



UTILITIES



DESIGN AND CONSTRUCTION MANUAL

Linear Municipal Infrastructure



REVISION TRACKING

Utilities

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UTILITIES

Introduction

INTRODUCTION

1.0 GENERAL REQUIREMENTS

This manual has been prepared to provide the City, consulting engineers, contractors, developers and the general public with a common reference to ensure the consistent application of utility design and construction practices in the City.

The information provided is not intended to hinder innovation and is rooted on meeting performance requirements over the lifecycle of the infrastructure. If deviating from the criteria and requirements set out in this manual, the Proponent shall provide justification for the change via a Standard Deviation Form (**Appendix G-1 in the General Preface**).

The key guiding principles underlying this manual are to:

- The City maintains its design requirements to safeguard the public.
- Protect health and safety of the public.
- Preserve the integrity of all buried utility infrastructure within City ROW.

2.0 OTHER REFERENCE DOCUMENTS

All utilities shall be designed and constructed in accordance with the latest versions of this manual as well as other industry standards and best practices, including but not limited to:

- Ontario Regional Common Ground Alliance (ORCGA)
- Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD)
- Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (ASCE 38-02)

3.0 INDUSTRY STANDARDS AND SPECIFICATIONS

All utilities materials and components shall comply with the most recent version of all applicable current industry standards and specifications for quality management and quality control, including but not limited to the following:

- Electrical Safety Authority (ESA)
- Canadian Standards Association (CSA)

4.0 OTHER APPLICABLE ACTS AND LEGISLATIONS

This manual does not supersede, nor replace any legislation governing the design and construction of utility infrastructure.

The Proponent shall be fully familiar with the latest version of these legislative requirements such when carrying out design and construction of linear projects, such as:

- Canadian Electrical Code
- Ontario Electrical Safety Code
- Ontario Underground Infrastructure Notification Systems Act (ON1Call)
- Technical Standards & Safety Authority (TSSA)
- Ontario Health and Safety Act (OHSA)
- Accessible Ontarian's with Disability Act (AODA)
- Telecommunications Act and related decisions of the Canadian Radio-Television and Telecommunication Commission

5.0 BRANTFORD UTILITIES COORDINATION COMMITTEE

This manual has been prepared with input from the City and the Brantford Utilities Coordinating Committee (BUCC), which consists of utility agencies and various City departments.

Through this manual and the BUCC, the City endeavours to safely and efficiently manage and protect existing and future underground infrastructure within its ROW.

The BUCC provides a forum for open communication and coordination on design, submission and construction requirements related to ongoing planning, subdivision and development applications.

The BUCC consists of the following members:

- Brantford Power Inc.
(Electricity Distribution)
- Brantford Hydro
- Bell Canada (Telecommunications)
- Rogers Communications Canada
(Telecommunications)
- Union Gas (Gas Distribution)
- Energy Plus
- Various City Departments

UTILITIES
Design

DESIGN

6.0 GENERAL

This section outlines the minimum requirements to aid in the design of both underground and overhead utilities in the City.

It is the responsibility of the Consulting Engineer to comply with the minimum requirements outlined in this manual or the standards of the individual utility company.

It is important to note that these requirements are not intended to replace standards set by regulators or those accepted as good engineering practices.

7.0 COMPOSITE UTILITY PLANS

In order to ensure that conflicts are avoided among utilities, street trees, municipal services and driveways, the Consulting Engineer shall prepare a Composite Utility Plan (CUP) for all new subdivision developments.

The CUP shall indicate the location of all underground and aboveground services, utilities, regulatory signs and street trees.

Any deviation will require submission of a Standard Deviation Form.

The following outlines the process for review of the CUP by the City and utilities:

1. Initiation of CUP preparation shall be in the detailed engineering design process.
2. A first submission of CUP shall be made to the City no later than with the second detailed engineering submission. Completed CUP shall be signed by each Utility before submission to the City for approval.

3. Final submission CUP shall be submitted for review by the City with the detailed engineering drawings for review by the City.

8.0 MINIMUM COVER

The minimum depth of cover shall be 0.9 m for underground utilities within City Right-of-Way (ROW).

