



# GENERAL PREFACE



## DESIGN AND CONSTRUCTION MANUAL LINEAR MUNICIPAL INFRASTRUCTURE STANDARDS



# REVISION TRACKING

EXISTING VERSION	VERSION NUMBER
October 2017	N: V1 – Original Final Submission
March 2018	Rev: V2 - 2018 Review
December 2018	V3
February 2020	V4
January 2022	V5
February 2023	V6
February 2024	V7

## 2024 Revisions

Section	Modification & Commentary
<b>2.0 Definitions</b>	<p><b><u>Transverse Markings</u></b> Transverse pavement markings extend across the travel lane and are used in applications where an immediate action is required by the vehicle operator. This action may be a command to stop at an intersection, to advise yield for pedestrians in a crosswalk, or to advise against travel within boundaries defined by crosshatching or painted islands. Transverse pavement markings include stop bars, yield lines, crosswalks, parking space markings, words and symbols.</p>

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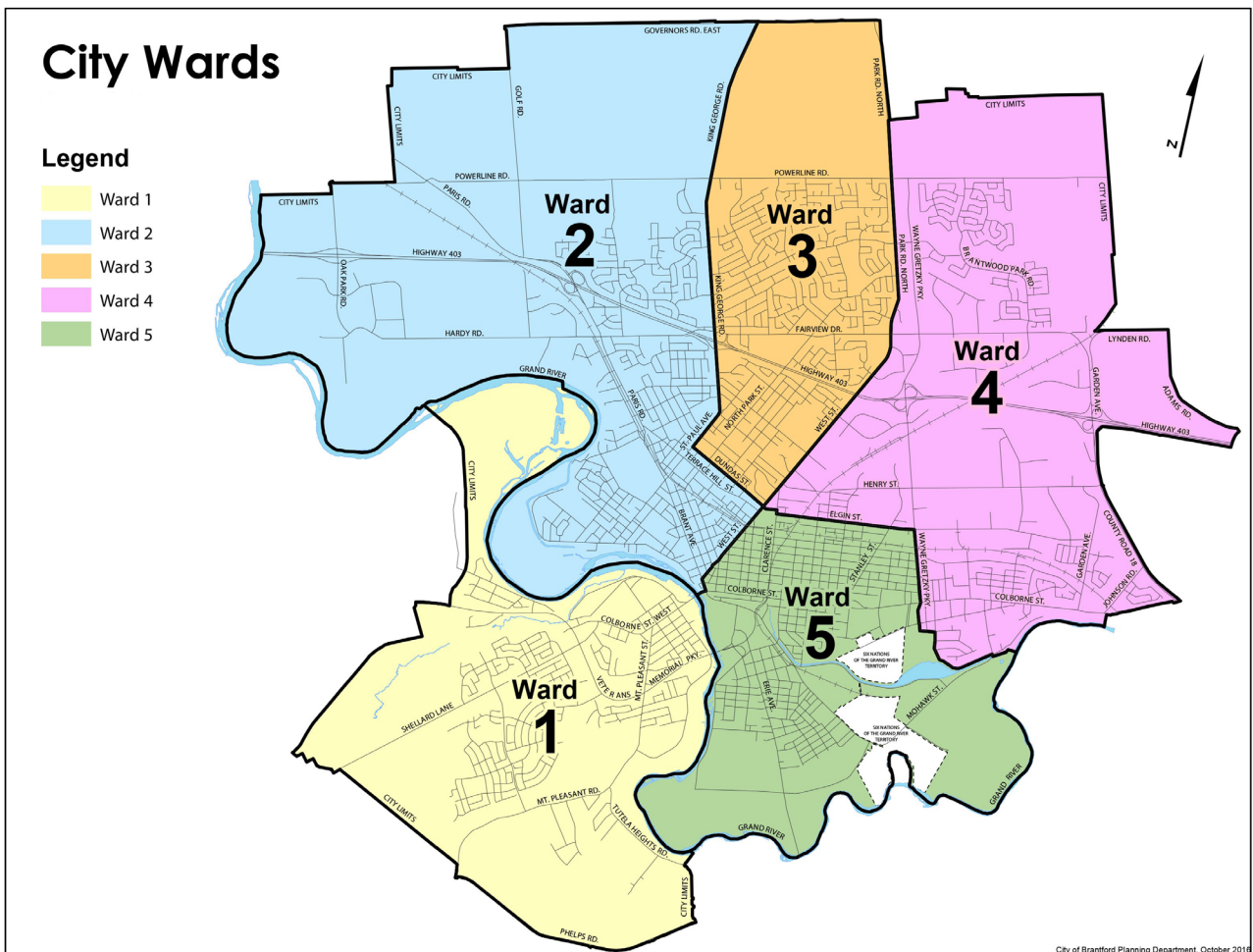
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1.0 PREAMBLE

