



PORT COLBORNE

DESIGN AND DEVELOPMENT MANUAL

2024

CITY OF PORT COLBORNE
ENGINEERING AND OPERATIONS DIVISION
1 KILLALY ST W, PORT COLBORNE, ON L3K 2L5

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Revision History

Section	Content	Author, Year

1 Introduction

The City of Port Colborne is a dynamic city nestled on the shores of Lake Erie, with a population of 20,000 residents. While Port Colborne shares commonalities with municipalities featuring both urban and rural landscapes, our rich history and distinctive vision for the future set us apart, making our city truly special. Situated on the north shore of Lake Erie and at the mouth of the Welland Canal, our boundaries connect with the Township of Wainfleet to the west, the Town of Fort Erie to the east, and the City of Welland and City of Niagara Falls to the north.

The urban core of Port Colborne, concentrated around the Welland Canal, encompasses diverse residential neighborhoods, a vibrant downtown/historic core, and various commercial and industrial areas. Despite its significance, the urban region constitutes less than one-quarter of the city's total geographic area. The Welland Canal has not only shaped our landscape but has also been a catalyst for industrial development along the waterfront.

In our two-tier government system within the Niagara Region, the City assumes responsibility for infrastructure services such as water distribution mains, sanitary sewers, road networks, lighting systems, storm sewers, drainage ditches, culverts, and stormwater management facilities. Meanwhile, the Niagara Region assumes responsibility for water treatment, transmission mains, storage facilities, pumping stations, wastewater treatment, trunk sewers, forcemains, sewage pumping stations, road networks, traffic signals, stormwater sewers, drainage ditches, and culverts.

2 Purpose of the Manual

The City of Port Colborne Engineering Design and Development Manual (“the Manual”) is intended as a guideline to:

1. Establish a uniform criterion of expected standards.
2. Promote consistency in the quality and consistency of design and construction for development and capital/operating projects.
3. Provide a good engineering basis for subdivision and site plan design.
4. Improve processing of development applications.

The manual does not supersede or replace any legislation or the Design Engineers overall responsibility. All infrastructure components shall meet the minimum requirements of all applicable current industry standards and specifications for quality management and quality control, such as the Transportation Association of Canada (TAC), Ontario Provincial Standard (OPS), the Ontario Traffic Manual, Ministry of Environment, Conservation and Parks (MECP), the Canadian Standards Association (CSA), Ontario Building Code (OBC) and Electrical Safety Authority regulations.

This manual should be considered as minimum guidelines and provides the City's design preferences under normal circumstances. The Design Engineer, however, should use best judgment to find innovative solutions when abnormal conditions are encountered. The proponent shall also consider infrastructure asset management principles in any decision-making process.

This Manual is a living document subject to regular reviews, revisions, and updates by the City. It is the responsibility of the user to obtain and use the latest version available at the time.

3 Use of the Manual

The manual is organized into distinct sections, each dedicated to a crucial aspect of urban infrastructure, outlining applicable reference documents, standards and legislation, minimum design criteria, permits and approvals, submission requirements, and construction requirements. The sections include:

- **Schedule A – Roads:** Providing detailed guidelines for the planning, design, and construction of road networks, ensuring safe and efficient transportation for users.
- **Schedule B – Sanitary Sewer Systems:** Offering insights into the design and construction of sanitary sewer systems to safeguard public health and the environment.
- **Schedule C – Storm Sewer Systems and Stormwater Management Facilities:** Addressing the challenges of stormwater runoff and providing strategies for effective storm sewer systems and management facilities to mitigate environmental impact.
- **Schedule D – Water Distribution Systems:** Detailing the design principles and commissioning requirements for water distribution systems, promoting reliable access to clean water.
- **Schedule E – Trees, Landscaping and Parks:** Enabling the creation and preservation of green spaces, emphasizing the importance of trees, parks, and landscaping in enhancing the quality of life for the community.
- **Schedule F – Lighting Systems:** Focusing on the illumination of public spaces and roadways, offering guidance on lighting design that promotes safety, security, and overall aesthetic appeal.
- **Schedule G – Utilities:** Focusing on communications, electrical, and gas utilities and services for projects.

The following appendices are included with the manual:

- **Appendix A - City of Port Colborne Approved Products List (APL):** intended for reference, supplying, or providing materials for new developments and capital/operating projects. The APL identifies specific brands of products or Suppliers of products which the City considers generally meet the requirements of this manual.
- **Appendix B - Typical & Detailed Cross-Sections:** illustrating typical road cross-sections for various right-of-way widths and road classifications, which include above and below-grade infrastructure.
- **Appendix C - Standard Drawings:** illustrating typical drawings for lot grading and servicing layouts.
- **Appendix D - Sanitary Sewer Design Sheet Template:** guiding Design Engineers for a consistent approach to the design of sanitary sewers in the City.
- **Appendix E - Storm Sewer Design Sheet Template:** guiding Design Engineers for a consistent approach to the design of storm sewers in the City.
- **Appendix F - City of Port Colborne CCTV Inspection Specifications:** intended for consistency in the inspection of sanitary and storm sewers.

4 Deviations from the Manual

Any deviations to the manual that improve the quality of the design will be considered at the City's discretion. Such deviations will need to be submitted on the following standard form with sufficient justification and supporting information for review by the City. Changes must be proven with sound evidence that the result will be comparable to standard application and consistent with good engineering practices.

Design and Development Manual – Deviation Form
(to be completed by the Applicant)

Applicant Name:	
Project and/or File:	
Email:	
Date:	

Summary of Proposed Deviations from Design and Development Manual

No.	Section/ Subsection	Infrastructure Type	Rationale and detailed description
1.			
2.			
3.			

Revision Request Process:

1. All deviation requests are to be submitted to the City for review. The typical review period is three (3) weeks. Depending on the deviation, the City may require additional time. Incomplete forms with insufficient supporting documentation will be returned without review.

2. If accepted, the Applicant or agent will be provided with further instructions on how the change may be applied.

3. 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.

**Internal Use Only – To be completed by City staff*

City Review and Approval

Consultation with Operations	YES ☐	NO ☐
	Name:	
Recommended by: (City Project Lead)	Name:	
	Signature:	
Approved by: (Manager, Infrastructure)	Name:	
	Signature:	
Comments:		



PORT COLBORNE

DESIGN MANUAL

Schedule A – Roads

Schedule B – Sanitary Sewer Systems

Schedule C – Storm Sewer Systems and
Stormwater Management Facilities

Schedule D – Water Distribution Systems

Schedule E – Trees, Landscaping and Parks

Schedule F – Lighting Systems

Schedule G – Utilities



PORT COLBORNE

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A1.1 General

This section of the manual outlines the minimum right-of-way (ROW) requirements in achieving the City's policies to develop an accessible, balanced and efficient transportation network for all members of the community.

Transportation systems for the City of Port Colborne shall be designed and constructed in a way which supports the land use goals of the Official Plan as well as the transportation goals of the Niagara Region. The City of Port Colborne supports the development of Complete Streets, as referenced in Regional Niagara Model Urban Design Guidelines, which includes provision for safety for drivers, bicyclists, transit vehicles and users, and pedestrians of all ages and abilities, as well as Practical Human Factors, as referenced in OTM Book 1C Positive Guidance.

The City's priority for transportation system extends beyond simply auto-centric, but to a more comprehensive consideration of all right-of-way users, such as multi-modal mobility, public health and safety, economic development, environmental quality, livability, quality of life, and equity.

A1.2 Applicable Reference Documents, Standards and Legislation

All roadways and components are to be in accordance with the latest versions of all applicable legislation, industry standards and guideline documents, including but not limited to the following:

- Accessibility for Ontarians with Disability Act (AODA)
- American Association of Transportation Highway Officials (AASHTO), latest edition
- Canadian Highway Bridge Design (CSA S6-14)
- City of Port Colborne Official Plan
- City of Port Colborne Applicable By-laws and policies
- Environmental Assessment Act
- Environmental Protection Act
- Niagara Peninsula Standard Contract Documents (NPSCD)
- Regional Niagara Model Urban Design Guidelines
- Ontario Building Code
- Ontario Highway Traffic Act
- Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD)
- Ontario Traffic Manual (OTM) prepared by the Ministry of Transportation (MTO)
- Ontario Water Resources Act
- TAC Geometric Design Guide for Canadian Roads

- TAC Manual of Uniform Traffic Control Devices for Canada
- TAC Canadian Guide to Traffic Calming
- Guideline for Security Lighting for People, Property and Public Spaces, G-1-03 prepared by IESNA
- Crime Prevention through Environmental Design Standards, Guidelines & Policies
- City of Port Colborne Approved Products List (**Appendix A** of this manual)
- Other applicable standards and references

A1.3 Construction

Construction of the roadway system shall comply with the latest revision of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), Niagara Peninsula Standard Contract Documents (NPSCD) and the approved drawings.

A1.4 Road Classifications

Roadway classification defines the function of the road segment and assists in transportation planning and design. In this manual, roadway classification and design vehicle are used to establish road cross-section design, pavement structure design, sidewalk requirements, and other ROW details.

A description of roadway classifications and characteristics for the City of Port Colborne is provided in Table 1. The basis is the latest version of the TAC Geometric Design Guide for Canadian Roads, where applicable.

Table 1 - Road Classification Characteristics

Characteristic	Local	Collector
General Function	Carries low traffic volumes, providing access to abutting lands. May be designated Residential or Industrial	Carries moderate traffic volumes between arterial and local roads. May be designated Major or Minor, Residential or Industrial
Volume of Traffic, typical both directions	Industrial areas: < 3,000 vpd. Residential areas: < 1,000 vpd.	Industrial areas: < 12,000 vpd. Residential areas: < 8,000 vpd.
Posted Speed Range (km/h)	Preferred 40 Maximum 50	Preferred 60 Maximum 70

Characteristic	Local	Collector
Intersection and Access	Intersection with collector and local roads (arterial roads discouraged). No access restrictions.	Intersection with arterial, collector and local roads. Access may be restricted to right-in/ right-out only.
Parking	Per Zoning By-Law	Peak hour restrictions
Heavy Trucks	Industrial: standard tractor semi- trailers Residential: typically service and emergency vehicles only.	Standard tractor semi- trailers
Regional Transit Service	Generally not allowed.	Regional transit busses permitted.
Pedestrians	Sidewalks normally on one side or both	Sidewalks provided on both sides.
Cyclists and Other Non-Motorized Users	In accordance with the City's Active Transportation Master Plan	

A1.5 Cross-Sections and Roadway Characteristics

All roads within the urban boundary shall be designed and constructed to urban standards with full municipal services (e.g. concrete curbs with subdrains, asphalt on granular base, concrete sidewalks, catchbasins, storm sewers and street lighting). For land development projects, new roadways designed to rural standards may only be considered for estate residential or industrial developments.

Appendix B includes Typical & Detailed Cross-Sections for all applicable road classifications.

Table 2 identifies standard right of way widths and roadway characteristics within the City.

Table 2 – Right-of-Way Widths and Roadway Characteristics

Road Type	ROW Width (m)	Pavement Width (m)	Sidewalk Width (m)	Number of Lanes
Local Roads				

Local Road Allowance	20.0	9.4	1.5	2
Collector Roads				
Collector Road Allowance	26.0	13.4	1.5	2
Laneways				
Laneway Road Allowance	10.0	6.0	n/a	2

Laneways are public roadways intended to convey motorists from a local roadway to a private access point (driveway, garage, etc.), and are not to be designed as a means to move traffic through a neighbourhood. As supported by the City of Port Colborne Official Plan, laneways may be accepted for use within the City of Port Colborne.

A1.6 Other Road Authorities

The following road authorities own and operate roads in the City and should be contacted for their road design requirements:

- Niagara Region
- St. Lawrence Seaway Management Corporation
- Ministry of Transportation Ontario (MTO).

A1.7 Geometric Design Elements

All roads shall be designed to meet the requirements in and be in accordance with the TAC Geometric Design Guide for Canadian Roads. New roads should be consistent with and extend the existing grid pattern where possible.

Table 3 - Geometric Design Elements

Geometric Detail	Local	Collector
Design Speed	60 km/h	70 km/h
Design Vehicle	Industrial: WB-20 tractor semi-trailer at low speeds Residential: WB-19 tractor semi-trailer at low speeds where possible	Industrial: WB-20 tractor semi-trailer at moderate speeds Residential: WB-20 tractor semi-trailer at low speeds
Width of Traffic Lane	3.0 to 3.7 m	3.5 m
Width of Turning or Two-Way Left- Turn Lane	N/a	3.25 m
Width of Parking Lane	2.5 m	2.5 m
Minimum Intersection Angle	Per TAC Chapter 9 – Intersections, Section 9.7.2 Horizontal Alignment	
Minimum Intersection Spacing (measured from centerline to centerline)	Per TAC Chapter 9 – Intersections, Section 9.4.2, Location and Spacing of Intersections and Table 9.4.1, Desirable Spacing between Signalized Intersections	
Minimum Access Driveway Spacing (measured from edge of driveway to edge of pavement at adjacent intersection; distance refers to the length along the noted road classification)	Per TAC Chapter 8 – Access, Section 8.9 Driveways	
Minimum Access Driveway Control Distance to Intersection (as measured to nearest curb of intersection) 1	Per TAC Chapter 8 – Access, Section 8.9 Driveways 70 m for commercial entrances	
Minimum Centreline Curve Radius	Per TAC Chapter 3 – Alignment and Lane Configuration, Section 2, Horizontal Alignment	
Minimum Sightline Requirements	Per TAC Chapter 2 - Design Controls, Classification and Consistency, Section 5, Sight Distance	

Geometric Detail	Local	Collector
Minimum Tangent Length Through Intersection	Per TAC Chapter 9 – Intersections, Section 9.7.2 Horizontal Alignment	
Allowable Centreline Grades	Industrial 0.5 to 6% Residential: 0.5 to 8%	0.5 to 6%
Allowable Centreline Grades at Controlled Intersections	Industrial: 0.5 to 3% Residential: 0.5 to 4%	0.5 to 2.5%
Minimum Crest Vertical and Sag Vertical Curve K Factor (Urban, Illuminated)	Per TAC Chapter 3 – Alignment and Lane Configuration, Section 3.3, Vertical Alignment Minimum horizontal curvature and minimum vertical curvature shall not be used at the same location. Vertical K factors shall be applied with all profile grade changes greater than 1.5 to 2.0%.	