The depth of cover for any utility is measured from the street surface to the top of the duct, if direct buried, or top of the concrete if the equipment is concrete encased. If the street elevation is subsequently altered, the utility may require modification to meet the minimum depth of cover requirements.

When attempting to locate existing underground utilities, it must not be assumed that all utilities are at standard depth.

9.0 ALIGNMENT

In preserving the City ROW for present and future use, the City coordinates its efforts to minimize the amount, while maximizing the efficient use, of underground space occupied by each utility.

All efforts shall be made when replacing existing or installing new infrastructure to be in accordance with the Standard Drawings in this manual and the Typical Cross-sections (shown in **Appendix G-2 in the Preface**).

9.0 ALIGNMENT (CONT'D)

Alignments selected for proposed utility installations shall adhere to the following conditions:

- Alignments of any new plant should coincide with that of existing plant.
- Alignments must be parallel or perpendicular to street property lines.
- When installing underground service to the same customer, those services running in parallel alignments are required to share a common trench.

Joint trench details must be clearly illustrated on utility company drawings.

- When abandoning plant, the alignment should replace or be placed immediately adjacent to the existing plant.
- A continuous alignment for the length of the installation is preferred.
- New and existing plant will occupy one utility corridor per street.



All efforts shall be made to not have service connections and appurtenances in the driveway. The General Layout drawing in this manual shall be utilized when placing service connection to individual lots.

The City recognizes that existing utilities located within the ROW may present obstacles in satisfying the conditions in this section. If a utility company has any concerns selecting an alignment, the Consulting Engineer shall submit an alternate alignment for review and approval by the City.

10.0 UTILITY CLEARANCES

Standard utility clearances between existing underground utilities have been established to minimize conflict and ensure a safe work zone exists around each utility's equipment. When construction activities require a utility to be temporarily or permanently relocated, arrangements that are equitable to all parties affected will be made.

Any exceptions to this clearance will require approval from the City and the affected utility or utilities.

Sewer and watermain construction often requires deep excavations with wider trenches to allow for extra shoring and safe working room.

With the added concern of shallower utilities collapsing into deeper sewer trenches, the City places restrictive requirements on utilities, requiring a minimum horizontal clearance of 1.5 m from all watermains including hydrants and 2.0 m from sewer main lines. In addition, the City reserves the right to require additional clearance under special circumstances.

10.0 UTILITY CLEARANCES (CONT'D)

All efforts shall be made when replacing existing or installing new infrastructure to be in accordance with the Standard Drawings and Typical Cross-sections in this manual.

Refer to the Coordination section in this manual for further detail.

The following represents the minimum clear separation between public utilities and municipal sewer and water services. The trench detail contained in this manual identified separation within joint trenches.

Table 1. Minimum Clearances From Utilities

| Gas (m) | Hydro, Telecom and Cable TV (m) |
|--|---------------------------------|
| Minimum Vertical Clearance | |
| 0.6 | 0.6 |
| Minimum Horizontal Clearance | |
| 0.9 | 0.6 |
| Minimum Distance below Ditch Inverts | |
| 0.6 to 0.75 | 0.9 |
| Minimum vertical distance from City-owned infrastructure | |
| 0.6 | 0.6 |
| Minimum horizontal distance from City-owned infrastructure (hydrants, chambers, etc.) | |
| 1.0 | 0.75 to 1.0 |
| Minimum horizontal distance from City-owned infrastructure (watermain) | |
| 1.5 | 1.5 |
| Minimum horizontal distance from City-owned infrastructure (sanitary and storm sewers) | |
| 2.5 | 2.5 |

11.0 UNDERGROUND STRUCTURES

Underground structures shall be in accordance with OPSS, OPSD and the individual Utility Standards, latest versions.

The City's primary concerns focus on the location of these structures within the ROW, capacity for adjustment and drainage provisions.

11.1 Location Criteria

To preserve utility corridor space for present and future needs, the City requires that installation of precast structures:

- Have the longer side of the equipment aligned parallel to the property line.
- Preferred alignment is to align the structure directly over top of utility.
- Maintain a minimum clearance from face of curb of 15.0 m from street intersections. This requirement ensures ease of access and adequate visibility for vehicle traffic during maintenance activities.
- Preferably, be located in the boulevard or curb lane of the roadway, so as to minimize disruptions during construction and maintenance activities.
- Are not permitted within a lane entrance or intersection curb return areas.