The City of Brantford is situated on the picturesque Grand River which is located in the heart of Southwestern Ontario, with access to major highways. The City is a single-tier municipal government that is fully independent and surrounded by the County of Brant, neighbouring the Six Nations community.

the municipal infrastructure, it is essential that there is consistency in the quality of design. These guidelines were developed to achieve an accurate representation of the expectations and visions for the City moving forward.

The City is responsible for: water treatment, transmission and distribution mains, storage facilities and pumping stations; wastewater treatment, sewers, forcemains and sewage pumping stations; road networks; and, stormwater sewers, drainage ditches, culverts and stormwater management ponds. As the City is responsible for the ongoing operational practices, maintenance activities and growth of



## 2.0 DEFINITIONS

The following contains definitions for terms used throughout the manuals.

TERM	DEFINITION
Anode	The electrode of an electrochemical cell where corrosion occurs and metal ions enter solution. An anode refers to a packaged anode consisting of the casting, chemical packing material, lead wire, tube and label.
AODA	Accessibility for Ontarians with Disabilities Act
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
ANSI	American National Standards Institute
Backfill	All materials placed at 300 mm or above the watermain or sewer.
Bedding, Embedment and Cover	All materials placed between the trench bottom and 300 mm above the watermain or sewer.
Binder Course	A Hot Mix Asphalt (HMA) course between a surface course and either a granular base course or stabilized base course, an existing pavement, or another HMA binder course.
BPI	Brantford Power Incorporated
Boulevard	Portion of the road allowance between the adjacent property line and the edge of the travelled portion of the highway or the edge of the shoulder, where such exists, furthest from the travelled portion of the highway.
Cathodic Protection	A technique to control the corrosion of a metal surface by making that surface the cathode of an electrochemical cell.
Corrosion Protection	Corrosion control of a metal surface either by coatings or cathodic protection or both.
City	The Corporation of the City of Brantford and all entities owned by it.
Consulting Engineer	The Professional Engineer responsible for the planning and design of the municipal infrastructure, performing those duties with the standard of care prescribed by the Professional Engineers Ontario (PEO).
Contractor	Any person, persons or corporation undertaking the installation of municipal infrastructure and services in the City.
Developer	A person, persons or corporation who has applied to subdivide and/or develop and/or service an existing parcel of land, whether as the owner or an agent for the owner of the land.
DRAP	Design Review Advisory Panel (standard review)
DWF	Dry Weather Flow
Easement	A right of use over the property of another. Common examples of easements include the right of a Municipal corporation to run a sewer line across a strip of an owner's land, often called a right of way. Easement requirements for infrastructure will be determined on an individual project basis.
ESA	Electrical Safety Authority
Hot Mix Asphalt	Hot mixed, hot laid asphaltic concrete. The terms are used interchangeably. HMA may include recycled or specialty mixes.
HSU	A heavy single unit vehicle is a vehicle with a gross weight or registered weight of over 5,000 kg. Examples of heavy single unit vehicles are single unit trucks, tractors and buses.