A1.8 Intersections

Intersections shall be designed based on the classification of the two (or more) intersecting roads. All standards pertaining to the design of intersections are as outlined above and shall be in accordance with TAC.

At the intersection of two roads, any transition of the minor classification road shall not interfere with the normal crossfall of the major road. A 1% to 2% backfall grade shall be provided on all road profiles where local streets intercept with arterial roads. The backfall grade shall be from the crown of the major road to the end of curb or first catchbasin on the local road. Where possible intersections shall be utilized as the high point of the roadway.

A1.9 Cul-de-sacs

Where necessary and approved by the City, temporary and permanent cul-de-sacs may be permitted on local roads and shall be in accordance with OPS and this manual.

The maximum allowable length of roads that terminate in a cul-de-sac is 250m. Minimum gutter grades of 0.5% are required along all gutters around the cul-de-sac, along the road grade on the cul-de-sac and at the beginning of the bulb area where catchbasins are located.

All cul-de-sacs shall have a radius of sufficient area to enable the turning of garbage trucks, snow removal equipment and other emergency vehicles. Cul-de-sac designs

may require consultation and approval with the Region, specifically as it relates to waste pick-up.

A landscaped island may also be considered where large turnaround areas are to be provided on dead end streets. In this case, a minimum pavement width of 6.0 m shall be provided to allow for turning movement and snow clearing operations. All new medians shall be paved with asphalt and have proper drainage for snow melt.

All cul-de-sacs, bulbs and intersections shall be detailed at a scale larger than the road plan drawings. The details shall show gutter, crown and other grades sufficient to determine that the road will properly drain and shall be used as a basis for layout.

A1.10 Pavement Design

Minimum pavement structures for asphalt and granular thicknesses for the various road classifications in the City are provided in **Table 4**.

Pavement designs will be in accordance with OPSS 310, 1101 and 1150 and are subject to change based on recommendations of the Geotechnical Engineer and approval by the City.

The developer and/or designer is required to engage a qualified Geotechnical Engineer to confirm the asphalt mix design based on results of the local area. This may be the same firm contracted to do compaction tests. Pavements shall be designed for an anticipated life of 25 years.

Table 4 - Minimum Pavement Structures

Road Classification	Minimum Pavement Structure		
	Surface Asphalt	Binder Asphalt	Base Course
Local	40 mm HL3 HS	60 mm HL8 HS	450 mm Granular 'A'
Collector	40 mm HL3 HS	80 mm HL8 HS	450 mm Granular 'A'
Fire Routes and Laneways	40 mm HL3 HS	80 mm HL8 HS	450 mm Granular 'A'

The pavement structure shall be designed by a qualified Geotechnical Engineer, and consider the following components. A Geotechnical Report, stamped by a Geotechnical Engineer will be submitted for review and final approval by the City in the detailed

design phase for Capital Projects or during the Engineering package submission phase for new developments.

- Mechanical analysis of the subgrade soil;
- Rock profile and composition;
- Drainage;
- Frost susceptibility;
- The future volume and class of traffic expected to use the pavement.

A1.11 Sight Triangle

Per the City's Zoning Bylaw, unobstructed sight triangles are required on all corner lots in all zones. The area within a sight triangle is determined by measuring from the point of the intersection of the front and corner side lot lines on a corner lot to a point along each such lot line. No signage or plantings are permitted within the site triangle.

Sight triangle distances are as follows:

- Residential zone – 6m
- All other zones – 7.5m

The City may request additional daylighting above these requirements, if deemed necessary.

A1.12 Grading within the Right-of-Way

The boulevard area from the curb to the property line shall be graded in accordance with OPSD. For existing developments, the Design Engineer shall provide a grading plan that details boulevard grades in relation to existing conditions. The height of sod located between the back of curb and the "forward" edge of the sidewalk should be installed at an elevation equal to or slightly less than the sidewalk surface.

For roads with a rural design cross-section, the area between the edge of shoulder and property line shall be in accordance with TAC and MTO Roadside Safety manual. The area shall be graded and the ditches cut with slopes of 3.0 m horizontal to 1.0 m vertical from the edge of the shoulder to the bottom of the ditch and from the bottom of the ditch to the original ground. In fill areas over 1.5 m measured vertically from the edge of shoulder to the toe of slope, the fill slope shall not be steeper than 2:1. The ditch shall be located at the toe of the fill slope. Longitudinal pipes and culverts at entrances shall be in accordance with TAC and MTO Roadside Safety Manual.

A1.13 Driveway and Entrance Design

All driveways and approaches/curb depressions shall be designed in accordance with NPSCD, OPS and AODA as well as this manual and the City's Entrance bylaw. Driveways and entrances shall have a minimum slope of 2% to a maximum slope of 8%. No reverse slope will be permitted in new developments. All efforts shall be made in existing developments to avoid reverse grades of driveway entrances and walkways. Minimum driveway separation distance will be in accordance with TAC standards and OPSS.

Existing driveway and entrance approaches will be replaced with like materials to the property line if impacted by construction activities. New driveways and entrances will be submitted for review and final approval by the City in the Engineering package submission phase. Existing curb returns at driveways will be reinstated on a case-by-case basis as approved by the City.

The width, location, grades and material of driveway aprons shall be detailed in the engineering drawings for review and approval by the City during the detailed design stage. The driveways shall be designed to accommodate the anticipated vehicular traffic without causing interference with the traffic flow on the street.

Table 5 outlines the minimum thicknesses for asphalt and concrete driveways and entrances.

Table 5 - Minimum Thicknesses for Asphalt and Concrete Driveway

Land Use	Asphalt Type	Concrete Type
Single Family Residential	50 mm of HL3F surface course 200 mm of Granular 'A'	125 mm Concrete 150 mm of Granular 'A'
Apartments, Commercial and Light Industrial Properties	40 mm of HL3F surface course 50 mm of HL4 base course 450 mm of Granular 'A'	150 mm Concrete, with reinforcing 200 mm of Granular 'A'

A1.14 Pedestrian Crossings

Pedestrian ramps complete with proper grades and tactile warning plates are required at all pedestrian road crossings. These shall be designed to Niagara Region Standards and in accordance with OTM Book 15 – Pedestrian Crossing Facilities and AODA.

A1.15 Culverts

Longitudinal pipes and culverts at entrances shall be in accordance with the detail in the Standard Drawing in **Appendix C**, and TAC and MTO Roadside Safety Manual.

The minimum sizes for entrance and road crossing culverts are 300 mm and 500 mm, respectively. Where the conveyance capacity of the minimum size culvert is not sufficient, a larger diameter culvert is to be sized using the cross-sectional end area calculated by the rational design method. Detail drawings and calculations shall be submitted for approval by the City. For driveway approaches with open ditches, culverts shall be implemented as required in accordance with the Stormwater Management Report, the City's standard drawing and requirements of this manual.

The minimum depth of cover for all culverts is 300 mm unless otherwise indicated by the City. The minimum length of culvert shall be that which is required to extend from centre of ditch to centre of ditch with matching slopes not exceeding 3:1. The minimum length of entrance culverts shall depend on the width of the entrance but shall extend no less than 1.5m on either side of the entrance. Culverts shall be constructed with granular bedding, backfill and rip rap end treatment in accordance with NPSCD and OPSD.

Refer to **Appendix A** of this manual for the City's Approved Products List.

A1.16 Concrete Sidewalks

Sidewalks will be in accordance with the policy outlined in the Official Plan in order to promote walkable neighbourhoods and have regard for the Accessibility for Ontarians with Disabilities Act. Concrete sidewalks will be in accordance with NPSCD, OPSD, OPSS, and AODA. Sidewalk location and layout will be submitted for review and final approval by the City.

Thickness shall be 125mm, and at residential driveways shall be 150mm and commercial and industrial driveways 200mm with wire mesh. All sidewalks will be a minimum of 1.5m in accordance with AODA. The sidewalk network should be designed to connect to the adjoining recreational trail networks.

Concrete sidewalks are required at the following locations:

- a) Along both sides of collector streets;
- b) Along only one (1) side of local streets;
- c) Along the inside of crescents;
- d) On one (1) side of cul-de-sacs if:

- a. 15 or more units on cul-de-sac;
- b. cul-de-sac is longer than 100 m to the bulb;
- c. cul-de-sac leads to a pedestrian node (i.e. a park, a school, a commercial area, an apartment building);
- d. cul-de-sac is of such a design within the subdivision that through pedestrian travel is required;
- e) On one side up to the built section of cul-de-sacs. The terminus of the sidewalk shall not conflict with driveways and services and the exact location shall be determined by the City prior to construction.
- f) On both sides of roads in Industrial subdivisions.

Concrete sidewalks are not required in the “Bulb” section of cul-de-sacs or along the longer side of crescents, unless otherwise specified by the City.

A1.17 Subdrains

In general, subdrains will be required to run continuous along both sides of all roads, as per OPSD. Subdrains will be required for a minimum length of 6m on the upstream side of all catchbasins.

The City will consider reducing subdrain requirements where a qualified Geotechnical Engineer indicates that there will be no adverse effects to the road either during or after construction.

A1.18 Curb and Gutter

Concrete barrier curb in accordance with OPSD shall be used on all streets with the exception of cul-de-sacs. Mountable curb may be considered and accepted by the City on a case-by-case basis through subdivisions and low speed zones. Curb type, including deviations will require review and approval by the City.

Curb saw cutting at property entrance depressions is not permitted. All depressions for property entrances or other not placed with the original curb construction, will be removed and replaced at no expense to the City. Two stage construction for curbs may be permitted at the discretion of the City.

A1.19 Multi-use Trails and Pedestrian Walkways

All multi-use trails and pedestrian walkways shall be constructed using flexible pavement. Requirements will be confirmed by the City during the subdivision approval process. The following outlines the minimum requirements for the design of trails and walkways.

Table 6 - Minimum Design Requirements for Trails and Walkways

Parameters	Minimum Criteria
Pavement Thickness	40mm of HL3F 50mm of HL8 300mm of Granular 'A' (100% SPD)
Grade	2% typical; 4% maximum
Width	3.0m typical 6.0m for utility easement; 4.5m for emergency access

Multi-use trail pavement structure design should be confirmed by a Geotechnical Engineer during the detailed design stage, and shall be carried out using the AASHTO 1993 method, if required.

A1.20 Bike Lanes

Bicycle lanes shall be in accordance with OTM Book 18 – Cycling Facilities. They shall be 1.5m in width and have the same pavement structure as the roadway and be designated by appropriate markings, as per the Traffic Control Plan. Bike lane requirements will be determined during the subdivision approval process. The final design details and timing of signage and markings will be determined by the City.

A1.21 Fire Access

Dead-end streets, whether permanent or as a result of phasing development greater than 110m in length, will require the provision of an emergency or a secondary access. A temporary emergency access may be provided as a ROW easement in favour of the City. The design of the emergency access shall receive pre-approval from the City's Fire Chief. Permanent dead-end streets longer than 110m may consider a wider road allowance.

A1.22 Signs and Pavement Markings

Initial details of the street naming, signs and pavement markings for new developments will be submitted as part of the Traffic Control Plan during the subdivision approval process. Final details and locations will be confirmed during the detailed design stage.

A1.22.1 Street Names

Street name signs and traffic control signs shall be required at all intersections within a subdivision. Street naming shall be in accordance with the City's Road Name Policy and be at the sole discretion and approval of the City.

A1.22.2 Regulatory and Non-Regulatory Street Signs

Regulatory and non-regulatory street signs shall be designed and located in accordance with the Ontario Traffic Manual and sign posts shall be in accordance with OPSD 990.110. All signage must be installed using a breakaway system.

Interpretive and regulatory signage related to the public use of woodlots, stormwater facilities, trails and open space shall be submitted to the City for review and approval. A minimum of one interpretive sign per each stormwater facility and woodlot is required. Regulatory by-law signage is required at all open space frontages accessible by roads and trails, as well as all park entrances.

The timing of sign installation will be determined on a site-by-site basis with consideration for public access, safety and the construction schedule. This will be confirmed with the City during the detailed design stage.

