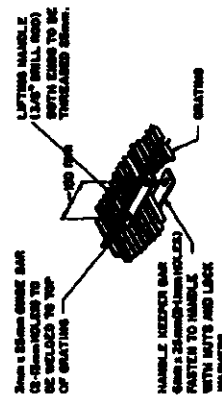
PLAN VIEW
ACCESS WELL GRATE ASSEMBLY



SECTION 'A-A'

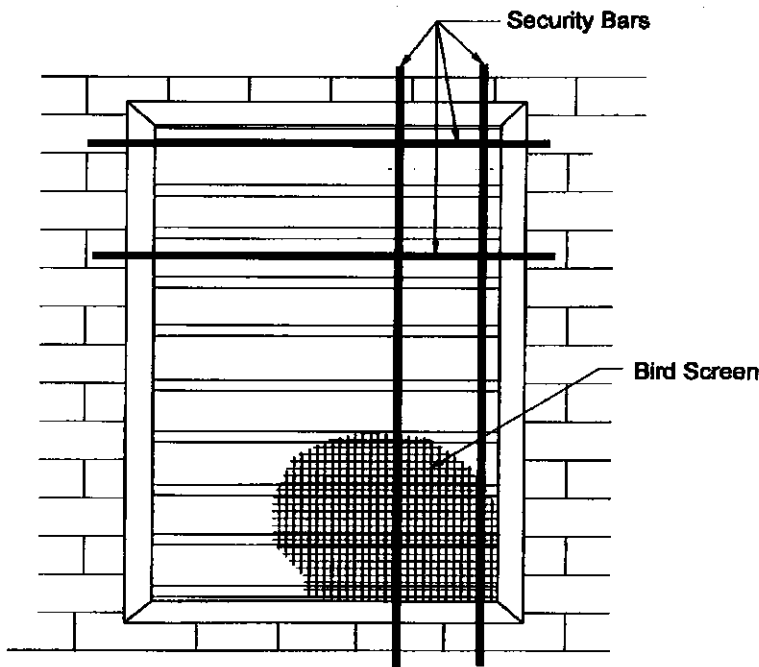


DETAIL 'E'
TYPICAL GRATE LOCKING HASP

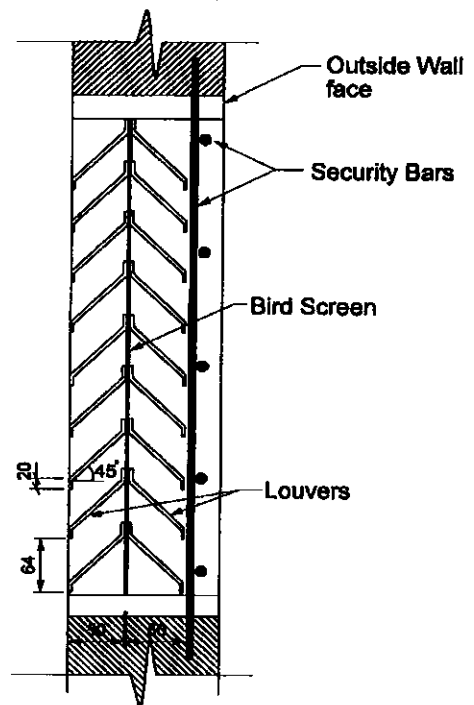


DETAIL 'D'
GRATE LIFTING HANDLE

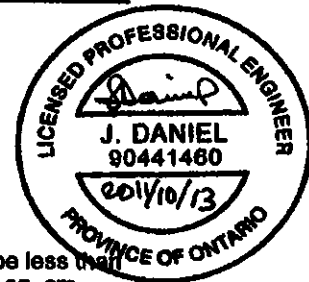
| | | | | | | | | | | | |
|--|--|--------------------------------|--|---------------------------------|--|--------|--|---------|--|-----|--|
| DISTRIBUTION CONSTRUCTION STANDARD Civil Construction | | Approved By: J.D.D. 2011/10/13 | | Original Issue: C.P. 2U03-11-27 | | Rev: 1 | | 31-6040 | | 1/1 | |
| Toronto Hydro | | Designed By: J.D.D. | | N.T.S. | | | | | | | |
| CUSTOMER-OWNED STRUCTURES STAIR & ACCESS WELL DETAILS FOR BELOW-GRADE VAULTS | | | | | | | | | | | |