## 2.0 DEFINITIONS (CONT'D)

TERM	DEFINITION
I/I	Inflow and Infiltration
Inflow	Water from rainfall or snow melt that enters the wastewater collection system via direct routes such as roof downspouts, cross-connections with storm drains, foundation drains and maintenance hole covers.
IDF Curve	Groundwater that enters through holes and cracks in maintenance holes, laterals and sewer pipes.
Maintenance Hole	Commonly called a manhole, it is an opening protected by a cast iron cover to access an underground sanitary sewer or storm sewer.
OPSD	Ontario Provincial Standard Drawings
OPSS	Ontario Provincial Standards and Specifications
Petrolatum	A purified mixture of semisolid hydrocarbons obtained from petroleum jelly.
Population Equivalents	Population per unit for determining sanitary sewer flows and water demands based on land use.
Photometric Plan	Plan that measures light, in terms of its perceived brightness to the human eye, for streetlight placement.
PRAP	Product Review Advisory Panel
Proponent	User of this manual, i.e., consulting engineer, contractor and developer.
PVC	Polyvinyl Chloride Pipe
PVCO	Polyvinyl Chloride Biaxially Oriented Pipe
Road Allowance	An allowance for a road laid out by a Crown surveyor, including a road allowance shown on an original township survey and a road allowance included on a Crown plan of subdivision.
RDII	Rainfall Derived Inflow and Infiltration
Special Provision	Forms part of the Contract Document and shall be used for the supply and installation of works.
Top Course	Hot Mixed Asphalt wearing course of any flexible or composite pavement.
TAC	Transportation Association of Canada
Thrust Block	Plain unreinforced concrete that is used at bends and pipe junctions to prevent damage to the pipe by transferring the thrust force from the pressurized system to the undisturbed soil behind the thrust block.
Transient Analysis	Method of flow analysis of a watermain or forcemain that considers changing flows or pressure conditions over time.
Transverse Markings	Transverse pavement markings extend across the travel lane and are used in applications where an immediate action is required by the vehicle operator. This action may be a command to stop at an intersection, to advise yield for pedestrians in a crosswalk, or to advise against travel within boundaries defined by crosshatching or painted islands. Transverse pavement markings include stop bars, yield lines, crosswalks, parking space markings, words and symbols.
ROW	Right-of-way includes all areas of Brantford that are the property of the City. These include, but are not limited to hydrants, maintenance holes, street lights, hydro facilities, communication pedestals, trees, roads, sidewalks, walkways, bike lanes, driveway aprons, boulevards and curbs.
WHMIS	Workplace Hazardous Materials Information System
WWF	Wet Weather Flow

### 3.0 INTRODUCTION

The Design and Construction Linear Municipal Infrastructure manual is to provide the City staff, consulting engineers, contractors, developers and the general public with a common reference to ensure the consistent application of design and construction practices of linear municipal infrastructure within the City.

The manual is intended to aid in the planning, design and construction and maintenance and operation activities of linear infrastructure for new subdivision developments and the retrofit of existing infrastructure.

#### **The key guiding principles of the manual are to:**

- Provide a comprehensive set of guidelines to aid in the consistent design and construction of new development and retrofits of linear infrastructure.
- Integrate industry standards and best practices.
- Encourage consistent approaches for design and construction in the City.
- Prioritize the health and safety of the public.
- Reduce impacts to the natural environment and protect resources.
- Undertake sustainable planning, operation and maintenance of the linear infrastructure over its lifetime.
- Meet regulatory and legislative requirements.

The use of this manual does not absolve the Proponent from their professional obligations in applying sound engineering principles and industry best practices for a solution that is practical, economical, efficient, safe and sustainable to operate and maintain by the City.

This manual does not supersede, nor replace any legislation governing the design and construction of the linear municipal infrastructure. The Proponent shall be fully familiar with legislative requirements as they relate to the subject infrastructure.

This manual will be reviewed and updated periodically to stay current with construction standards, industry best practices and to remain in compliance with regulatory requirements. It is the responsibility of the Proponent to ensure they are using the most recent version of this manual.

The information provided is not intended to hinder innovation, rather is rooted on meeting performance requirements over the lifecycle of the infrastructure. The Proponent is encouraged to provide innovative solutions.



## 4.0 OTHER REFERENCE DOCUMENTS

The Proponent shall design and construct the linear infrastructure in accordance with the latest versions of this manual and industry standards and best practices, including but not limited to:

- [City of Brantford Urban Design Guidelines](#)
- [Ontario Provincial Standard Specifications Drawings](#)
- [City of Brantford Master Servicing Plan](#)
- [City of Brantford Transportation Master Plan](#)
- [City of Brantford Official Plan](#)
- Applicable City of Brantford By-laws
- [City of Brantford Site Plan Manual](#)
- [Accessibility for Ontarians with Disabilities Act \(AODA\)](#)

Other reference documents related to various linear infrastructure components are identified in each section of the manual.

## 5.0 PROPOSED DESIGN CHANGES

The manual contains design and construction related guidelines for consistency of the implementation of linear municipal infrastructure within the City. This manual is intended to be updated as needed on a regular basis, however proponents may submit any suggested changes via the Design Standard Change Form (contained in **Appendix G-1**) for review and approval by the City.

The Proponent shall provide justification for any changes for review and acceptance by the City. Changes and deviations shall provide sufficient justification and supporting information to

prove sound evidence that the result will be comparable to standard application and is consistent with good engineering practices.

## 6.0 USE OF THE MANUAL

Each section of the manual is meant to be used in conjunction with one another, however, can be utilized independently if warranted by the work.