A1.22.3 Pavement Markings

Pavement markings shall be in accordance with the OTM Book 11 – Pavement Hazard and Delineation Markings, Book 8 – Guide and Information Signs, and Book 6 – Warning Signs and shall be located at all intersections, school crossings, walkways, bike lanes and railway crossings to clearly indicate the proper traffic zones, lanes and stop lines. Pavement markings will be completed following the placement of final asphalt and upon notification by the City. Temporary pavement markings may be requested by the City, dependent on the elapsed time between the binder and surface course asphalt.

Lane markings are to be organic, solvent-based, or water borne traffic paint complete with glass beads. All lane marking applications to new asphalt require two applications of paint. The second application shall not be applied until the first is tack free. Pavement markings are to conform to OPSS.

Traffic lane symbols stop bars and pedestrian crosswalks are to be durable pavement markings or field reacted polymeric pavement markings in accordance with OPSS.

All pavement marking removal required to prepare the area for final pavement marking shall be done by abrasion.

A1.23 Noise Barriers

Where requested by the City, a noise and vibration study will be required during the subdivision approval process for new developments or during the design phase for capital projects. Noise barriers should be designed to mitigate anticipated noise effects and attain acceptable noise levels. Initial noise study results will be required during the subdivision approval process. Noise barrier details will be submitted for review and approval by the City during the detailed design stage. Timber walls or berms are not preferred but may be permitted at the discretion of the City.

A1.24 Fencing

All fences will be in accordance with the City's fence by-law and the policies set forth in the City's Official Plan.

All pedestrian walkways, emergency accesses, and Stormwater Management facilities abutting residential lots shall be fenced with a 1.5m high black vinyl-coated chain link fence (6 gauge), located on City-owned block or easement, to the satisfaction of the City. Lots with reverse perimeter frontages shall be fenced with a 1.5m high pressure treated board on board fence complete with a 0.30m high lattice top. Should a fence be required for noise attenuation purposes; the fence may be altered to meet the noise mitigation requirements of the subdivision.

Pedestrian gates may be permitted for lots abutting a City-owned open space or parkland at the discretion of the City, at the request and sole expense of the Developer.



PORT COLBORNE

**SCHEDULE B
SANITARY SEWER SYSTEMS**

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B1.1 General

This section of the manual outlines expert guidance, design criteria, technical specifications, and best practices for designing and constructing a dependable sanitary sewer system with the overall objective to protect public health and the environment.

B1.2 Applicable Reference Documents, Standards and Legislation

All sanitary sewer system components are to be in accordance with the latest versions of all applicable legislation, industry standards and guideline documents, including but not limited to the following:

- American Society for Testing and Materials International (ASTM)
- American Water Works Association (AWWA)
- Building Code Act, 1992
- Canada Safety Association (CSA) Standards
- City of Port Colborne Approved Products List (**Appendix A** of this manual)
- City of Port Colborne Environmental Compliance Approval For a Municipal Sewage Collection System ECA Number: 073-W601
- City of Port Colborne Official Plan
- Fire Code (O.Reg. 388/97)
- MECP Design Criteria for Sanitary Sewers, Storm Sewers and Force mains for Alterations Authorized under Environmental Compliance Approval
- MECP Design Guidelines for Sewage Works
- Niagara Peninsula Standard Contract Documents (NPSCD)
- Niagara Region Municipal Comprehensive Review
- Niagara Region Water and Wastewater Master Servicing Plan
- Niagara Region Water and Wastewater Project Design Manual
- Ontario Building Code (O. Reg. 350/06)
- Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD)
- Other applicable standards and references

B1.3 Construction

Construction of the sanitary sewer system shall comply with the latest revision of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), Niagara Peninsula Standard Contract Documents (NPSCD) and the approved drawings.

The Public Works Department requires at least 48 hours of notice in advance of work requiring City staff to operate or inspect any parts of the system.

No connection to the existing system will be permitted until the new sanitary sewer is satisfactorily commissioned by the Contractor and approved by the Design Engineer and City's Overall Responsible Operator (ORO).

B1.4 Confirmation of Available Capacity

The City has an existing all pipes model of its sanitary and storm sewer system. Prior to the commencement of any design, the developer and/or Design Engineer must contact the City for confirmation that there is adequate capacity to accommodate the proposed development and / or project. A model update will be required for each new development, which will be completed by the City at the developer's expense. The results will be included in the Functional Servicing Report for new developments and in the design report for Capital projects.

B1.5 Approved Products

All materials in the sanitary sewer system including pipes, joints and fittings, and maintenance holes, shall meet all applicable quality standards set by the AWWA and CSA Standards. Refer to **Appendix A** of this manual for the City's Approved Products List.

B1.6 Hydraulic Design

B1.6.1 Design Flows

All sewers shall be sized for peak design flows, including an allowance for infiltration based on the criteria in this section. Sanitary sewer design sheets shall be included with the design submission. The City's Sanitary Sewer Design Sheet Template can be found in **Appendix D**.

The following design criteria should be used:

- Residential Flow Generation: 255 Lpcd
- Employment Flow Generation: 310 Lpcd
- Peaking Factor based on Harmon formula with values between 2 and 4
- Extraneous Flow Design Allowance (to be managed within the pipe):
 - 0.4 L/s/ha for existing areas
 - 0.286 L/s/ha for new developments
- Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design flow conditions

Residential and non-residential population densities are to be derived from the Niagara Region Development Charges Background Study (2022), Appendix A Background Information on Residential and Non-Residential Growth Forecast.

B1.6.2 Service Area

The system shall be designed to accommodate all on-site drainage areas as well as all external areas to their maximum future development capacity in accordance with the City's Official Plan and Niagara Region WWW Master Servicing Plan (MSP).

B1.7 Pipe Design

B1.7.1 Sewer Design Capacity

The pipe capacity under full flow conditions is to be calculated using Manning's formula, and a roughness coefficient of $n = 0.013$.

Sanitary sewers shall be sized for full-flow under post-2051 design peak wet weather flows as identified in the Region's latest MSP and by the City's planning projections. Upsizing and / or upgrading of a pipe segment is required when $d/D > 1$ under the design flow conditions.

B1.7.2 Minimum Size, Velocity and Grade

The minimum size of the sanitary sewer main shall be 200 mm @ 0.40% minimum slope. All sanitary sewers are to be designed for the following velocities:

- Minimum velocity of 0.60 m/s to achieve proper cleansing
- Maximum velocity of 3.0 m/s to minimize erosion

The pipe slope must be adequate to maintain minimum velocity when flowing full. If possible, the minimum slope for the upstream section of the sanitary sewer shall be 1.0%.

B1.7.3 Bedding, Cover and Backfill

The minimum depth of cover is measured from the final centreline finished road elevation to the top of the sanitary sewer at standard location. For residential, commercial and institutional areas, the minimum depth is 2.5 m unless approved by the City. In all cases, the proposed sanitary sewers shall be installed at sufficient depth to service lands external to the site as determined by the City.

It will be the responsibility of the Design Engineer to justify any reduction in the depth of cover by submitting a report outlining the reasons for the reduction and alternative frost protection measures to be taken. The Design Engineer shall specify insulation in accordance with NPSCD, Special Provisions – Contract Items.

Bedding, cover and backfill for all sanitary sewers and laterals shall be in accordance with NPSCD, Special Provisions – Contract Items and OPSD to suit applicable pipe material and ground conditions accordingly. The class, type of pipe and type of pipe bedding shall be shown on the profile for each section of sewer and shall be CSA approved. The use of native material for backfill will be considered by the City on a case-by-case basis when deemed suitable by a Qualified Geotechnical Engineer. In soft or wet conditions, additional Geotechnical investigation may be necessary to determine the appropriate bedding and backfill measures.

B1.7.4 Location and Separation

Horizontal and vertical separation between sewer and watermain shall be in accordance with MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit, or as otherwise accepted by the latest version of the City's DWWP. Any deviations from MECP will require review and written approval by the City.

B1.7.5 Crossings

Generally, a minimum clearance of 150 mm shall be provided between the outside of the pipe barrels at the point of pipe crossing for storm sewers and other utilities except for watermain crossings when the minimum clearance shall be not less than 500 mm. In the event the minimum clearance of 150 mm cannot be obtained, then the pipes at the crossing shall be concrete encased to ensure that the pipes are properly bedded.

B1.8 Maintenance Holes

All maintenance holes are to be precast and supplied or constructed in accordance with OPSD 701 Series with watertight connection KOR-N-SEAL type or approved equal. Maintenance holes shall be provided at each change in alignment, grade, pipe material and at all junctions, and at the points of connection of sewer over 200 mm in diameter where the size of connection is equal to or one size smaller than the City sewer. Pipe opening alternatives shall be in accordance with OPSD 701.021.

Per the Niagara Region Sewer Use By-law, an inspection maintenance hole will be required at the property line for all commercial and industrial sites. Residential applications may allow for direction connection to an existing or proposed maintenance

hole in the right-of-way not at the property line and is subject to review and approval by the Region and / or City.

B1.8.1 Spacing

Maintenance holes shall be spaced in accordance with MECP Design Criteria for Sanitary Sewers:

Table 1 – Maintenance Hole Spacing

Pipe Size (mm)	Max. Spacing (m)
Up to 400mm	120
450 to 750mm	150
* where maintenance holes cannot be provided, an upstream maintenance hole is required at 30 m (max) from where a maintenance hole could not be placed to facilitate maintenance.	

B1.8.2 Sizing and Benching

The type and size of maintenance hole shall be specified on the profile and a detail of the benching, or reference to OPSD, is to be shown on the plan portion of the engineering drawing. The minimum maintenance hole size shall be 1200mm and opening alternatives shall be in accordance with OPSD 701.021. All sanitary maintenance holes shall be benched as per OPSD 701.021 and be completed to obvert.

B1.8.3 Change in Direction of Flow

Changes in direction of flow through a maintenance hole greater than 90° will not be permitted. In pipe sizes 675 mm or greater, a change in direction of flow through a maintenance hole greater than 45° shall not be permitted.

B1.8.4 Drop Across Maintenance Hole

To compensate for head loss through manholes, the minimum drop between inverts across sewer manholes shall be:

Table 2 – Drops Across Maintenance Holes

Alignment Change	Drop Required
Straight Run	Grade of sewer
45° Turn	0.03m
90° Turn	0.06m
Change of Pipe Size	Match obvert to obvert

B1.8.5 Drop Structures

If the design of the sewer is such that the difference in elevation between inlet and outlet exceeds 610 mm, a drop structure is then required. The drop structure shall be in accordance with OPSD. External drop structures are required for all new maintenance holes. An internal drop structure will require approval by the City.

B1.8.6 Frame and Grates

Cast iron maintenance hole lids shall be as per OPSS 1850 and OPSD 401.010 Type “A” Closed Cover, with date and “SANITARY” cast into the cover.

For new developments, all maintenance holes within an asphalt roadway shall include a self-adjustable autostable frame. Structures outside roadways or existing frame and grates in base asphalt which require adjustment for top lift asphalt may use lift rings when approved by the City. In the case where adjustment units are used, a minimum of one to a maximum of three adjustment units (Moduloc) shall be installed on the top of the structure. The maximum vertical adjustment of maintenance holes via Moduloc shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

Where maintenance holes are located in areas to be flooded by the major storm design, maintenance hole covers shall be of the sealed variety and properly vented.

B1.8.7 Access and Landings

All maintenance hole chamber openings shall be located parallel to flow direction and shall be a minimum diameter of 610mm. Safety gratings shall be required in all maintenance holes greater than 5.0m in depth. Safety gratings shall not be more than 5.0m apart and constructed in accordance with OPSD and the Occupational Health and Safety Act, R.S.O. 1990, c. O.1 requirements and inspection, operation, and maintenance needs. The maximum distance from the finished surface to the first step is 400mm.

B1.9 Private Service Connections

Sanitary service connections shall be located per the Standard Drawings in **Appendix C**, and shall be installed in accordance with the latest version of the following, and as otherwise noted below:

- Ontario Building Code (*O. Reg. 350/06*)
- American Water Works Association (AWWA) Standard C800: Underground Service Line Valves and Fittings

- OPSD 1006.010
- OPSS 410
- MECP Watermain Design Criteria for Sanitary Sewers
- MECP Design Guidelines for Sewage Works
- NPSCD, Special Provisions – Contract Items

All sanitary service connections shall be single type 125 mm diameter, with a 125 mm x 100 mm test fitting at property line.

Connections for commercial, industrial and institutional will be considered on an individual basis but will generally be 150 mm diameter with a maintenance hole at property line for review and approval by the City.

The minimum slope for all service connections shall be 2.0%.

Tees shall be installed at a 45° angle to the main, where possible, such that the invert of the tee is at the springline of the main.

Service connections shall be located at a minimum depth of cover of 2.5 m or sufficient depth for basement floor drains and frost cover. Service connections should cross under watermain. Cleanouts should be located at the property line.

All floor drains are to be connected to the sanitary service connection. Foundation drains and roof water leaders are not to be connected to the sanitary system.

B1.10 Allowance for Future Servicing

If the location of future servicing is in doubt then the servicing can only be installed with written approval by the City. Where a sanitary sewer is to be stubbed, a sanitary maintenance hole will be required to limit infiltration into the existing system.