FRONT VIEW



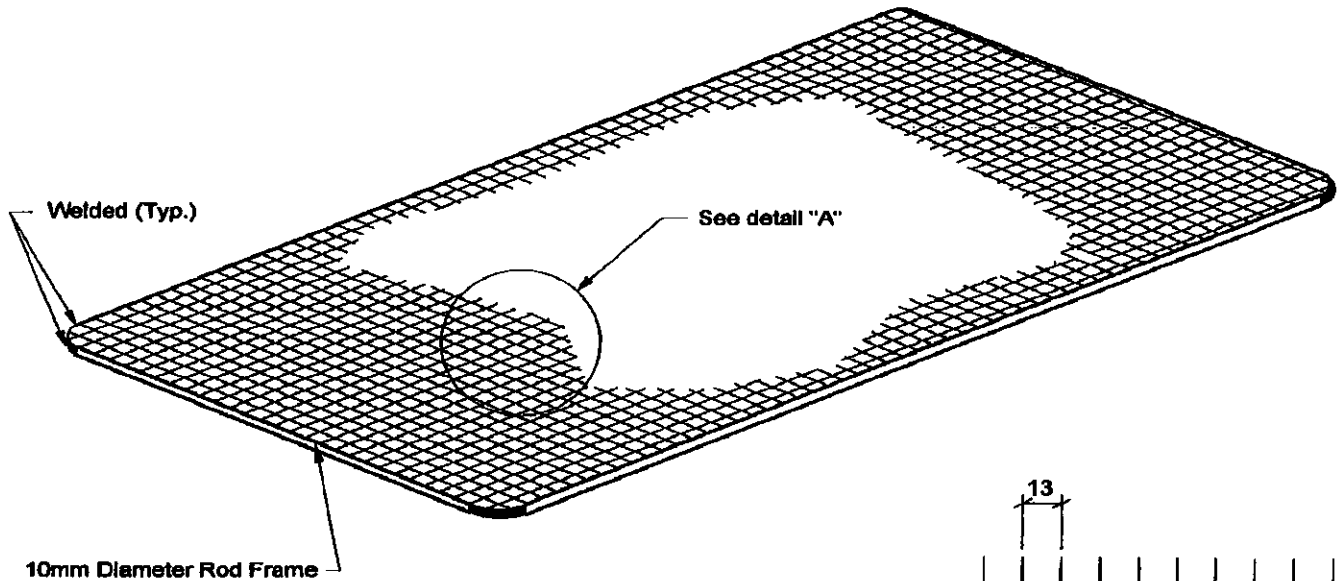
CROSS SECTION



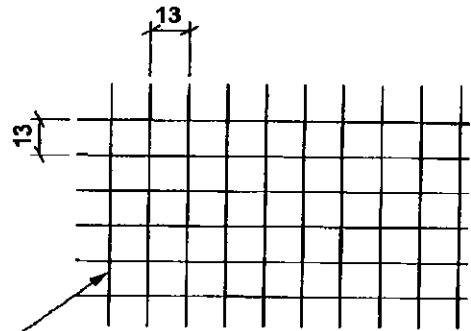
Notes:

- 1). All dimensions are in millimeters unless noted otherwise.
- 2). The allowable NET area of inlet and outlet openings for ventilation in vaults shall not be less than 19 sq. cm per kVA of maximum projected transformer capacity with a minimum of 930 sq. cm. The net area is based on the reduction in air flow due to double sided louvers, bird screen and security bars.
- 3). Vent openings to have 64mm spaced gabled double louver vent. Construction to be of minimum 16 gauge steel using 13mm square mesh bird screen. Both the vent & the screen to be galvanized as per CSA Standard G-164.
- 4). Refer to Standard 31-6060 for details of bird screen.
- 5). Shop drawings must be reviewed and accepted by Toronto Hydro before fabrication.
- 6). 15mm (#5) security bars to be mounted on wall, spaced vertically at 200mm centers and horizontally at 500mm centers with welds at intersecting points.

| | | | | | | | | |
|--|--------------|---|-----------------|--------|------|---|---------|-----|
| DISTRIBUTION CONSTRUCTION STANDARD Civil Construction | | △ CUSTOMER-OWNED STRUCTURES LOUVER DETAILS FOR VENT OPENINGS | | | | | | |
| | Approved By: | | Original Issue: | Scale: | Rev. | 1 | 31-6050 | 1/1 |
| | Drafted By: | Designed By: | C.P. | N.T.S. | | | | |
| | H.M. | J.D. | 2003-11-27 | | | | | |