- General Preface - Introduction to the manuals and their use
- Design Standards Change Form
- Standard Deviation Form
- Typical Cross-Sections - Identifies road classifications and right-of-way widths
- Typical Residential Lot Plans - Identifies service configurations and offsets
- Detailed Engineered Cross-Sections

6.0 USE OF THE MANUAL (CONT'D)

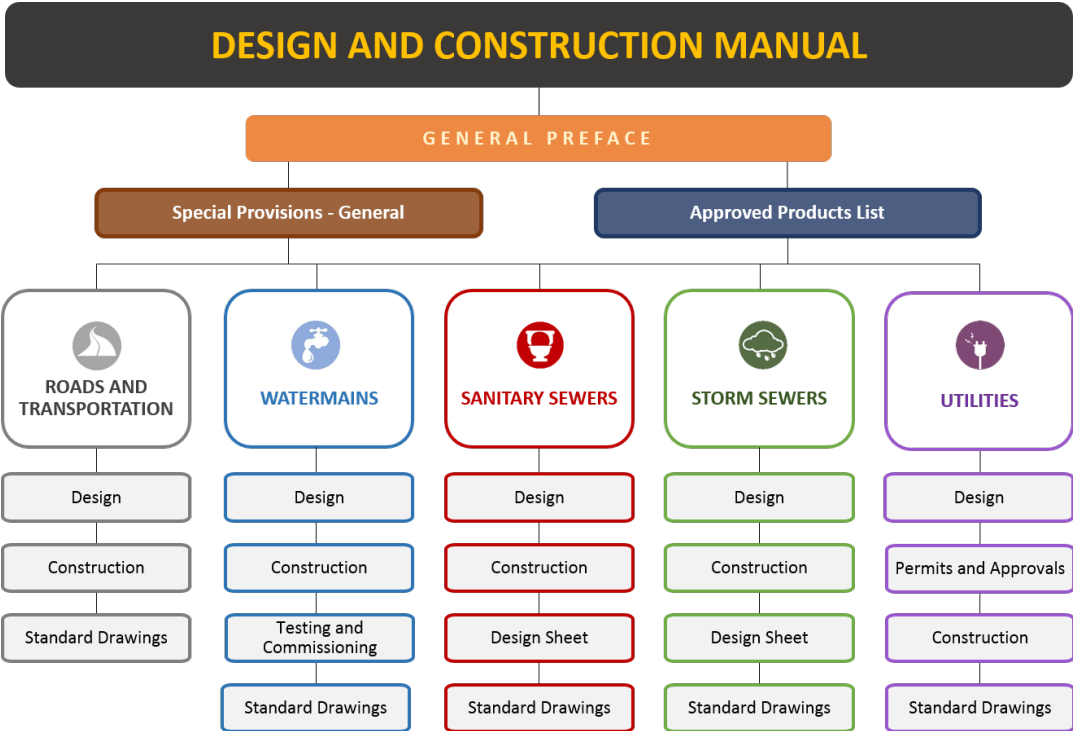
- Roads - Design and Construction guidelines
- Watermains - Design and Construction guidelines
- Sanitary Sewers - Design and Construction guidelines
- Storm Sewers / Stormwater Management - Design and Construction guidelines
- Utilities - Design and Construction guidelines
- Special General Provisions - Typical provisions for all sections
- Approved Product List - For each component of infrastructure

The Proponent shall follow processes and standards within the current City of Brantford Site Plan Manual when applying for Site Plan Approval. Contained within each section of the manual are Special Provisions Contract as well as testing and commissioning, inspection, permits and approvals requirements. Each of these sections shall form part of the Contract Documents for construction projects.

The Proponent shall apply the appropriate provisions as contained herein to adequately price the bid for all labour, equipment and materials to supply and install the works.

Any deviations, extensions and additions to the provisions contained within this manual will be included in the Contract Document as Supplemental Special Provisions.

The following illustrates the contents of each section in the manual.



## 7.0 DESIGN DRAWINGS AND AS-BUILT DRAWINGS

All drawings shall be completed in AutoCAD Civil 3D version 2021 or newer. The submitted CAD drawing(s) will be in grid scale with the world coordinates matching the **Zone 17 North, UTM NAD83 (CSRS-2010)**. Elevations shall be provided in **CGVD28, using geoid model HTv2.0**. Ground control points shall be shown in the drawing including the published geodetic point number, coordinates and elevation.