B1.11 Reconnect Existing Sewer Laterals

Reconnection of existing sewer laterals to a new sewer shall be in accordance with NPSCD, Special Provisions – Contract Items and OPS.

B1.12 Easements

When sanitary sewers are located in easements, the easement width shall be 6.0m minimum.

B1.13 Backwater Valve

All new houses (single detached, semi-detached and townhouses) require a normally open backwater valve located in the building drain inside the house and shall be in accordance with the Ontario Building Code.

B1.14 Pump Stations and Forcemains

Pump Stations and forcemains shall be designed and constructed in accordance with latest version of the Niagara Region Water-Wastewater Project Design Manual and MECP Design Guidelines for Sewage Works.

B1.15 Inspection Requirements

Full time inspection by a designated inspector retained by the Developer or Design Engineer, is required to oversee and inspect the construction of the new sanitary system, in it's entirety.

An Inspection and testing plan including; procedure, equipment, schedule, safety requirements, and emergency response plan shall be submitted to the Public Works Department at least two (2) weeks prior to the start of construction, and be finalized one (1) month prior to testing and commissioning. The plan must be accepted by the Public Works Department prior to proceeding with the inspection or testing.

Inspection shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains.

Compaction Reports must be completed by a qualified Geotechnical Engineer shall be submitted for trench backfill at frequencies acceptable to the City.

B1.16 Testing Requirements

The following testing requirements apply to all new sanitary sewers. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Public Works Department.

B1.16.1 Leakage Testing

Leakage testing shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains.

Hydrostatic testing shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains.

B1.16.2 Deflection Testing

Deflection testing shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Force mains.

B1.17 Flow monitoring

For new developments, flow monitoring will be required to be completed by the Developer and submitted to the City for review and approval at the following milestones:

- **New developments**
 - For 3 months following primary acceptance
 - For 3 months leading up to assumption

The City may request that the flow monitoring program be extended in order to capture representative results. Flow monitors will be in accordance with **Appendix A** - Approved Products List and will be purchased by the Developer to be installed by the City. The schedule and installation location will be approved by the City's project lead.



PORT COLBORNE

SCHEDULE C
STORM SEWER SYSTEMS AND STORMWATER
MANAGEMENT FACILITIES

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C1.1 General

The principles and design criteria in this section are intended for storm sewer and stormwater management facilities and to augment the guidelines, policies, and standards established by the Ministry of Transportation (MTO), Ministry of the Environment, Conservation and Parks (MECP), Niagara Peninsula Conservation Authority (NPCA) and Niagara Region. Where this manual does not provide specific details, all designs should stay in conformity with the most current version of the industry standards and legislation.

C1.2 Applicable Reference Documents, Standards and Legislation

All storm systems and stormwater management facilities are to be in accordance with the latest versions of all applicable legislation, industry standards and guideline documents, including by not limited to the following:

- American Society for Testing and Materials International (ASTM)
- American Water Works Association (AWWA)
- Building Code Act, 1992
- Canada Safety Association (CSA) Standards
- City of Port Colborne Approved Products List (**Appendix A** of this manual)
- City of Port Colborne Official Plan
- Drainage Act, R.S.O. 1990, c. D.17
- MECP Design Criteria for Sanitary Sewers, Storm Sewers and Force mains for Alterations Authorized under Environmental Compliance Approval
- MECP Stormwater Management Planning and Design Manual
- Ministry of Transportation (MTO) Drainage Management Manual
- MTO Highway Drainage Design Standards
- Niagara Peninsula Conservation Authority (NPCA) Policy Document
- Niagara Peninsula Standard Contract Documents (NPSCD)
- Niagara Region Stormwater Management Guidelines
- Crime Prevention through Environmental Design Standards, Guidelines & Policies
- Ontario Building Code (O. Reg. 350/06)
- Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD)
- Other applicable standards and references

C1.3 Construction

Construction of the stormwater system shall comply with the latest revision of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), Niagara Peninsula Standard Contract Documents (NPSCD) and the approved drawings.

The Public Works Department requires at least 48 hours of notice in advance of work requiring City staff to operate or inspect any parts of the system.

C1.4 Approved Products

All materials in the storm sewer system including pipes, joints and fittings, and maintenance holes, shall meet all applicable quality standards set by the AWWA and CSA Standards. Refer to **Appendix A** of this manual for the City's Approved Products List.

C1.5 Stormwater Management Policies

This section describes stormwater management policies adopted by the City regarding environmental protection and flood and erosion control.

C1.5.1 Low Impact Development Best Management Practices (LID BMPs)

The City encourages the use of LID BMPs wherever practical to address the requisite water quality control criteria for the site or development, as well as complementary benefits for water balance and erosion control. Potential LID BMPs which are supported include but are not limited to:

- Bioretention areas and bioswales,
- Vegetated filter strips,
- Inline, inground storage,
- Enhanced grassed swales,
- Permeable pavements (asphalt, concrete, and paving stones),
- Pre-fabricated modules (including soil retention cells) and tree pits, and
- Green Roofs.

Design Engineers should reference available resources through the Credit Valley Conservation (CVC) and Toronto Region Conservation Authority (TRCA), Ministry of Environment Conservation and Parks, and others, including:

- CVC Low Impact Development Guidance Documents (<https://cvc.ca/low-impact-development/low-impact-development-support/stormwater-management-lid-guidance-documents/>)
- Low Impact Development Stormwater Management Planning and Design Guide Wiki (https://wiki.sustainabletechnologies.ca/wiki/Main_Page)
- MECP “DRAFT Low Impact Development Stormwater Management Guidance Manual” for review in January - April 2022 (<https://ero.ontario.ca/notice/019-4971>)

The selection and design of LID BMPs must consider site characteristics, including but not limited to:

- Local groundwater table elevation (seasonal maximum),
- Subsurface soil type(s) and associated permeability/infiltration capacity (MECP recommended minimum soil infiltration rate of 15 mm/hr),
- Depth to bedrock,
- Sub-surface utility conflicts,
- Existing zoning and land use, including legacy contamination sites,
- Existing groundwater use including downgradient groundwater receptors (e.g. private wells, wetlands, sourcewater protection areas, etc.), and
- Long term operation and maintenance requirements.

Where sub-surface LID BMPs are proposed, it is recommended that an additional water quality treatment measure be placed upstream, to prevent and/or reduce the potential for clogging and improve long term functionality.

The use of LIDs will be reviewed and approved by the City on a case-by-case basis.

C1.5.2 Flood Control

Design Engineers are required to consult with the City, Niagara Region, and Agencies (including NPCA) regarding the acceptable level of flood controls to be applied to the site, including special cases (receivers with limited capacity, lack of overland flow route, etc.). The following flood control is required for developments as a minimum:

- Where a site discharges to a watercourse system: post-development to pre-development peak flow control for the 2 through 100-year return period events. The need for quantity control will need to be reviewed with the City. Peak flow timing effects with the surrounding watershed must also be taken into account.

- Where a site discharges to a storm sewer: 100-year return period post-development runoff shall be controlled to the allotted capacity of the storm sewer;
 - Where the allotted capacity of storm sewer is unknown: 100-year return period post-development to 5-year return period pre-development peak flow control
- For sites with split minor/major drainage, the minor and major systems are to be assessed separately for the need for quantity controls. There is a potential that one may require control while the other does not.
- Where a site discharges to a road right-of-way (ROW), it must be demonstrated that there is no negative impact to the infrastructure and meets the Permissible Depth of Flooding in Section 1.20.1. Examples can include flows via a private swale to a roadside ditch, via a private pipe system to a ditch or storm sewer system in the ROW, and via overland flow that will runoff to the ROW from driveways and entrances.
- Where a site discharges to a municipal drain, it must be demonstrated that the 100-year return period post-development is equal to or less than the 2-year return period pre-development peak flow control. Municipal drains are designed to convey a 2-year design storm. New developments shall outlet to a stormwater management pond prior to discharging to a municipal drain. There shall be no direct connection to the municipal drain.
- Dual-drainage system modelling may be required (minor/major system), on a site-by-site basis.
- For sites with multiple outlets, all of the outlets are to be assessed for the need for quantity controls
- Regulatory 100-year event controls or Regional Storm controls (i.e. Hurricane Hazel) will not be required, as control of the regulatory event is inherently provided through management of the 100-year event, in accordance with the NPCA guidelines and Regulations

Where stormwater controls are proposed on private lands, the City may require an easement to allow for periodic access to confirm the SWM controls are being operated and maintained by the owner. The requirement for an easement may be considered during pre-consultation, and on a site-by-site basis where appropriate. SWM controls on private lands are preferred to be in proximity to the property line to facilitate such access. Ultimately, operation and maintenance of all private SWM controls are the responsibility of the private property owner.

C1.5.3 Peak Flow Controls

Stormwater quantity controls require the implementation of peak flow controls. The City accepts the use of orifice plates and weir structures for City-owned and operated infrastructure. For private sites, the City requires devices that are permanently fixed, in

order to eliminate the possibility of the control device being physically removed. This includes orifice tubes, permanently fixed orifice plates, and permanently fixed weir structures, as these systems cannot be readily removed or altered or tampered with. Exchangeable inlet control device inserts are acceptable, provided they cannot be readily removed/altered.

Where the required diameter of an orifice is determined to be too small (i.e. less than the MECP 2003 recommended minimum of 75 mm diameter) and could result in debris blockage, other devices may be considered at the discretion of the City. Smaller diameter orifices may be used if the proponent can demonstrate that there is a low risk of debris or clogging, or measures put in place to prevent blockage.

C1.5.4 Erosion Control

Design Engineers are required to provide erosion control measure when a wet or dry SWM facility is being proposed and the development discharges to a receiver that is sensitive to erosive flows, the design should provide erosion control in the form of retention of the geographically specific 90th percentile precipitation storm event. Note: this is also referred to as the Runoff Volume Control Target, in the MECP DRAFT LID Stormwater Management Guidance Manual (2022).

Design Engineers are required to consult with the City, Region and Agencies (including NPCA) regarding the acceptable level of erosion controls to be applied to the site / development prior to initiating the requisite studies and design. The applicable level of erosion controls may be based on the conditions of the receiving channel (as established through field observations and monitoring programs). In some instances, in order to establish suitable erosion control criteria, an erosion investigation may be required or requested by the City.

C1.5.5 Acceptable Storage Usages

Permitted storage options are as outlined in the latest version of the Niagara Region SWM Guidelines. Rooftop storage will be considered by the City on a case-by-case basis if no other alternatives exist.

C1.5.6 Water Budget Summary

Stormwater volume reduction techniques may include infiltration, reuse and rainwater harvesting, canopy interception, evapotranspiration and/or additional techniques. Higher priority shall be given to LID Best Management Practices (BMPs) that promote volume reduction. Secondary preference is to employ filtration techniques, followed by rate control BMPs. The recommendations of hydro-geotechnical reports and environmental impact studies need to be considered as part of any design.

Design Engineers are required to ensure that pre-development infiltration, or evapo-transpiration volumes calculated on a site basis are maintained under post-development conditions. Green Infrastructure (GI) and Low Impact Development Best Management Practices (LID BMPs) are supported by the City to achieve these requirements.

At a minimum, the Design Engineer must ensure that the first 5 mm of rainfall which lands on the site is retained, reused, evapo-transpired and/or infiltrated on site (i.e. zero runoff for the first 5 mm of rainfall). The water budget target of 5 mm is based on a review of current policies in both local and Greater Golden Horseshoe Area municipalities.

Where site constraints limit the ability to achieve the required water budget criteria, the Design Engineer must document the site constraints, and propose best efforts approach to achieving the required criteria for review and acceptance by the City. In this instance, the City may negotiate alternative solutions to provide supplemental watershed benefits at offsite locations.

C1.5.7 Quality Control

To help meet water quality targets of 80% average annual removal of Total Suspended Solids (TSS) removal, equivalent to the MECP “Enhanced” criteria, for the entire Region, the City requires enhanced quality control such as oil-grit separators, catchbasin and maintenance hole inserts, filtration-based technologies and any new-proven technologies. The Design Engineer must include quality control measures, with supporting calculations in the SWM Report for review and approval by the City during detailed design phase.

C1.6 Minor System

C1.6.1 General

Storm sewers shall be sized using approved analytical methods and stormwater management guidance as outlined in this manual, the Region’s SWM Guidelines and MECP Guidelines. Inlet control devices (ICDs) may be required to limit storm sewer inflows, in conjunction with the required assessment of the capacity of the major overland flow system. Only stormwater, drainage from foundations and roads or LIDs are acceptable flows into the sewer system.

When a City-owned storm sewer is within a Region-owned road, the sewer design will follow the City’s criteria, however overland flow needs to be reviewed by the Region.

C1.6.2 Design Flow

Storm sewers shall be provided on all roads with curb and gutter. Storm sewer systems with a drainage area ≤ 50 ha shall be designed to convey the 1:5 year design storm (at minimum) using the Rational Method unless otherwise approved or directed by the City.

Storm sewer systems with a drainage area > 50 ha shall be designed using an approved computer program and verified with the Rational Method. The storm sewer design shall be based on the larger of the two flows calculated using the computer model and the Rational Method. Under no circumstances shall the storm system be designed in a surcharged condition.