11.2 Adjustment Units

Adjustment units shall be utilized such that the elevation of the grate is level with the surface of the base course asphalt. Frames and covers shall be raised to the surface course asphalt's elevation before paving is completed.

12.0 SURFACE STRUCTURES

The following sections detail loading and placement criteria of surface structures, including vaults and non-standard maintenance holes.

12.1 Loading Criteria

The City requires that all structures are constructed in accordance with the latest version of industry standards.

The City recognizes that vehicles of varying size and weight frequently occupy sidewalk and other non-travelled portions of the street and note that the referenced design standard applies equally to structures within these areas.

12.2 Placement Criteria

Alongside the aforementioned loading criteria, surface structures shall comply with the following requirements:

- Clearance shall be maintained near standard pedestrian ramps so as not to block access during maintenance.
- Vaults shall maintain a minimum 1.0 m clearance from typical surface features such as poles, fire hydrants and street furniture.
- For clearance with street trees, vaults shall maintain the greater distance of:
 - a. 1.5 m measured at breast height (1.4 m high) from the main trunk; or
 - b. Six times the tree trunk diameter (measured at breast height) from the main trunk of the tree at breast height from street trees.
- Vaults shall maintain a minimum 1.0 m clearance with traffic poles and 2.0 m from pads.
- Vaults shall maintain a minimum 1.0 m clearance from residential and business entrance / walkways.
- Standard clearances from all other utilities shall be maintained.
- The ideal location for vaults is in the boulevard and shall fall within the approved utility corridor.
- The vault roof is to be installed at the City design grade.
- Vaults should not be located in front of or behind bus-stop shelters.
- The maximum gap permitted for all grates shall be 6.0 mm.
- A minimum allowance for a 100 mm vertical adjustment of the equipment is required to accommodate changes to street grade and settling.
- Equipment must be located within the existing utility alignments and / or corridors and will not be permitted where proposed placement may inhibit the use of a future corridor or limit optimum use of such space.
- To minimize the amount of utility corridor space occupied, equipment is to be installed with the longer side parallel to the property line.
- Vault locations should accommodate standard street treatments (e.g., utility strips, sidewalks, pedestrian lane crossings).
- Attention must be paid to overhead encroachments (e.g., awnings, building overhangs, canopies) that may be installed directly over proposed locations.
- Locates for all buried utility equipment and service connections within the immediate area of a proposed alignment may be requested for proposed drawings.

13.0 ABOVEGROUND STRUCTURES

Height of the aboveground structure shall be considered when placing the structures to ensure adequate sight lines from driveways are maintained.



13.1 Location of Aboveground Structures

City street space is at a premium throughout most of the City.

There are street lights, traffic signs, parking meters, public bike share, fire hydrants, trees, post boxes, benches, bus shelters, garbage cans, sidewalk cafes, bike racks, newspaper boxes, street vendors, underground utilities and services including meters, businesses with their entrances and window displays and other street furniture and public art.

The following placement criteria applies.

- Located on a flankage street preferably near the back of the property against a hedge, wall or fence, as to minimize the visual impact on the adjacent property.
- Located against the adjacent property line.
- Located within the existing utility alignments and/or corridors and will not be permitted where proposed placement may inhibit the use of a future corridor or limit optimum use of such space.
- Limited to one piece of aboveground equipment per adjacent property, where possible.
- Aboveground equipment shall maintain the following clearances from stated objects:
 - Minimum 1.0 m clearance from typical surface features such as poles, fire hydrants, planters and street furniture.
 - Minimum 1.0 m for all vehicle crossings.
 - Minimum 1.0 m for pedestrian entrances to residential and commercial properties (not applicable to those located within curb return / pedestrian ramp areas).
 - Minimum 0.3 m from sidewalks and future sidewalks (not applicable to those located within curb return / pedestrian ramp areas and multi-use trails).
- The City may place additional restrictions on a site- by-site basis, where concerns regarding sight lines arise.