Issued for Tender and Issued for Construction drawings (paper and electronic copies) shall be transferred to the City prior to commencement of construction. As-built drawings shall be transferred to the City within three (3) months of project completion and meet the following requirements:

- Revise all invert elevations, slopes, lengths and locations of Storm Sewers, Sanitary Sewers, Service Laterals, Watermain, Hydrants, Valve Chambers and any other revisions to reflect actual as-built site conditions.
- Revise all drawings to state “As Built” along with the date in the revision table.
- Remove any notes stating “to be removed”, “future”, “proposed”, etc.
- The locations of manholes/valves/ hydrants, etc. which have been installed in significantly different locations from the original design will require updating on the plan and profile.
- One (1) digital copy set in PDF format, including the AutoCAD file in DWG format shall be submitted to the City upon completion.
- “-AB” suffix shall be added to each drawing file name.

## 8.0 PERMITS AND APPROVALS

The Proponent shall follow the requirements and seek approvals of other applicable approval authorities including but not limited to the following:

- City of Brantford
- Ministry of Environment, Conservation and Parks
- Ministry of Tourism, Culture and Sport
- Ministry of Natural Resources and Forestry
- Ministry of Transportation
- Grand River Conservation Authority
- Canadian National Railway
- Utilities

All required permits and approvals shall be in place prior to construction.

## 9.0 TYPICAL RESIDENTIAL LOT PLANS

Typical residential lot plans are contained within this Preface (Refer to **Appendix G-2**) to provide details for the layout of municipal services (watermains, sanitary sewers and storm sewers), utilities (hydro, street lights, gas and telecommunication) and easement requirements.



Key elements of the lot plans are the horizontal clearances between the local services, offsets from lot lines and typical easement widths.

## 10.0 TYPICAL RIGHT-OF-WAY CROSS-SECTIONS

Typical right-of-way (ROW) cross-sections are contained within **Roads and Transportation** section of the manual.

The ROW Cross-Sections are as follows:

- Local Road – 18.5 m ROW width (7.8 m road width)
- Local Road – 18.5 m ROW width (10.2 m road width)
- Minor Collector Road – 24.5 m ROW width (12.6 m road width)
- Minor Collector Road – 24.5 m ROW width (15.0 m road width)
- Major Collector Road – 27.5 m ROW width (17.4 m road width)
- Major Collector Road – 27.5 m ROW width (14.7 m road width)
- Major Collector Road – 30.5 m ROW width (18.0 m road width)
- Arterial Road – 40.0 m ROW width (20.8 m road width)
- Arterial Road – 40.0 m ROW width (22.1 m road width)
- Laneway – 10.0 m ROW width (5.6 m road width)

Additional information on determining road classifications and standard widths are contained in the **Roads and Transportation** section of the manual.

## 11.0 DETAILED ENGINEERED CROSS-SECTIONS

Detailed Engineered cross-sections are contained within **Roads and Transportation, Watermain, Storm, and Sanitary** sections of the manual.

The Detailed Cross-Sections are as follows:

- Local Road – 18.5 m ROW width (7.8m road width)
- Local Road – 18.5 m ROW width (10.2 m road width)
- Local Road – 20.0 m ROW width (10.2 m road width)
- Minor Collector Road – 24.5 m ROW width (12.6 m road width)
- Minor Collector Road – 24.5 m ROW width (15.0 m road width)
- Major Collector Road – 27.5 m ROW width (17.4 m road width)
- Major Collector Road – 27.5 m ROW width (14.7 m road width)
- Major Collector Road – 30.5 m ROW width (18.0 m road width)
- Arterial Road – 40.0 m ROW width (20.8 m road width)
- Arterial Road – 40.0 m ROW width (22.1 m road width)
- Industrial Minor Collector Road 27.5 m ROW width (10.0 m road width)

Additional information on determining road classifications and standard widths are contained in the Roads and Transportation section of the manual. The detailed engineering cross sections are instrumental in the planning, design, constructability, operations and maintenance of the roads, watermains, sanitary sewer, storm sewers and the utilities by associating all above ground and below ground infrastructure, as a whole, as they relate to each other.

## 12.0 APPROVED PRODUCT LIST AND REVIEW PROCESS

### 12.1 *Approved Product List*

An Approved Product List (APL) is available for each section of the manual. The APL is intended for reference by Proponents who are providing services or performing work for the City, which entails supplying or providing materials.

The APL identifies specific brands of products or Suppliers of products which the City considers generally meet the requirements of this manual.

The absence of a particular brand of product or Supplier from this list does not necessarily imply that it does not meet the requirements.