The City's Storm Sewer Design Sheet Template can be found in **Appendix E**. All storm sewers shall be designed according to the Rational Method where:

$$Q = K * c * i * A$$

Where:

Q = Return Period Storm Event Flow (L/s)

K = Conversion Factor (2.78)

c = Runoff Coefficient (dimensionless)

i = Rainfall Intensity (mm/hr), to be calculated as per the approved IDF equation

A = Contributing Drainage Area (hectare)

Rainfall Intensity ("i")

The values of the rainfall intensity shall be determined using the IDF Curves and Storm Depths for the City of Port Colborne:

Table 1 - IDF Curve Parameters

		Parameter		
		a	b	c
Return Period (Yrs.)	2	755	8	0.789
	5	830	7.3	0.777
	10	860	6.5	0.763
	25	900	5.2	0.745
	50	960	5.1	0.736
	100	1020	4.7	0.731

$$i = \frac{a}{(t + b)^c}$$

Where: i = intensity (mm/hr)
 a, b, c = above, based on return period
 t_d = storm duration (min)
 Ratio of time to peak = 0.375

The storm duration is set to the time of concentration (i.e. the sewer inlet time plus the time of travel in the pipe or channel) for the total cumulative drainage area to the node of interest. The maximum inlet time for the first pipe of a storm sewer system is 10 minutes.

The Design Engineer shall provide calculations to demonstrate the expected time of concentration. An appropriate empirical equation shall be applied, or the value shall be calculated based on the length of storm sewer to the point of interest and an assumed average velocity of 1.25 to 1.5 m/s, plus an additional inlet time of 10 minutes.

Runoff Coefficient (“c”)

The following table outlines the runoff coefficients to be selected and used by the Design Engineer, as licensed by the Professional Engineers Ontario, and is in alignment with Niagara Region SWM Guidelines:

Table 2 - Runoff Coefficients

Source	Runoff Coefficient (C)
Asphalt, concrete, roof areas	0.90
Grassed areas, parkland	0.15 - 0.35
Brick Roads	0.7 - 0.85
Sandy Soil	0.05 - 0.25
Playgrounds	0.2 - 0.35
Gravel	0.9
forest and dense wooded areas	0.10 – 0.25
Permeable pavements	0.15 to 0.25
Green roofs	< 0.3

Where impervious and pervious areas are directly measured, the Design Engineer must also account for proposed hard surface amenity areas if not indicated on the drawing (i.e. areas beyond the rooftop, such as driveways, walkways, patios, etc.). For detached and semi-detached residential properties (including row houses and townhouses), if no additional information is available, amenity areas shall be calculated as 90% of the rooftop area (including the driveway). The revised combined Runoff Coefficient should however not exceed 0.9. The Design Engineer should also consider accounting for hardened amenity areas that could be implemented by homeowners (i.e. patios, hardscaping, etc.).

At the detailed design stage, storm sewer sizing and stormwater management calculations should not be completed using generic runoff coefficients. Rather, weighted runoff coefficients must be calculated based on the proposed pervious and impervious surfaces. Supporting calculations demonstrating the calculated imperviousness ratio must be provided for all developments. Impervious areas should include all proposed impervious surfaces (e.g. rooftops, driveways, walkways, etc.), and an allowance for potential future impervious surfaces that could be implemented in the future (e.g. hard-surfaced patios), all to the satisfaction of the Region.

C1.6.3 Drainage Area

The drainage system shall be designed to accommodate all upstream drainage areas plus any external area tributary to the system for the existing, interim and ultimate development conditions, as determined by the delineation of appropriate topographic mapping and the preparation of drainage plans.

C1.6.4 Approved Hydrologic Models

The following are the hydrologic models which are currently accepted by the City for event-based and/or continuous simulation modelling. Modelling approach and software requires approval by the City.

Table 3 - Approved Hydrologic Model

Modelling Software	Scenario
SWMHYMO	Single Event
VISUAL OTTHYMO	Single Event
MIKE	Single Event or Continuous
INFOWORKS	Single Event or Continuous
GAWSER1	Single Event or Continuous

Modelling Software	Scenario
HSP-F	Single Event or Continuous
HEC-HMS	Single Event or Continuous
EPA-SWMM	Single Event or Continuous
PCSWMM	Single Event or Continuous
XP-SWMM	Single Event
MIDUSS	Single Event

C1.6.5 Pipe Capacity

Manning's Equation

The Manning's Equation may be used in conjunction with the Rational Method to determine design capacity for simplified conveyance systems, such as storm sewers and open channels, within the limitations of the Rational Method (5.0 hectares drainage area or less).

The following table outlines the approved Manning's Roughness Coefficients to be used, and is in alignment with Niagara Region SWM Guidelines:

Table 4 - Manning's Roughness Coefficient

Material/surface Type	Manning's 'n'
Concrete Pipe	0.013
Corrugated Metal Pipe	0.024
PVC Pipe	0.013
Roads and Gutters (concrete or asphalt)	0.013
Concrete Channel	0.013
Rip Rap and River Stone	0.035 – 0.045
Maintained Channels	0.03 – 0.08
Unmaintained Channels	0.05 – 0.14
Naturalized Overbank Areas	0.08

Hydraulic Modelling

For larger, or more complex hydraulic conveyance elements, 1-dimensional (1D) hydraulic modelling should be applied. 1D hydraulic modelling presumes that flow is conveyed in the same direction as the defined hydraulic element (open channel or closed conduit). Where the flow route is ill-defined and flows spill outside of the primary channel, then 2-dimensional (2D) hydraulic modelling is considered to be more appropriate.

Additional guidance on Hydraulic Modelling can be found in the Niagara Region SWM Guidelines and as industry best practices.

The following are approved hydraulic models for various applications:

Table 5 - Approved Hydraulic Models

Modelling Software	Scenario
CULVERT MASTER	Culvert Structures
FLOWMASTER	Open Channel, Culvert, Pipe
HEC-RAS	Open Channel, Culvert / Bridge Structures / 2D
MIKE	Open Channel, Culvert, and Urban Storm Drainage System Analysis
INFOWORKS	Open Channel, Culvert, and Urban Storm Drainage System Analysis
EPA-SWMM	Open Channel, Culvert, and Urban Storm Drainage System Analysis
PCSWMM	Open Channel, Culvert, and Urban Storm Drainage System Analysis / 2D
XP-SWMM	Urban Storm Drainage System Analysis / 2D

C1.7 Minimum Size, Velocity and Grade

Storm Sewers design shall be verified (major system and minor system capacity analysis) accounting for the captured flows that enter the Storm Sewers (minor system) through inlets and the flow remaining at the surface (major system) at minimum under the following conditions;

- No inlet capacity restriction; and
- 50% inlet capacity restriction at depressions and roadway sags.

Maximum depths of flows at the surface and maximum hydraulic grade lines in the Storm Sewers shall be verified for up to the 100-year design storm.

The minimum size of the storm sewer main shall be 300 mm @ 0.30% minimum slope. All storm sewers are to be designed for the following velocities:

- Minimum velocity of 0.75 m/s to achieve proper cleansing
- Maximum velocity of 6.0 m/s to minimize erosion, with additional protection against erosion, scouring and pipe displacement when velocity exceeds 4.5 m/s

Decreases in pipe size from upstream to downstream are not permitted, except under circumstances where approved SWM controls permit.

For storm sewer sizes 450 mm in diameter or greater, pipes shall be concrete. The City, in its sole discretion, may require alternative pipe materials (such as HDPE or large diameter PVC) on a case by case basis.

C1.8 Bedding, Cover and Backfill

The minimum cover to the top of pipe shall be 1.2 m, unless otherwise specified in an approved Stormwater Management Report or as required by the Design Engineer. The Design Engineer must outline the reasons for the depth reduction and alternative frost protection measures to be taken. Insulation must be specified in accordance with NPSCD. In all cases, the proposed storm sewers shall be installed at sufficient depth to service lands external to the site as determined by the City.

Bedding, cover and backfill for all storm sewers and laterals shall be in accordance with NPSCD, Special Provisions – Contract Items and OPSD to suit applicable pipe material and ground conditions accordingly. The class, type of pipe and type of pipe bedding shall be shown on the profile for each section of sewer and shall be CSA approved. The use of native material for backfill will be considered by the City on a case-by-case basis when deemed suitable by a Qualified Geotechnical Engineer. In soft or wet conditions, additional Geotechnical investigation may be necessary to determine the appropriate bedding and backfill measures.

C1.9 Location and Separation

Horizontal and vertical separation between sewer and watermain shall be in accordance with MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit, or as otherwise accepted by the latest version of the City's DWWP. Any deviations from MECP will require review and written approval by the City.

C1.10 Crossings

Generally, a minimum clearance of 150 mm shall be provided between the outside of the pipe barrels at the point of pipe crossing for storm sewers and other utilities except for watermain crossings when the minimum clearance shall be not less than 500 mm. In the event the minimum clearance of 150 mm cannot be obtained, then the pipes at the crossing shall be concrete encased to ensure that the pipes are properly bedded.

C1.11 Maintenance Holes

All maintenance holes are to be precast and supplied or constructed in accordance with OPSD 701 Series with watertight connection KOR-N-SEAL type or approved equal.

Maintenance holes shall be provided at each change in alignment, grade, pipe material and at all junctions, and at the points of connection of sewer over 200 mm in diameter where the size of connection is equal to or one size smaller than the City sewer. Pipe opening alternatives shall be in accordance with OPSD 701.021.

C1.11.1 Spacing

Maintenance holes shall be spaced in accordance with MECP Design Criteria, as shown in Table 6 below:

Table 6 - Maintenance Hole Spacing

Pipe Size (mm)	Max. Spacing (m)
300 to 975mm	120
1050mm and greater	150
* where maintenance holes cannot be provided, an upstream maintenance hole is required at 30 m (max) from where a maintenance hole could not be placed to facilitate maintenance.	

C1.11.2 Sizing and Benching

The type and size of maintenance hole shall be specified on the plan and profile engineering drawing. The minimum maintenance hole sizes and opening alternatives shall be in accordance with OPSD 701.021.

All storm maintenance holes shall be benched as per OPSD 701.021 and be completed to obvert.

C1.11.3 Change in Direction of Flow

Changes in direction of flow through a maintenance hole greater than 90° will not be permitted. In pipe sizes 675 mm or greater, a change in direction of flow through a maintenance hole greater than 45° shall not be permitted.

C1.11.4 Drop Across Maintenance Hole

To compensate for head loss through manholes, the minimum drop between inverts across sewer manholes shall be:

Table 7 - Drops Across Maintenance Holes

Alignment Change	Drop Required
Straight Run	0.03m
45° Turn	0.03m
90° Turn	0.06m

C1.11.5 Frame and Grates

Cast iron maintenance hole lids shall be as per OPSS 1850 and OPSD 401.010 Type “A” Closed Cover, with the date and “STORM” cast into the cover.

For new developments, all maintenance holes within an asphalt roadway shall include a self-adjustable autostable frame. Structures outside roadways or existing frame and grates in base asphalt which require adjustment for top lift asphalt may use lift rings when approved by the City. In the case where adjustment units are used, a minimum of one to a maximum of three adjustment units (Moduloc) shall be installed on the top of the structure. The maximum vertical adjustment of maintenance holes via Moduloc shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

C1.11.6 Access and Landings

All maintenance hole chamber openings shall be located parallel to flow direction and shall be a minimum diameter of 610mm. Safety gratings shall be required in all maintenance holes greater than 5.0m in depth. Safety gratings shall not be more than 5.0m apart and constructed in accordance with OPSD and the Occupational Health and Safety Act, R.S.O. 1990, c. O.1 requirements and inspection, operation, and maintenance needs.

C1.12 Catchbasins

Catch basins shall be located upstream of pedestrian crossings, at street intersections such as to avoid driveways, sidewalks, and walkways and, where possible.

Catch basins shall be precast as per OPSD Series 700. The storm sewer connections to the main sewer shall be made with an approved manufactured tee for main sewer sizes up to and including 450 mm diameter and in accordance with City requirements for larger sizes (i.e. when sewer diameter less than 2X lateral diameter).

C1.12.1 Types

The single (CB), double (DCB) and rear yard (RYCB) type of catch basin shall be designed based on OPSD, amended to provide a minimum of 600mm sump. Any proposed special catch basins and inlet structures must be approved by the City.

RYCB's are typically not permitted by the City except when other options are not feasible. Wherever possible, site grading should be designed so that RYCB's are not required. Any CBs on private property that only serve that lot will be privately-owned and not maintained by the City. CBs servicing a new subdivision may be owned by the City following assumption.

RYCB and leads shall be included in the overall grading and drainage design to provide outlets for rear yard swales. The maximum distance from the swale high point to the RYCB or between RYCB shall be the lesser of 50.0 m or four single family lots between high points in each direction.

For the installation of connections to RYCB every effort must be made to install the lead so that it will outlet to a maintenance hole or catchbasin within the right-of-way.

C1.12.2 Spacing

The maximum spacing of catchbasins shall be as follows:

Table 8 - Catchbasin Spacing

Road Gradient	Maximum Spacing
0.5% to 3%	110 m
3% to 4.5%	90 m
over 4.5%	75 m

The maximum drainage area for any catchbasin shall be 2000 m² of paved area or 5000 m² of grassed area. Additional catch basins may be required at road intersections, curves, and cul-de-sacs to facilitate satisfactory drainage.