ISOMETRIC VIEW



20 Gauge wire
(hot dipped galvanized)

DETAIL "A"
13mm Welded Wire Mesh



Notes:

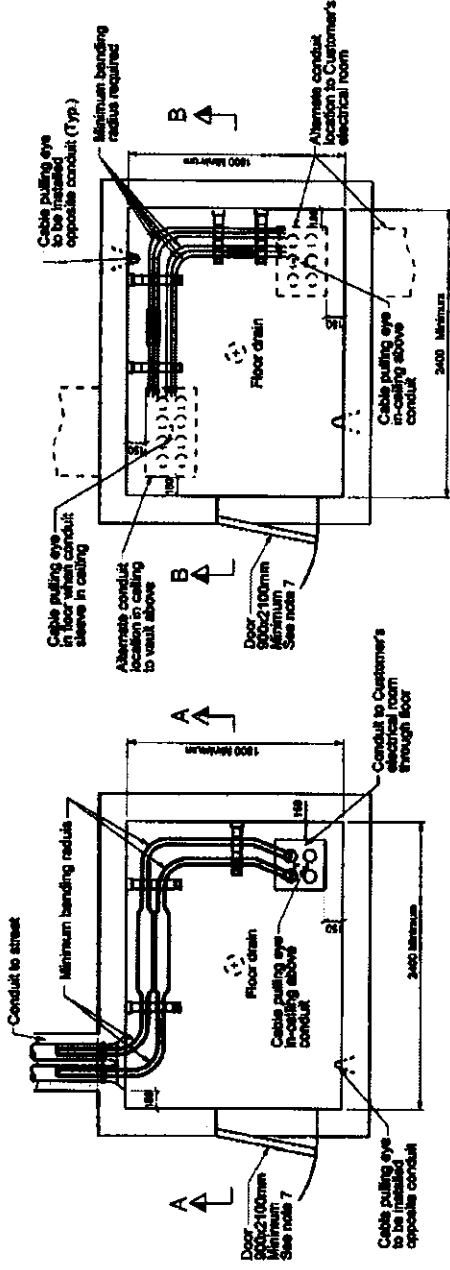
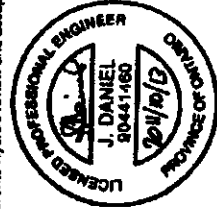
- 1). All dimensions are in millimeters unless noted otherwise.
- 2). Bird Screen to be of metal construction with welded joints.
- 3). Bird Screen & all mounting to be hot dipped galvanized after fabrication as per CSA G-184.
- 4). Shop Drawings must be reviewed and accepted by Toronto Hydro before fabrication.
- 5). Refer to standard 31-6050 for details of Louver Vent.

| | | | | | | | |
|--|----------------------|------------------------------------|------------------------------------|--------------------|------------------|----------------|------------|
| DISTRIBUTION CONSTRUCTION STANDARD Civil Construction | | △ CUSTOMER-OWNED STRUCTURES | | | | | |
| Approved By: <i>J. Daniel</i> 2011/10/13 | | BIRD SCREEN DETAILS | | | | | |
| | Drafted By: H. M. | Designed By: J. D. | Original Issue: C.P. 2003-11-27 | Scale: N. T. S. | Rev: 1 | 31-6060 | 1/1 |

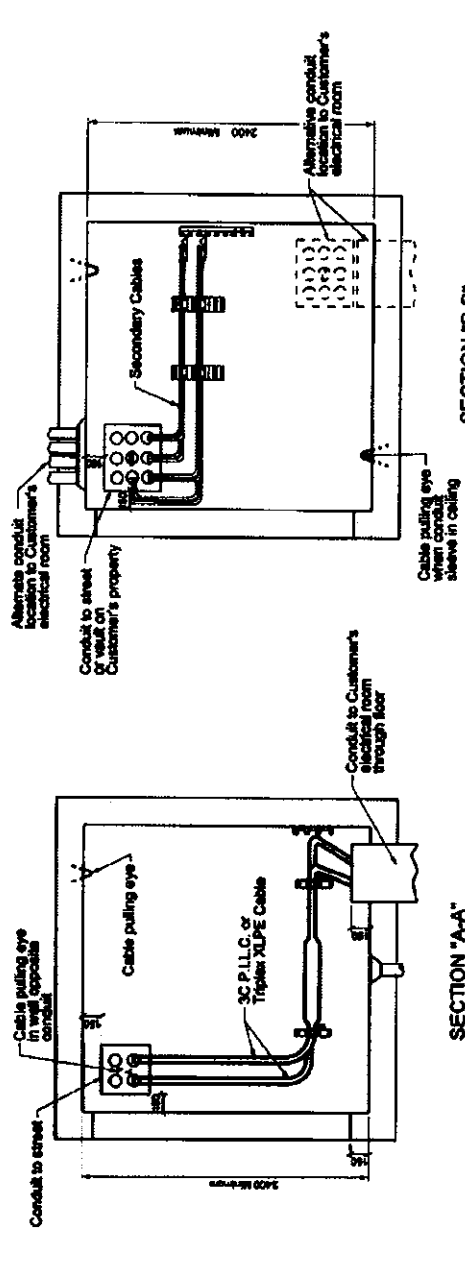
Requirements for Customer-Owned Structures