The APL is not to be construed as an endorsement of a given product, or in any way a guarantee of adequate performance relative to specific Contract requirements.

Use of any product on the APL by proponent shall in no way relieve the Proponent from any contractual obligations.

The products listed on the APL are approved for use, subject to the following conditions:

- The products meet the specific requirements of the project design and are not used in a manner that is contrary to the manufacturers' intended use or warranty conditions, without prior written approval from the City.
- Appropriate safe work procedures and precautions are to be taken in accordance with Occupational Health and Safety, WHMIS and the manufacturers' guidelines for the material's use.

### 12.2 *Product Review Advisory Panel (PRAP)*

A Product Review Advisory Panel (PRAP) will be responsible for the selection, review and approval of new product applications for watermain, sewer, road, lighting and traffic signal related products used within the City.

The APL will be updated on a regular basis to ensure products and Suppliers are current and reflect the current needs of the City's infrastructure. (Refer to **Approved Products** section of the manual)

**APPENDIX G-1  
STANDARD FORMS**



# Proposed Design Standards Change Form

## PROPOSED DESIGN STANDARDS CHANGE FORM CITY OF BRANTFORD

Mail to: Engineering Services  
Attention: Design Review Advisory Panel (DRAP)  
Corporation of the City of Brantford  
100 Wellington Square Brantford, Ontario N3T 5R7

Name: \_\_\_\_\_ Phone (    ) \_\_\_\_\_

Address: \_\_\_\_\_

Company or Organization: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

**PROPOSED CHANGE:**

(including proposed new or revised wording, or identification of wording to be deleted)

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**REASON FOR CHANGE:**

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*(attach additional information if required)*

# Proposed Design Standards Change Form

## FOR INTERNAL USE ONLY

Reviewers	
<input type="checkbox"/> Engineering Services <input type="checkbox"/> Environmental Services <input type="checkbox"/> Facilities & Asset Management	<input type="checkbox"/> Operational Services <input type="checkbox"/> Fleet & Transit Services <input type="checkbox"/> Development <input type="checkbox"/> Other _____
<input type="checkbox"/> <b>Accept Change</b>	
<input type="checkbox"/> <b>Reject Change</b>	
Rationale/Comments	

AUTHORIZATION			
Title	Name (Print)	Signature	Date (MM/DD/YYYY)
Manager			



**TO BE COMPLETED BY APPLICANT**

TO:	
FROM: (Applicant Name & Company)	
PHONE:	
EMAIL:	
DATE:	
RE:	

**Summary of Proposed Deviations from  
City of Brantford Design and Construction Manual**

Ref #	Type of Infrastructure	Related Brantford Standard Reference	Summary of Deviation Request / Brief Rationale	DRAP
1				
2				
3				

**Revision Request Process:**

1. All deviation requests are to be submitted to the City. The City will initiate review of the deviation request by relevant departments and inform the applicant of the tentative period of approval. Three (3) weeks will be provided to the City departments for review. Depending on the nature of the deviation request, the City's response may require additional review time.
2. Incomplete submissions (e.g. forms and drawings) of deviation request with insufficient supporting documentation will be returned to the applicant without review. The onus is on the applicant to provide a complete submission, which fully supports the deviation request.
3. The City will review the deviation request and advise the director for approval or refusal.
4. If the deviation request is accepted, the applicant will be provided with further instructions on how the change may be applied to the subject or pending works.
5. If the deviation request is rejected, the City will provide the applicant with reasons for the rejection. The applicant may elect to resubmit the deviation request, provided the City's reasons for initial rejection are fully addressed in the subsequent submission.

# Standard Deviation Form

## FOR INTERNAL USE ONLY

3. Reviewers	
<input type="checkbox"/> Engineering Services <input type="checkbox"/> Environmental Services <input type="checkbox"/> Facilities & Asset Management	<input type="checkbox"/> Operational Services <input type="checkbox"/> Fleet & Transit Services <input type="checkbox"/> Development <input type="checkbox"/> Other _____
<input type="checkbox"/> <b>Accept Change</b>	
<input type="checkbox"/> <b>Reject Change</b>	
Comments	
Rationale for the Decision	
Should the Existing Standard(s) Be Updated? Why?	