C1.12.3 Lead Sizing, Grades and Material

Storm sewer connections for catchbasin leads within roadways, multiple family and other blocks, commercial and Institutional Areas are to be sized individually according to the intended use.

- Single catch basins – 200 mm diameter at 0.50% slope minimum
- Double catch basins – 250 mm diameter at 0.50% slope minimum

C1.12.4 Location and depth of cover

Where changes of grade occur, the average gradient shall determine the maximum spacing. Catch basins should not be located within 1.5 m of the curb depression for a driveway or sidewalk. At intersections, catch basins shall be installed so that no more than 15 m of gutter will drain past the upstream point of tangency.

In sags, when drainage is received from more than one direction, double catch basins shall be installed and the maximum length of gutter contributing from each side shall be 75% of the spacing permitted above.

Catch basins are required at the throat section of cul-de-sacs.

C1.12.5 Frame and Grate

Catch basin frame and grate shall be per OPSD 400.020 except where high flow or low profile covers are required by the design and approved by the City, or requested by the

City.. Precast concrete adjustment units with modoloc tape between layers for grade adjustments.

C1.13 Storm Service Connections

All sewer service connections shall be installed in accordance with OPSD 1006.010. Sewer service connections may be installed in a common trench provided the trench detail is provided to and approved by the City. The minimum depth of cover is 1.2 m and the minimum slope is 2.0%. Utility duct trench depths and other crossings must be considered in setting the depth of service connections.

Sewer service connections shall be provided with suitable stoppers 1.0m inside the property line complete with 50 mm x 100 mm timber markers identifying such connections.

C1.14 Foundation Drains

Foundation drainage shall be designed for every residential lot and best efforts shall be made to discharge and absorb overland at surface grade via the use of sump pumps and concrete splash pads to the private property. Other methods of controlling foundation drain flow rate will be considered in consultation with the City:

- A sump pump discharging to an underground storm sewer service connection
- A gravity connection to the storm sewer, provided the 100-year hydraulic gradeline is minimum of 0.5 m below the finished basement floor elevation of the dwelling.
- A sump pump or gravity connection to a third pipe (foundation drain) collection system that is separate from the storm sewer system, which discharges to a sufficient outlet or another approved location such as a valley or hillside.

Foundation drains cannot be directly connected to Region-owned storm sewer systems.

Refer to City of Port Colborne Grading by-law and Sewer Use by-law for more information on foundation drains.

C1.15 Roof Leaders

Residential roof leaders shall not be connected to the storm sewer system. Roof leaders are to be discharged to the ground surface onto splash blocks or extended by a minimum of 900mm outwards, and flows shall be directed away from the building in such a way as to prevent ponding or seepage into the foundation weeping tile. Flow cannot be directed at a neighbouring property or structure.

Where flat roofs are used, as in commercial or industrial sites, detention roof hoppers requiring smaller or fewer roof leaders may be used as part of the stormwater management design. Connections are to be installed directly to storm sewers or to grade if a storm sewer outlet is not available.

C1.16 Drainage from Multiple Family, Commercial and other Blocks

Parking lots, driveways, and/or other hard surfaced areas servicing multiple family, commercial and other blocks, shall be drained by a properly designed internal drainage system (including catch basins, maintenance holes and pipe) which shall connect to the storm sewer system or other City approved outfall.

C1.17 Easements

When sewers are located in easements, the easement width shall be 6.0m minimum.

Easement requirements for RYCB and leads shall be a minimum width of 3.0 m and shall be conveyed in favour of the City of Port Colborne for storm drainage purposes. Required easements shall be clearly shown on the drawings including a typical RYCB lead offset, minimum 400 mm from the easement line.

C1.18 Inspection Requirements

Full time inspection by a designated inspector retained by the Developer or Design Engineer, is required to oversee and inspect the construction of the new storm system, in it's entirety.

An Inspection and testing plan including; procedure, equipment, schedule, safety requirements, and emergency response plan shall be submitted to the Public Works Department at least two (2) weeks prior to the start of construction, and be finalized one (1) month prior to testing and commissioning. The plan must be accepted by the Public Works Department prior to proceeding with the inspection or testing.

Inspection shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains. Refer to **Appendix F** of this manual for the City's CCTV Inspection Specifications.

Compaction Reports must be completed by a qualified Geotechnical Engineer shall be submitted for pipe bedding and trench backfill at frequencies acceptable to the City.

C1.19 Testing Requirements

The following testing requirements apply to all new storm sewers. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Public Works Department.

C1.19.1 Leakage Testing

Leakage testing shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Force mains.

C1.19.2 Hydrostatic Testing

Hydrostatic testing shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Force mains.

C1.19.3 Deflection Testing

Deflection testing shall be in accordance with the latest version of the MECP Design Criteria for Sanitary Sewers, Storm Sewers and Force mains.

C1.20 Major System

C1.20.1 Roadway Conveyance

Roadways shall be designed to accommodate the major system flow and shall be taken as the difference between the storm sewer capacity and the 100-year storm event. Roadway conveyance capacity shall be determined using the approved methods presented in this manual, with applicable coefficients for major systems. Analyses must consider both the minor and major system, and the interaction between the two (e.g. factors such as inlet capacity, and pressure flow).

Depth of flooding within roadways shall be limited in order to provide public safety and protect adjacent properties and shall be in accordance with the following, which aligns with Niagara Region SWM Guidelines:

Table 9 - Permissible Depth of Flooding

Location	Storm Return Frequency (Years)		
	5	25	100/Hazel
Walkways	minor surface	as required	as required
Open Spaces	flow up to 25 mm on walkways	for overland flow outlets	for overland flow outlets
Local	No ponding	0.05m above crown	0.15m above crown
Collector	1.0 m wide in gutter or 0.10m deep at low point catchbasins	up to crown	0.10 m above crown maximum depth of flooding of 0.3 m
Private Property	minor ponding in swales	no structural damage, ponding in yard areas below building openings - no basement flooding	no structural damage from overland flow
Public Property	minor ponding in swales or ditches	no structural damage, ponding in flat areas, no erosion	no structural damage, ponding in flat areas, some erosion

All best efforts should be made to keep depth of flooding within roadways limited to the of the right-of-way limits so as not to impact adjacent properties. Roadways shall be positively graded to continuously convey overland flow to suitable outlets or other overland flow routes.

The allowable depths applies to roadways with urban servicing (curb and gutter) and rural servicing (ditches).

Flooding depths on roadways due to riverine (fluvial) conditions for the Regulatory Event (100 year) should also be determined based on providing access and egress in accordance with the Ontario Ministry of Natural Resources River and Stream Systems: Flooding Hazard Limit Technical Guidelines (2002 or latest revision).

C1.20.2 Overland Flow Routes

Overland flow routes are commonly used to provide a linkage of overland flow conveyance between roadways and SWMF, channels/watercourses, or other suitable storm drainage outlets. Overland flow routes shall be appropriately sized to convey the peak flows which they capture and intercept, up to and including the 100-year storm

event (and the Regional Storm, in those locations where the Regulatory Storm may exceed the 100-year storm event). The need for erosion protection of overland flow routes shall also be incorporated in the design.

C1.20.3 Watercourses and Watercourse Crossings

Proposed works in the vicinity of watercourses, wetlands, valleys, and shorelines may lie within areas regulated by NPCA. The proponent is required to assess approval requirements based on consultation with NPCA, which will use their current regulation mapping. Additional requirements may also apply from other agencies, including, but not limited to the Ministry of the Environment, Conservation and Parks (MECP), the Ministry of Natural Resources and Forestry (MNR), the Department of Fisheries and Oceans (DFO), and the Ontario Ministry of Tourism, Culture and Recreation where heritage features may be present.

C1.20.4 Sufficient Outlet

All developments must demonstrate that the stormwater generated onsite is directed to a sufficient outlet. A sufficient outlet typically constitutes a lake or permanently flowing watercourse. Sufficient outlet may also include public rights-of-way provided that written permission is obtained from the City. In the case where the discharge is directed over private land, the developer must obtain a legal right of discharge registered on title. In such instances, the provision of the Drainage Act will apply and consultation and approval from the City's Drainage Superintendent will be required. Copies of all written documentation such as a legal right of discharge registered on title and/or written permissions from the City must accompany the design submission.

The Design Engineer shall provide calculations for the conveyance capacity of the downstream conveyance routes to demonstrate that upstream, downstream and adjacent landowners do not incur adverse impacts, including increased runoff flows, and that the flow is conveyed in a safe manner.

C1.21 End-of-Pipe Stormwater Management Facilities

C1.21.1 General

In the planning and design of stormwater management facilities (SWMF), the Design Engineer is to have full regard for the riparian rights of all surrounding, upstream and downstream landowners. Consideration of the surrounding topography, land uses, and environment and integration of the facility into such elements is paramount.

This section provides guidance on the design of stormwater management facilities as they may be applied to traditional urban design, urban design concepts employing

principles of low impact development (LID) and redevelopment as infill. The stormwater management guidelines to be applied to proposed site plans and developments are dependent upon the drainage area associated with the site.

End-of-pipe Stormwater Management Facilities (SWMF) refers to those systems with areas used for quantity, erosion and/or quality control storage to mitigate the impacts of development. An end of pipe SWMF may refer to a dry pond, wet pond, wetland, or hybrid design type. End of pipe SWMFs are typically only applicable for drainage areas of 5 ha or greater in order to support a permanent pool component.

C1.21.2 Design Requirements

SWMF shall be designed in accordance with the MECP 2003 Stormwater Management Planning and Design Manual, or any subsequent updated versions as follows:

- Wet ponds – Section 4.6.2
- Hybrid wet pond / wetland systems – Section 4.6.4
- Dry ponds – Section 4.6.5

C1.21.3 Aesthetics and Landscaping

SWMFs shall be constructed with acceptable building materials (e.g. no gabions) to ensure that the pond is an aesthetically pleasing component of the community.

Stormwater management facilities shall be integrated with parks and trails where feasible. Retaining walls may be permitted in the design of stormwater management facilities with City approval.

A planting strategy is required for any SWMF (wet pond) to provide shading, aesthetic, safety, bird control, enhanced pollutant removal, and other benefits. The design should include species of trees, shrubs, vines and herbaceous materials which are appropriate for use in the design of ponds, wetlands and other SWMPs. Depth and frequency of inundation, particularly during the growing season, are the primary factors controlling species survival. Water quality may be a secondary consideration. The planting strategy may include up to five zones based on frequency of inundation:

- deep water areas;
- shallow water areas;
- extended detention or shoreline fringe areas;
- flood fringe areas; and
- upland areas.

In cases where there are residential lot(s) adjacent to a SWMF, a minimum 3 m wide landscaping buffer with a maximum slope of 5% will be required between the residential lot(s) and side slope of the pond to provide separation between the stormwater management facility and private property. This buffer can be included within the stormwater management block.

C1.21.4 Fencing

Fencing shall be installed where the SWMF abuts private lots and schools with maximum slopes of 5:1. The City may request to install fencing in other conditions on project-by-project basis. Fencing shall be in accordance with the requirements of this manual.

All SWMF are to be designed such that perimeter fencing is not required where it is adjacent to municipal right of ways.

Gates with a locking system shall be provided on all maintenance road access points where there is fencing.

C1.21.5 Signage

A sign shall be clearly visible and erected at the SWMF maintenance access road entrances, as approved by the City.

Warning signs shall be clearly visible and erected at all access points (maintenance access roads or pedestrian trail access points) to the SWMF. Warning signs shall be supplied and installed by the developer.

C1.21.6 Maintenance Access

Maintenance access roads are required to all inlet and outlet structures, sediment forebays, sediment drying areas (if applicable), and emergency spillways associated with the SWMF. Co-location of access roads with trails shall be implemented wherever possible. Where feasible, two access points shall be provided from the municipal road allowance such that the access road is looped to key hydraulic features.

In situations where this is not practical, dead end access roads can be submitted to the City for review. Approval will be on a case-by-case basis. The access should be designed with a hammerhead turning area consisting of a minimum hammerhead width of 17.0 m and a 12.0 m centerline turning radius. No turning circles will be accepted.

The access roads shall provide for all-weather ingress and egress with a minimum width of 4.0 m and a maximum grade of 10%. The maintenance access road shall consist of 50 mm HL4 with a minimum base of 450 mm of compacted granular “A” (or as recommended by a licensed Geotechnical Engineer). Curves on all access roads shall have a minimum centerline radius of 12.0 m. Maintenance access roads shall be set a minimum of 600 mm above the maximum pond water level. The forebay ramp shall be constructed parallel with the forebay and be consistent with the lining of the bottom of the forebay or as recommended by a geotechnical engineer.

At locations where overland inlet flow routes or the emergency spillway cross the maintenance access, reinforcing measures shall be incorporated to strengthen the access route to carry truck loading and permit bike/stroller crossing.

C1.21.7 Berming

Berms around wetlands and wet ponds shall be designed with a minimum top width of 3.0 m (where trails and access roads are not located) with a 3:1 maximum side slope on the outside. The core of the berms shall be constructed with engineered fill on the basis of the recommendations of a licensed Geotechnical Engineer. Topsoil is not permitted for berm construction except as a dressing to support vegetation on the top of the core.