13.1 *Location of Aboveground Structures (cont'd)*

- Aboveground equipment shall not:
 - be located in front of windows, doors and gates.
 - be located adjacent to sidewalk cafes.
 - obstruct driver or pedestrian sight lines, or otherwise compromise public safety.
 - require pedestrians to adjust their line of travel to pass the aboveground equipment.
 - be located in front of or behind bus-stop shelters.
 - be within any transit loading or unloading area in a manner that interferes with boarding, disembarking, or queuing by transit passengers.
 - be permitted within lane entrance or intersection curb return.
 - shall not be located adjacent a high volume driveway.

13.2 *Aesthetics / Design*

- Height of the aboveground equipment shall be limited to the minimum height needed for the equipment.
- In certain locations aboveground equipment shall have a peaked or rounded roof on the top to deter unwanted activity.
- Aboveground equipment shall be positioned with the longer side and / or doors of the aboveground equipment running parallel to the street property line.
- The foundation shall not extend beyond the edges of the aboveground equipment and shall be installed flush to meet street design grade.

13.3 *Other Criteria*

- Attention must be paid to overhead encroachments (e.g., awnings, building overhangs, canopies) that may be installed directly over proposed locations.
- Drawing submittals shall meet the requirements of the manual.
- When choosing equipment locations, consideration should also be given to limiting construction impacts to the street space and to vegetation where possible.

14.0 POLES AND ANCHORS

The following section details the City's design requirements for utility poles and anchors.

14.1 *Location of Poles*

When an additional pole is to be installed on a street or an existing pole is to be relocated, there are standard pole locations for placement. Existing conditions will generally restrict available locations.

Generally, pole locations shall be:

- At lot lines or projected lot lines;
- A minimum 1.0 m clear of vehicular crossings;
- A minimum 1.0 m clear of fire hydrants;
- A minimum 1.0 m clear of catchbasins;
- A minimum 1.0 m clear of crosswalks.

14.2 *Down Guy and Anchor*

The following are general location requirements for down guy and anchor installations:

- A sidewalk guy must be installed with the anchor at a maximum distance of 0.3 m, or as otherwise approved by the City, from property line.
- Access to existing entrances or driveways must not be compromised.

UTILITIES

Permits & Approvals

PERMITS AND APPROVALS

15.0 CITY OF BRANTFORD PERMITS AND APPROVALS

Utility agencies shall apply and secure all necessary permits and approvals from the City prior to commencement of any works within the ROW.

Necessary City approvals include but are not limited to the following:

- Municipal Consent
- Street Excavation Permit
- Temporary ROW Occupancy Permit

Proponents shall follow the appropriate procedures with each of the above listed permits and approvals.

All new infrastructure projects to be constructed within City ROW will require a Municipal Consent approval between the City and the Utility prior to installation.

The City will provide the required forms upon request.

16.0 GRAND RIVER CONSERVATION AUTHORITY PERMITS AND APPROVALS

Utility agencies shall apply and secure all necessary permits and approvals from the Grand River Conservation Authority (GRCA) for any installations within GRCA jurisdiction.

UTILITIES

Construction

CONSTRUCTION

17.0 COORDINATION

17.1 *Utility Coordination and Subsurface Locates*

As of 2012, the Province passed the *Ontario Underground Infrastructure Notification System Act* (Bill 8) which requires all utility owners to register with Ontario One Call (ON1Call).

This law ensures that a single phone call from excavators, contractors or residents reaches the private Locate Service Provider to perform the locates.

The role of Ontario One Call is to notify all registered owners of underground facilities within the vicinity of the planned excavation area to provide the locate service.

Requests for locates of all City-owned utilities must go through ON1CALL by:



Calling **1-800-400-2255**
or
Visiting <http://www.on1call.com/>

17.2 *Notification of Damage to Other Utilities*

Any damage to existing plants, including but not limited to protective coatings, support structures, cathodic protection, or the housing of the plant shall be reported to the respective utility company.

The plant shall remain exposed with the excavation properly supported until the plant owner has assessed the damage and authorized a repair to proceed, unless otherwise approved.

17.3 *Street Trees*

When a known conflict arises between a proposed utility and existing street trees, the approved utility permit shall include a requirement to notify the City five (5) working days prior to the start of construction.