AUTHORIZATION			
Title	Name (Print)	Signature	Date (MM/DD/YYYY)
Division Manager			

# Standard Deviation Form

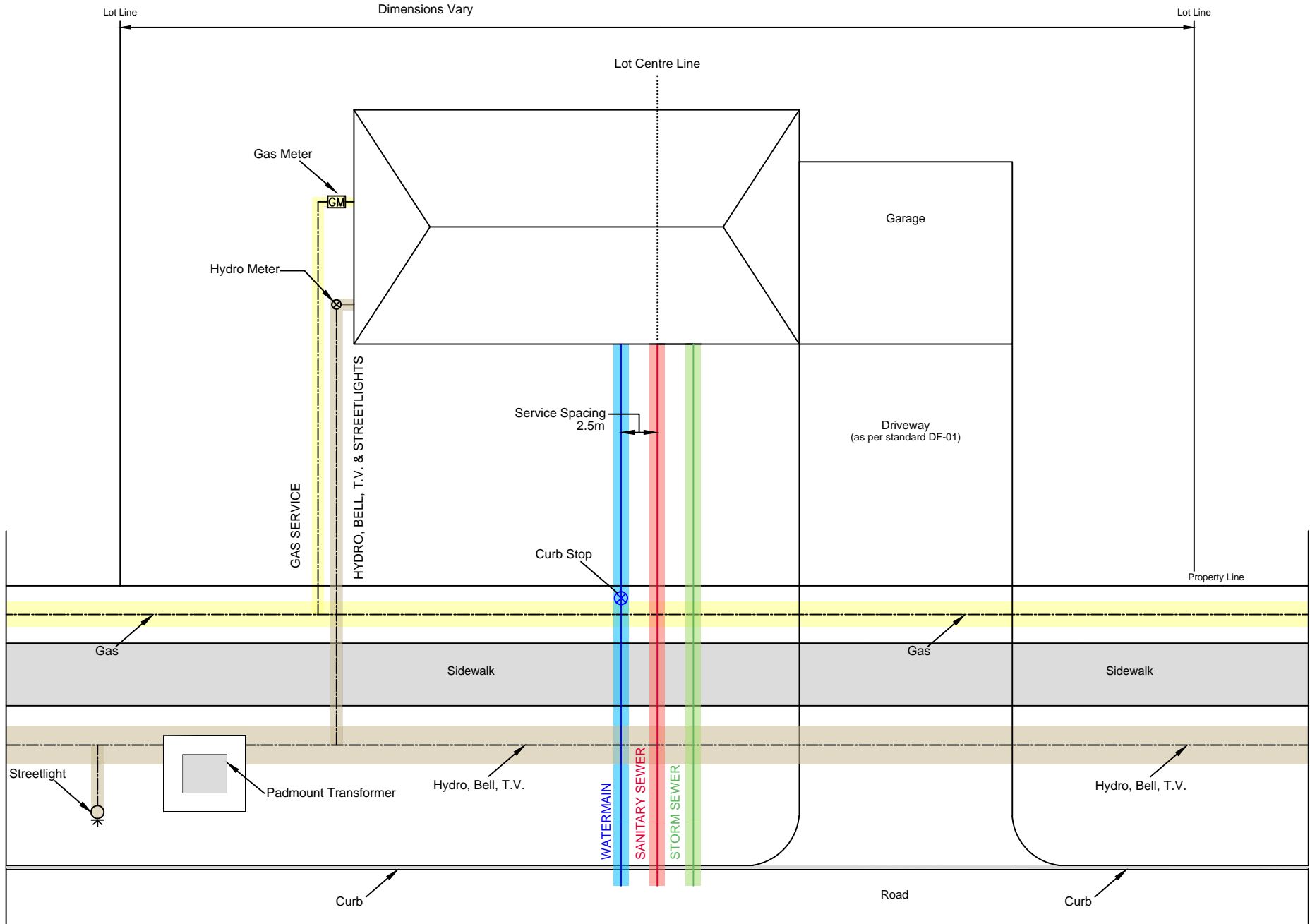
## TO BE COMPLETED BY APPLICANT

1. General Information			
Description of Work Undertaken			
Location of Work Completed		Project ID (if applicable)	
Location of Deviation in Design Submission		Contact Phone No.	