Notes:

- 1). All dimensions are in millimeters unless noted otherwise.
- 2). When high voltage primary cables/ low voltage secondary cables are routed through the cable pull room, the following points are to be considered in determining the construction requirements and general layout:
 - a). It must, in all cases, be possible to make cable joints in the room.
 - b). Joints in cable must be horizontal.
 - c). The wall on which the cable joint is to be racked must be long enough to accommodate the joint, and two cable bends. The cable joint must be at least 300mm from the floor.
- 3). The walls of the room must be at least 2400mm long, and 1800mm wide, and the minimum headroom is 2400mm. Larger dimensions are required when:
 - a). Steps, railings, columns are located in the "clear" working area.
 - b). More than 2 circuits are installed.
 - c). Conduits are located such that the cables must encircle the pull room i.e., ducts located close together. Headroom dimensions are increased in such cases.
- 4). Cable pulling eyes are to be installed and located as per Standard 31-8210.
- 5). The conduit entrances should be near the corners of the room and be as far apart as possible in the room, and should be offset from each other. Also, the ducts that go to the street must slope away from the Pull Room.
- 6). Lighting and drainage must be provided by the Customer. Light to be located in the center of room.
- 7). Pull room to be equipped with a door and frame having a fire rating of 1.5 hours.
- 8). Where possible, the doorway should be located opposite a duct face and positioned so that it does not interfere with joining or cable installation.
- 9). Padlock trap to be provided for door (or provision for Toronto Hydro cylinder lock - 28mm diameter cylinder).
- 10). No foreign equipment or pipes are allowed in the Pull Room.
- 11). Cable racks and arms will be supplied and installed by Toronto Hydro and charged to the Customer.
- 12). 24 hr. access is required to Pull Room.
- 13). The above requirements are to be shown on the customer's drawings for Toronto Hydro's review and acceptance.



ROOM FOR HIGH-VOLTAGE CABLES PLAN

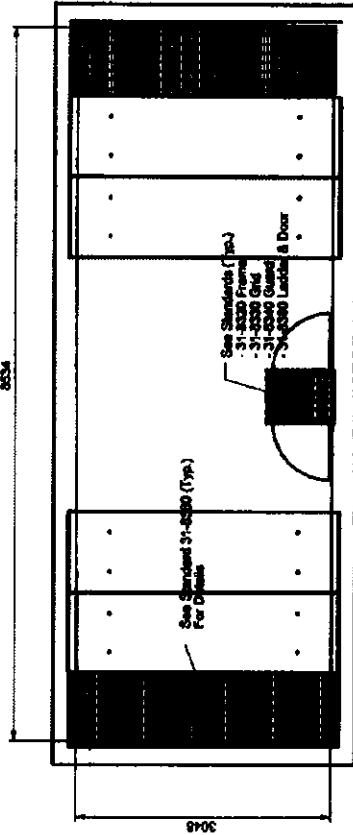


ROOM FOR LOW-VOLTAGE CABLES PLAN

SECTION "A-A"

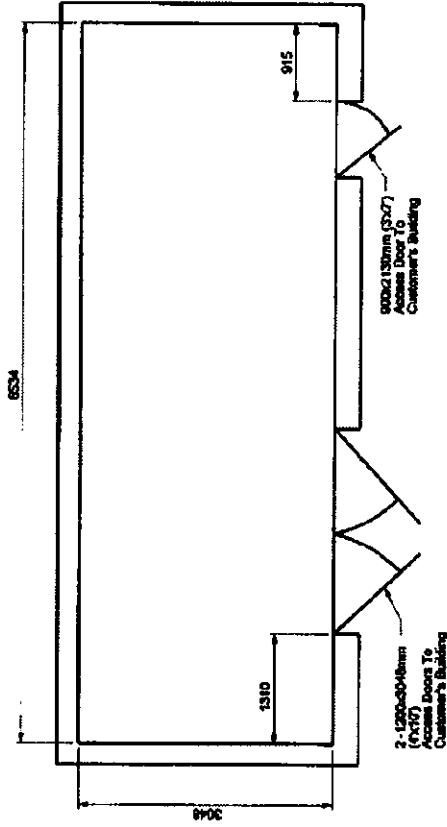
SECTION "B-B"