This is to ensure that sufficient time is provided to assess the site and determine construction techniques that will mitigate potential disruption to the trees and their root systems.

Boulevard trees shall be protected from potential damage during construction and maintenance activities.

For conflicts encountered during construction, the affected utility and the City shall be notified immediately.

Further information on street trees can be found in the Roads and Transportation Manual.

17.4 *Protected Locations and Cultural Heritage Resources*

The discovery of buried archaeological materials during the construction or installation of any service or utility, may be indicative of a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. Upon discovery of the materials, alteration of the site must cease and the City must be notified immediately.

Should human remains be uncovered at any stage of work, fieldwork and construction activities shall cease and the discovery shall be reported to the police, in accordance with the *Cemeteries Act R.S.O. 1990 c.C.4* and the *Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, C.33* (when proclaimed in force).

18.0 UTILITY INSTALLATION

18.1 General

This section is in accordance with the provisions of OPSS.

18.2 Material Requirements

All cable and duct material and associated fittings for utility plant shall be in accordance with CSA and shall be subject to approval by each applicable Utility Company.

Concrete, bedding and backfill materials shall be in accordance with OPSS and OPSD and as specified by each Utility Company's standard requirements.

18.3 Execution

— Excavation —

All excavations shall be done in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects, Revised Statutes of Ontario, 1990 Chapter 1 as well as independent utility company requirements.

The Utility Company shall be responsible for the proper handling and disposal of all excess material removed from the source site to the receiving site in accordance with the current regulations.

— Bedding, Embedment and Cover —

Bedding, embedment and cover materials shall be placed for the full width of the trench and mechanically compacted to 98% of Standard Proctor Maximum Dry Density (SPMDD), as determined by ASTM D698.

— Backfill —

Backfill materials for new developments shall be compacted to 98% SPMDD, in accordance with ASTM D698. Unshrinkable fill with a maximum compressive strength of 0.4 MPa shall be used for retrofit projects as specified by the City.

Care shall be exercised during backfill operations so that the utility (ducts, concrete, cables or other) is not damaged or displaced.

— Common Trench —

Common trench installation is encouraged when supported by the recommendations of a soils report prepared by a qualified Geotechnical Engineer. Minimum vertical separations as specified by each Utility Company's standard requirements shall be maintained between utilities within the common trench. Warning tape may be required in common trenches.

— Duct Installation —

Duct whether direct buried or concrete encased, shall be installed in accordance with OPSS and OPSD, latest edition and as specified by each Utility Company's standard requirements.

They shall be laid end-to-end in as straight a line as possible to facilitate pulling of cables. Maximum number and radii of bends between pull points (i.e. Maintenance holes, hand holes and transformer bases / vaults) shall be based on pull calculations.

— Trenchless Installation —

Trenchless installation is the preferred method for utility installations under a paved surface and a minimum clearance of 1.0 m from other utilities shall be provided.

18.3 Execution (cont'd)

— Road Crossings —

Road crossings shall be in accordance with OPSS and OPSD and as specified by each Utility Company's standard requirements. The depth of each affected utility shall be confirmed prior to installation of the new utility.

— Utility Crossings —

Where a plant crosses over or under other plants, the clearance and type of crossing shall follow the respective utility's standard requirements.

Appropriate bedding for the plants and associated crossings shall be included in the scope of work for the project.

— Restoration —

Restoration of the work area shall be in accordance with the City's Utility Cut Restoration Procedure.

UTILITIES

Utility Data Collection

UTILITY DATA COLLECTION

19.0 DATA COLLECTION AND SURVEY STANDARDS

Utility agencies and other plant owners shall collect and maintain records for their respective infrastructure in sufficient detail and accuracy.

The City shall be provided with all as-built records within three (3) months of installation.

Data shall be referenced using the **Universal Transverse Mercators Projection (UTM) NAD CSRS 1983 Zone 17 North (WKID EPSG: 2958)** and include markers (such as benchmarks, survey monuments, GPS coordinates) to ensure that the plant can be located, upon request.

Utilities shall ensure the following information is captured to facilitate planning, design, construction, documentation, location and maintenance of the plants.