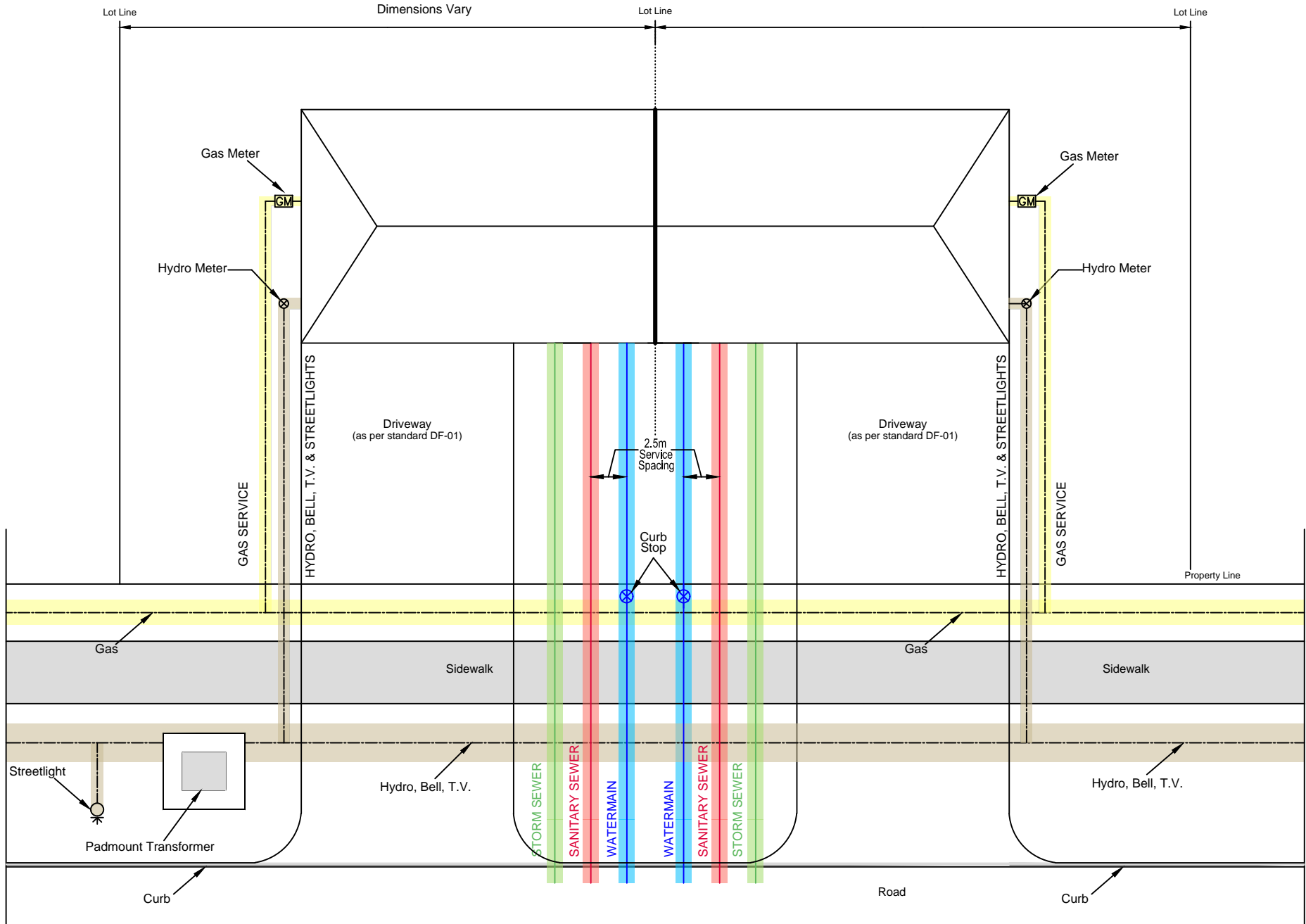
2. Reason / Justification for Deviation
<b>2.1 Background Information / Rationale for Deviation</b>
<b>2.2 Potential Benefits of Deviation</b>
<b>2.3 Potential Disadvantages of Deviation</b>
<b>2.4 Information Gathered During the Deviation Review Process</b>

**APPENDIX G-2  
TYPICAL RESIDENTIAL LOT PLANS**

DRAWING NO.	TITLE
G-111	Single Family Home
G-112	Semi-Detached / Townhome (Typical)



<b>CITY OF BRANTFORD</b> PUBLIC WORKS COMMISSION		Date: July 2017
Drawn By:		Revised:
Checked By:		Scale: N.T.S.
Approved By:		Drawing Number G-111
<b>LOT PLAN LAYOUT SINGLE FAMILY HOME</b>		



<b>CITY OF BRANTFORD</b> PUBLIC WORKS COMMISSION		Date: July 2017
Drawn By:		Revised:
Checked By:		Scale: N.T.S.
Approved By:		Drawing Number G-112
<b>LOT PLAN LAYOUT</b> <b>SEMI-DETACHED / TOWNHOME</b> <small>(Typical)</small>		