| | | | |
|--|---|--|-------|
| DISTRIBUTION CONSTRUCTION STANDARD Civil Construction | Approved By: <i>[Signature]</i> Date: 2011/10/13 | CABLE PULL ROOMS TYPICAL INSTALLATION OF HIGH & LOW VOLTAGE CABLES | |
| | Designed By: H.M. Original: G.D./A.P. 2004-07-30 | Scale: N.T.S. | No. 2 |
| TORONTO HYDRO | | | 1/1 |



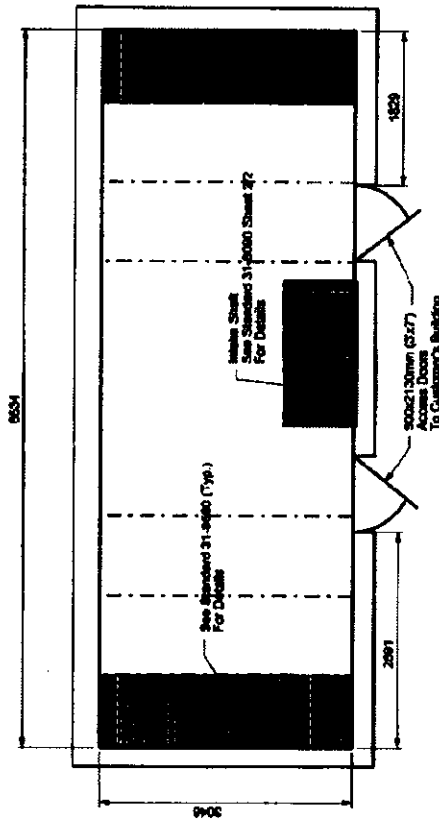
BELOW GRADE - TOP ENTRY VAULT

See Standard 13-4010 page 1/6 for Electrical Layout



ABOVE GRADE - WALK-IN VAULT - TYPE 1

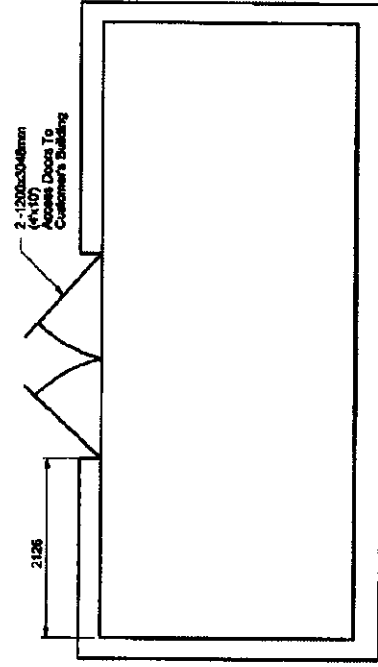
See Standard 13-4010 page 3/6 for Electrical Layout



BELOW GRADE - WALK-IN VAULT

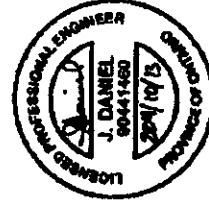
Notes:

- 1). All dimensions are in millimeters unless noted otherwise.
- 2). This drawing shall be read in conjunction with Standards 31-8000 and 31-8010.



ABOVE GRADE - WALK-IN VAULT - TYPE 2

7315 x 3050 x 3660mm, See Standard 13-4020 page 8/12 for Electrical Layout
6700 x 3050 x 3660mm, See Standard 13-4040 page 5/6 for Electrical Layout



DISTRIBUTION CONSTRUCTION STANDARD
Civil Construction

| | |
|-----------------|----------------------|
| Approved By: | 20/10/13 |
| Checked By: | J.D. |
| Original Issue: | C.P./G.D. 2003-11-27 |

CUSTOMER OWNED STRUCTURES

13.8 KV RADIAL SYSTEM
BELOW & ABOVE GRADE VAULTS

| | |
|-----------|---------|
| Scale: | N.T.S. |
| Sheet: | 2 |
| Project: | 31-6080 |
| Revision: | 1/1 |