As-built information shall be provided in the form of “red line” drawings including:

- Horizontal position of the plant (x and y coordinates).
- Depth of cover at date of installation.
- Horizontal alignments in relation to property line (i.e. SIB).
- Cross-sectional size of duct bank or cable trench.
- Number and size of conduits, pipes, or number of direct buried cables if not concrete-encased.
- Plant’s external material type that would first be encountered if exposed.

20.0 ASSET ATTRIBUTE DATA

High quality asset data are critical for effective management of municipal and utility infrastructure. As a best practice, all asset data shall be collected digitally and stored in a central database management system for future reference.

Table 2. Typical Data Collection Attribute Requirements

| Attribute Name | Attribute Description |
|-------------------------|---|
| Unique Identifier (UID) | A unique identifier carried through the life of the asset. |
| Asset Network or Group | Parent group to which asset belongs to <i>(e.g. water, sanitary, storm, utility, etc.)</i> |
| Type | Type of asset within the asset network/group. <i>(e.g. pumps, gas main, hydro cable, etc.)</i> |
| Location | Field reference and coordinate-based references. <i>(e.g. street address, x / y coordinates, etc.)</i> |
| Dimensions | Size of the asset. <i>(e.g. diameter in millimetres, length, etc.)</i> |
| Installation Date | Date in which the asset was installed. <i>(Specified in DD/MM/YYYY format)</i> |
| Material | Material in which the asset is constructed of. <i>(e.g. concrete, PVC, HDPE, etc.)</i> |

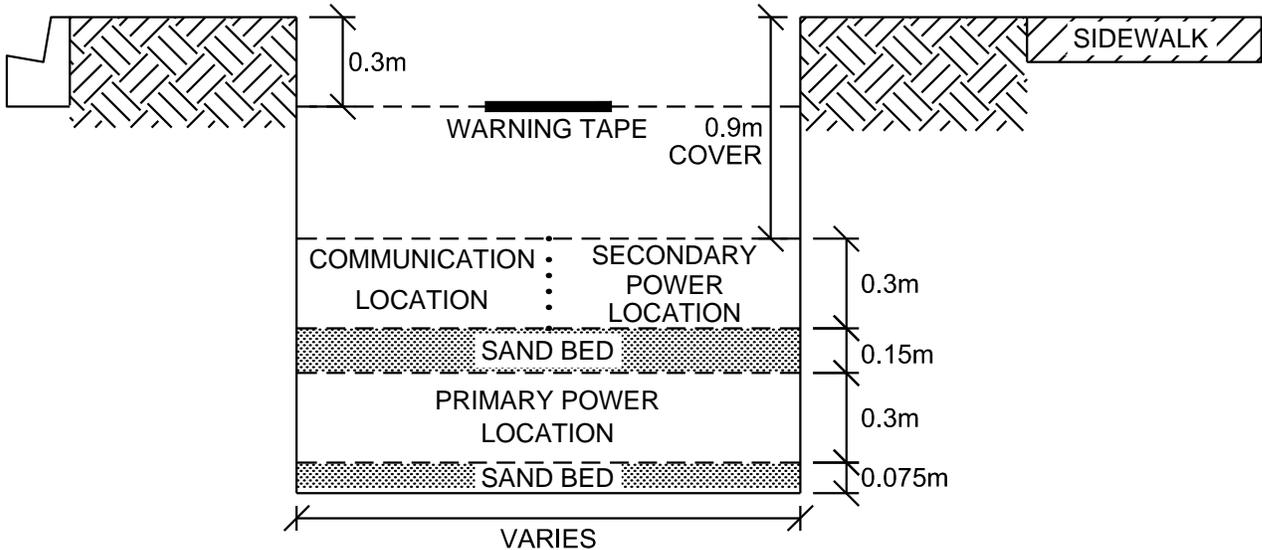
UTILITIES

Standard Drawings & Details

STANDARD DRAWINGS AND DETAILS

| Drawing No. | Title |
|-------------|--------------------------------|
| UT-104 | Standard Utility Trench Detail |

PROFILE VIEW



STANDARD UTILITY TRENCH DETAIL

ENGINEERING SERVICES DEPARTMENT

JUNE, 2017

N.T.S.

DETAIL

DRAWN BY:
J.M.B.