For pond berms exceeding 2.0 m in height from the top of the berm to the toe of slope, the berm must be designed by a qualified professional engineer in accordance with the latest edition of the Ontario Dam Safety Guidelines (MNRF).

C1.21.8 Trails

Pedestrian circulation trails shall be incorporated into SWMF where public safety has been fully addressed in terms of access, side slopes and fencing requirements. The feasibility of connections to adjacent neighborhood parks, recreation areas and existing trail networks is to be explored as part of the initial SWM facility submission plans to the satisfaction of the City. Wherever possible trails shall be co-located with maintenance access roads.

C1.21.9 Operations and Maintenance Manual

A stand-alone operations and maintenance manual will be required as part of the design of each facility, including inspection checklists, maintenance descriptions and projected frequency, as well as recommendations for facility cleanup. Operating, maintenance and monitoring requirements are to be provided in accordance with the latest version of the MECP Stormwater Management Planning and Design Manual.

C1.21.10 Guarantee Period

All aquatics, perennials, trees and shrubs are to be guaranteed for a period of not less than one year from the beginning of the maintenance period. If aquatics, perennials, trees and/or shrubs are found dead, diseased, missing or are deemed to be unhealthy within the guarantee period the defective plants are to be replaced and re-guaranteed for an additional two (2) years.

The developer is required to provide details as to who is responsible for SWMF maintenance before and following assumption by the City.

C1.21.11 SWMF Post–Cleanout (Final Acceptance)

Following removal of accumulated sediment, the Design Engineer shall provide a bathymetric survey of the cleaned out SWMF and provide as-built drawings which includes the following:

- A summary table with the design, pre, and post cleanout permanent pool volumes;
- A summary table with the design and as-recorded elevations of inlet headwall(s), outlet(s), weir(s), forebay berm inverts, emergency spillway inverts, and any other structures which are required for the facility to function as designed.
- Plan and sections of the pond which illustrate the maintenance access, hydraulic structures, and representative pond side slopes.

A geodetic monument shall be installed on the inlet headwall with the exact location and elevation included on the as-built drawings. All required warning signage will be installed with proof of installation provided to the City.

The Design Engineer shall provide the City with an Engineering Certification letter which confirms that all of the components of the SWMF are in good condition and do not require repair, and have been installed in general conformance with the approved SWMF design and final approved drawings. The additional information should be included in a package to the City:

- The approved SWM Facility Report;
- All approvals associated with the SWMF and associated infrastructure (e.g. outfall headwalls to the natural environment), including MECP and NPCA and DFO and MNRF as appropriate.

The Design Engineer shall provide the City with a Landscape Certification letter which confirms that all of the plantings associated with the SWMF are in good condition and do not require replacement and are in general conformance with the approved landscape plans. The additional information should be included in a package to the City:

- The final approved Landscape plans associated with the SWM facility;
- All approvals associated with the landscape plans.



PORT COLBORNE

SCHEDULE D WATER DISTRIBUTION SYSTEMS

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D1.1 General

The water distribution system is to be designed as a network system to meet the water demand for each area or development under consideration. Long dead-end mains and single supply systems are to be avoided. For system reliability, a looped system must be provided to the satisfaction of the City.

Any repair, replacement, installation or work on the existing watermain distribution system and appurtenances will be completed by an MECP Certified Water Operator as per the Safe Drinking Water Act. The Operations Division must be notified at least 24 hours in advance to operate such valves or hydrants.

No connection to the existing system will be permitted until the new water distribution system is satisfactorily commissioned by the Contractor and approved by the Design Engineer and City's Overall Responsible Operator (ORO).

D1.2 Applicable Reference Documents, Standards and Legislation

All water distribution system components are to be in accordance with the latest versions of all applicable legislation, industry standards and guideline documents, including but not limited to the following:

- American Society for Testing and Materials International (ASTM)
- American Water Works Association (AWWA)
- Building Code Act, 1992
- Canada Safety Association (CSA) Standards
- City of Port Colborne Drinking Water Works Permit (DWWP)
- City of Port Colborne Official Plan
- Consumer safety standards NSF/ANSI Standard 60: Drinking Water Treatment Chemicals Health Effects and NSF/ANSI Standard 61: Drinking Water System Components Health Effects.
- Fire Code (O.Reg. 388/97)
- Fire Protection and Prevention Act, 1997
- Fire Underwriters Survey document Water Supply for Public Fire Protection
- MECP Design Guidelines for Drinking-Water Systems
- MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit
- MECP 2020 Watermain disinfection procedure
- Niagara Peninsula Standard Contract Documents (NPSCD)
- Niagara Region Municipal Comprehensive Review
- Niagara Region Water and Wastewater Master Servicing Plan
- Niagara Region Water and Wastewater Project Design Manual
- Ontario Building Code (O. Reg. 350/06)

- Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD)
- Ontario Water Resources Act
- Safe Drinking Water Act, S.O. 2002
- City of Port Colborne Approved Products List (**Appendix A** of this manual)
- Other applicable standards and references

D1.3 Construction

Construction of the water distribution system shall comply with the latest revision of the Niagara Peninsula Standard Contract Documents (NPSCD), Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), the approved drawings.

D1.4 Confirmation of Available Capacity

The City has an existing model of its water supply and distribution systems. Prior to the commencement of any design, the developer and/or Design Engineer must contact the City for confirmation that there is adequate capacity to accommodate the demands of the proposed development and / or project. A water model update will be required for each new development, which will be completed by the City at the developer's expense. The results will be included in the Functional Servicing Report for new developments and in the design report for Capital projects.

D1.5 Approved Products

All watermain materials in the drinking water system including pipes, joints and fittings, valves, fire hydrants and materials shall meet all applicable quality standards set by the AWWA and CSA Standards, and NSF/ANSI Standard 60: Drinking Water Treatment Chemicals Health Effects and NSF/ANSI Standard 61: Drinking Water System Components Health Effects. Refer to **Appendix A** of this manual for the City's Approved Products List.

D1.6 Hydraulic Design

D1.6.1 Design Flows

The estimated populations and areas shall be in accordance with the Official Plan. Average consumption shall be based on the following:

Table 1 – Unit Consumption Rates

Water Demand ¹	
Residential Average Day	240 Lpcd
Employment Average Day	270 Lpcd
Peaking Factors ¹	
Max Day	1.57
Peak Hour	1.5 – 2.0 X Max Day Demand ²
Fire Demand	Fire flows should be confirmed by hydrant testing. Local hydrant tests may not be required if a local test has been completed by the City in the last 3 years. The Design Engineer shall satisfy the following at a minimum for new developments: Residential detached – 100 L/s; Residential townhouse – 150 L/s; Industrial, commercial, high rise and stacked townhouses – to be determined by the Design Engineer in accordance with FUS and / or AWWA requirements and submitted for City approval.

¹Based on Niagara Region Master Servicing Plan

²To be confirmed with the City at pre-design, and will be dependent on the location in the system and land use

Residential and non-residential population densities are to be derived from the Niagara Region Development Charges Background Study (2022), Appendix A Background Information on Residential and Non-Residential Growth Forecast.

D1.6.2 Pressure

Watermain supply systems are to be designed in accordance with MECP design requirements to achieve the following minimum pressures under the noted demand scenario:

Table 2 - Minimum Acceptable Pressure Range

Demand Scenario	Preferred (kPa (PSI))	Accepted (kPa (PSI))
Max Day Demand	345 – 480 (50 – 70)	275 – 550 (40 – 80)
Max Day + Fire	>140 (20)	>140 (20)
Peak Hour Demand	345 – 480 (50 – 70)	275 – 550 (40 – 80)
Average Day Demand	345 – 480 (50 – 70)	275 – 550 (40 – 80)
Min Hour Demand	345 – 480 (50 – 70)	275 – 550 (40 – 80)

The distribution system shall be sized to meet normal peak demands. The maximum sustained operating pressures shall not exceed 700kPa (100psi). Where pressures in localized areas are above this level, pressure reducing valves will be required.

All watermains shall be capable of withstanding minimum design pressures of 1035 kPa regardless of the working pressure in the system or the rating necessary to meet the structural requirements of the trench condition. The design pressure is the maximum sustained internal hydrostatic pressure to which the pipe is to be subjected, excluding transient pressures.

In the case of new developments, the City requires the Design Engineer to verify that the existing distribution system is sufficient to supply the above requirements to the development. In which case, the Developer is responsible for all associated costs for verifying. The result of the analysis complete with drawings and calculations shall be submitted to the City for review and approval during the subdivision application stage.

D1.7 Pipe Design

D1.7.1 Friction Factors

The Hazen-Williams formula shall be used for computing friction losses and subsequently sizing the watermains. The following "C" values shall be used for the design of water distribution systems regardless of pipe materials:

Table 3 – Friction Factor

Pipe Diameter (mm)	C-Factor
150	100
200 to 250	110
300 to 600	120
Over 600	130

The above C-factors represent long-term values. A C-factor of 130 shall be used to calculate maximum velocities for transient pressure estimations, and for checking pump motor sizes for run-out conditions.

D1.7.2 Sizing

Sizes and looping of watermains will be determined at the preliminary stage of the development. In all cases, watermain diameters shall be sized for fire protection and such that a flushing velocity of 0.8 m/s can be achieved for cleaning and disinfection procedures.

Residential Areas

- 150 mm diameter minimum, 200 mm diameter will be required on dead end streets or cul-de-sacs and looped with a 50 mm diameter watermain.

Industrial, Commercial and Institutional Areas

- Sized according to the anticipated demand for commercial and institutional developments.

Oversizing of watermain may be required where the system is expected to be extended to adjacent areas in the future, and to provide fire flow requirements including oversizing of hydrants, openings and leads as required in accordance with modelling results.

D1.7.3 Bedding, Cover and Backfill

The minimum depth of cover to watermain should not be less than the depth of frost penetration. Generally, the depth of cover shall not be less than 1.7 m measured in a vertical plane above the pipe from the top of the pipe to the finished ground elevation.

It will be the responsibility of the Design Engineer to justify any reduction in the depth of cover less than 1.7 m by submitting a report outlining the reasons for the reduction and alternative frost protection measures to be taken. Unless otherwise specified, if cover is less than 1.2 m at any location along the length, the Design Engineer shall specify insulation in accordance with NPSCD.

Bedding, cover and backfill for all watermain and appurtenances shall be in accordance with NPSCD, Special Provisions – Contract Items and OPSD to suit applicable pipe material and ground conditions accordingly. The class, type of pipe and type of pipe bedding shall be shown on the profile for each section of sewer and shall be CSA approved. The use of native material for backfill will be considered by the City on a case-by-case basis when deemed suitable by a Qualified Geotechnical Engineer. In soft or wet conditions, additional Geotechnical investigation may be necessary to determine the appropriate bedding and backfill measures.

D1.7.4 Horizontal and Vertical Separation

Horizontal and vertical separation between sewer and watermain shall be in accordance with MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit, or as otherwise accepted by the latest version of the City's DWWP. Any deviations from MECP will require review and written approval by the City.

Where watermain cross over or under utilities other than sewers, the clearance and type of crossing provided shall conform to the requirements of the particular utility involved and provide proper bedding and structural support of the watermain and utility.

D1.7.5 Easements

When watermains are located in easements, the easement width shall be 6.0m minimum.

D1.7.6 Dead End

The distribution system shall be designed to eliminate dead-end sections. Where dead-ends cannot be avoided, they shall be provided with a fire hydrant, flushing hydrant or a flushing post hydrant. This detail must be included in the Engineering Drawings being submitted as part of Subdivision Agreement and / or detailed design submission for Capital Projects.

D1.7.7 Pipe Deflection

If it is necessary to deflect a watermain to avoid a conflict with other infrastructure, the Design Engineer will be required to provide detailed drawings and calculations for approval by the City. Joint deflection to enable bends in the watermain is not permitted. All pipe bends or deflections shall be accomplished using manufactured bends.

D1.8 Thrust Restraint

All joints are to be mechanically restrained in fill areas, as per the manufacturer's recommendations. Concrete thrust blocks may be permitted but require approval from the City prior to install. Restrained joints shall be installed at all tees, bends, hydrants, end of mains and connections for all mains.

Calculations will be required from the Design Engineer in accordance with City requirements and manufacturer's specifications to determine the number of joints to be restrained beyond the bend, fitting, tee, etc.

D1.9 Cathodic Protection of Watermains and Appurtenances

Cathodic protection is to be provided at fittings, valves, water services and hydrants will be in accordance with the provisions of NPSCD, Special Provisions – Contract Items and OPS.

D1.10 Valves

D1.10.1 Size, Location and Spacing

Valves shall be placed in the distribution system in accordance with the provisions of NPSCD, Special Provisions – Contract Items, OPS, and as amended by the following:

Table 4 – Valve Types and Sizes

Type	Pipe Size*
Gate Valve	350mm or less
Butterfly Valve	400mm or greater

*The size of the line valves shall be the same size as the watermain.

A minimum of three (3) isolation valves are required at a tee intersection and a minimum of four (4) isolation valves are required at a cross intersection. The valves shall be located at the point where the projections of the streetline intersects the watermain or with anchor tees.

Valve boxes and chambers shall be located in boulevards whenever possible. Line valves shall be located at not more than 150 m intervals in commercial and industrial districts and at not more than one block, 21 houses or 240 m intervals in other districts. Where systems serve rural areas and where future development is not expected, the valve spacing should not exceed 2 km.

A valve shall be installed a minimum of one pipe length away from casing pipe on each side of a railway crossing, of any water stream or as directed by the Design Engineer and City.

Valves shall operate freely prior to installation. Boxes shall be carefully set over the bonnet with the shaft truly vertical and the top at the proper elevation. Valve boxes shall be braced to the sides of the trench prior to backfilling in order to maintain their setting. Guide plates shall be used with all boxes.

All valves shall be of the approved type in accordance with **Appendix A** of this manual for the City's Approved Products List, with non-rising stem and a 50 mm square operating nut opening counter-clockwise.

D1.10.2 Air Release Valves

Air release valves shall be placed at all significant high points of the distribution system. In addition, an attempt shall be made to locate hydrants at high points or at dead ends, thereby eliminating the need for vacuum-air relief valves and/or blowoffs.

D1.10.3 Valve Boxes and Chambers

All valves 350 mm diameter and smaller shall have valve boxes and specified direct bury operators shall be used.

All valves 400 mm diameter and larger (butterfly valves) shall be installed in valve chambers. Valve chambers shall be in accordance with latest version of the Niagara Region Water-Wastewater Project Design Manual.

Chambers or pits containing valves, blow-offs, meters or other such appurtenances to a distribution system shall not be connected directly to any sanitary or combined sewer, nor shall blow-offs or air-relief valves be connected directly to any such sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subjected to flooding by surface water, to absorption pits or to a sump within the chamber where ground water level is above the chamber floor or storm sewer. In order to minimize the total number of chambers on any project, care should be exercised in locating the line valves, air relief's, drains, etc., with a view to combining these functions in a single chamber.

D1.11 Fire Hydrants

Hydrants shall be installed on all watermains 150mm diameter and larger in accordance with the latest version of the following, except where modified below:

- AWWA C502: Dry-Barrel Fire Hydrants
- OPSD 1105.010
- OPSS 441
- MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit
- NPSCD

Hydrants shall be in accordance with the following:

- Depth of bury: 1.8m
- Boot: 150mm diameter mechanical joint
- Top Colour: per pressure rating (AWWA)
- Drain ring bolts and nuts; stainless steel type 304
- Shall be epoxy coated in compliance with AWWA Standard C550
- Secondary valve: 150mm diameter
- Joint: mechanical
- Tee off watermain shall be anchor type. Secondary valve shall be fastened to anchor tee. All piping required (from tee to valve to hydrant) shall be Class 150 PVC
- Bends in fire hydrant leads will not be allowed unless site conditions warrant and with written approval by the City

Where hydrants do not conform to the finished ground elevation, the proper length extension will be inserted either at the drain ring flange before backfilling or the ground line flange with proper rod extension. Extension must be installed in accordance with manufacturer's specifications.

If the hydrant requires a shorter barrel due to a necessary grade change in the watermain, the proper length barrel will be installed before backfilling the hydrant trench.

Where hydrants are set in a bank, the slopes shall be graded within a 1.8m radius from 75mm (3") below the ground flange not steeper than 1:2.

For long-side hydrant leads, a valve is required on both side of the road.

In areas where the water table is known to be high, the drain holes of the hydrant are required to be internally plugged.

D1.11.1 Maximum Spacing and location

Hydrants shall be located at high points, low points, between isolation valves or dead ends to eliminate the need for vacuum-air relief valves and/or blow offs wherever possible. They should be located as per the typical road cross-sections in **Appendix B** and generally 3.50m from the property limit preferably at all intersections and opposite lot lines in residential areas. All hydrants when installed in new subdivisions shall have a clearance of at least one (1) metre from any boulevard apron as to not cause any conflict with ingress and egress of driveway access. On rural cross-sections, hydrant access complete with culvert is to be provided.

Design Engineer should confirm spacing per the Fire Underwriters Survey. Hydrant spacing and locations are subject to review and approval of the City's Fire Chief. Maximum spacings are as follows:

Table 5 – Hydrant Spacing

Zoning	Max. Spacing (m)
Single family residential area	150
Commercial, industrial, institutional and multi-family residential areas	90

*To be confirmed by Design Engineer based on the required Fire Flow. To be reduced by 30m for dead-end street or roads. On median divided streets and/or arterial streets, hydrant spacing should not exceed 150m.

D1.12 Water Services

Water services shall be copper and be installed in accordance with the latest version of the following, and as otherwise noted below:

- Ontario Building Code (O. Reg. 350/06)
- American Water Works Association (AWWA) Standard C800: Underground Service Line Valves and Fittings
- OPSD 1104

- OPSS 441
- MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit
- NPSCD, Special Provisions – Contract Items

The design is to include two services with an isolation valve between the connections to help ensure redundancy to sensitive users (such as hospitals, day cares, long-term care facilities, etc.) in the event of a service line failure.

Any shared existing services will need to be split when replacing services. Any new services will be at a cost to homeowner from the house to the watermain.

Any deviation will require City approval.

D1.12.1 Pipe Size

The minimum size for service connections shall be 25 mm inside diameter. Service connections for multiple family dwellings shall be sized to provide capacity equivalent to 25 mm diameter connection to each dwelling unit. Service connections for blocks, commercial and industrial areas shall be sized according to the intended use.

D1.12.2 Location

Water service connections shall not be located under a driveway, if possible. The location of water service connections for single family and semi-detached lots shall be in accordance with Standard Drawings in **Appendix C**. Curb stops shall be located at the property line.

D1.12.3 Minimum Depth

Minimum service connection depths are as follows:

Table 6 – Minimum Service Depths

Road Types	Minimum Depth (m)
Curb and Gutter	1.7m below finished centreline of road grade
Open Ditch and Unimproved Roads	1.7m below ground level

Unless otherwise specified, services with less than 1.2 m of cover shall be insulated in accordance with NPSCD.

D1.12.4 Mainstops

All domestic water service connections shall have main stops installed at the watermain equal to the water service connection diameter. A main stop shall be the same size as

the service line, bronze, round way. The main stop valve shall conform to the City's Approved Products List in **Appendix A**.

For service sizes 25mm in diameter, the following is required:

- service saddle
- tapping must not exceed 15° from horizontal centre line of main

For sizes 38mm diameter and 50mm diameter:

- service saddle
- must be tapped at horizontal to centre line of main
- AWWA standard thread inlet and female iron pipe thread outlet
- plastic pipe to iron coupling or adapter

D1.12.5 Curb Stops and Boxes

All service connections shall have curb stops and boxes installed at the property line or at an approved location. Curb valve to be compatible (same size) as the service and valve shall conform to the City's Approved Products List in **Appendix A**. All curb stops on the open end must be protected with the use of a plastic cap or plug.

Service connection to watermains greater than 400 mm diameter or owned by Niagara Region will not be permitted.

D1.12.6 Water Meters

A water meter is required for each water service. The water meter will be sized by the City using the peak instantaneous flow provided by the Design Engineer. Meter chambers will be requested on a case-by-case basis as deemed suitable by the City.

D1.12.7 Reconnection of Existing Water Services

Existing water services shall be reconnected to new watermains in accordance with the latest version of NPSCD.

D1.12.8 Allowance for Future Servicing

If the location of future servicing is in doubt then the servicing can only be installed with written approval by the City.

D1.12.9 Tapping Sleeves

All tapping sleeves shall conform to the City's Approved Products List in **Appendix A**.

D1.13 Backflow Prevention

Backflow prevention devices must be installed and maintained on all existing and/or proposed water services to industrial, commercial, institutional and multi-level

residential buildings to prevent the flow of contaminants into the municipal drinking water system.

Where a private water system is connected to the municipal water system, the municipal water system shall be protected through premise isolation of the private system by installation of a backflow prevention device in an aboveground enclosure / building. The use of underground chambers to house backflow preventer devices shall not be permitted, unless approved by the City.

Backflow prevention devices must be installed downstream of the property's water meter, or in the case of a fire protection system, where the fire protection system enters the building. The backflow preventor for the property should be tested annually by an Approved testing person and submitted to the City of review and acceptance.

All backflow prevention devices, appurtenances and enclosures must be selected and maintained in accordance with the manufacturer's specifications, and the guidelines set out in the most recent version as well as AWWA, Canadian Cross Connection Control Manual, CSA Standards, Ontario Building Code and applicable Provincial Regulations.

D1.14 Tracer Wire

Tracer wire shall be designed and installed in accordance with OPS, or as amended in NPSCD.

D1.15 Water Sampling Station

Placement of water sampling stations within any new development or watermain rehabilitation project will be determined by the City, and shall be based on establishing the most optimal water quality monitoring program.

Where and when they will be installed is dependent on the most strategic location that will provide water quality data to efficiently monitor the distribution system based on surrounding sampling stations. Consultation with the City shall be required in the determination of need and location.

D1.16 Temporary Water Supply

Temporary water supply systems may be required to facilitate watermain replacement projects. The use of temporary water supplies will require the approval by the City prior to design.

The Design Engineer will be responsible for designing the temporary water system, including installation, operation, testing procedures, and a list of material and equipment to be used. The system shall be installed in accordance with the latest version of the following, and as otherwise noted below:

- OPSS 493
- MECP Design Guidelines for Drinking-Water Systems
- NPSCD, Special Provisions – Contract Item D12

D1.17 Inspection Requirements

Full time inspection by a qualified Design Engineer retained by the Developer or Consulting Engineer, is required for the construction of the new water distribution system.

Compaction Reports must be completed by a qualified Geotechnical Engineer shall be submitted for pipe bedding and trench backfill at frequencies acceptable to the City.

D1.18 Testing and Commissioning

The new water distribution system shall be pressure tested, flushed, chlorinated and bacterial tested in the presence of the Design Engineer and the City's designated MECP Certified Operator in accordance with City and MECP requirements. Sampling will be conducted by the City's designated MECP Certified Operator.

Commissioning shall be in accordance with MECP and AWWA requirements and the City of Port Colborne Watermain Commissioning Protocol (New Build and Replacement) (ref: Document No. QMS-WCP).

D1.18.1 Final Connection

The final connection shall be in accordance with the City of Port Colborne Watermain Commissioning Protocol (New Build and Replacement) (ref: Document No. QMS-WCP) and shall not be made until all of the above testing has been satisfactorily completed and the ORO has provided written notification to proceed. Final approvals must be received from the City's ORO prior to connection to the existing system.



PORT COLBORNE

**SCHEDULE E
TREES, LANDSCAPING AND PARKS**

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E1 Trees and Landscaping

E1.1 General

This section provides policies, general standards and guidelines for the protection of existing trees during construction and for the planting of new trees. The section outlines tree inventory, preservation and protection requirements to ensure existing vegetation is retained where possible, and measures to ensure damage to existing vegetation is minimized.

E1.2 Applicable Reference Documents, Standards and Legislation

All trees and landscaping to be in accordance with the latest versions of all applicable legislation, industry standards and guideline documents, including but not limited to the following:

- Accessibility for Ontarians with Disability Act (AODA)
- Building Code Act, 1992
- Canada Safety Association (CSA) Standards
- Canadian Standards for Nursery Stock
- City of Port Colborne Approved Products List (**Appendix A** of this manual)
- City of Port Colborne Official Plan
- City of Port Colborne Urban Forestry Master Plan
- Good Forestry Practice by the Ontario Professional Forester's Association
- Niagara Peninsula Conservation Authority Tree and Forest Conservation By-law
- Niagara Peninsula Conservation Authority A Guide to Niagara's Native Plants
- Niagara Peninsula Standard Contract Documents (NPSCD)
- Niagara Region Municipal Comprehensive Review
- Crime Prevention through Environmental Design Standards, Guidelines & Policies
- Ontario Building Code (O. Reg. 350/06)
- Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD)
- Other applicable standards and references

E1.3 Construction

Construction shall comply with the latest revision of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), Niagara Peninsula Standard Contract Documents (NPSCD) and the approved drawings.

E1.4 Approved Products

Refer to **Appendix A** of this manual for the approved species for trees, shrubs, grasses and forbs.

E1.5 Trees

E1.5.1 City of Port Colborne Urban Forestry Management Plan

All new developments and capital projects should align with the goals of the City as stated in the Urban Forestry Management Plan:

- To protect existing public trees and encourage the retention of private trees.
- To increase the canopy cover over 10 years to help minimize climate change through tree protection, planting, and maintenance.
- To increase tree planting with native species to enhance biodiversity and connectivity
- To ensure the creation of beautiful treed and healthy places for people to enjoy
- To enable the urban forest to help increase the education and awareness opportunities
- To use more trees to improve economic opportunities (tourism) through greater canopy
- To manage the risk that trees pose to an acceptable level for residents and visitors alike

Proposed tree species are to be provided to the City for approval. When selecting tree species, the following criteria are to be considered:

- Assess conflicts with power lines, sidewalks and underground utilities.
- Select of large trees where space is available to maximize planting effect.
- Encourage diversity of species to reduce susceptibility to disease.
- Utilize native species as much as possible.
- Consider long-term maintenance pruning requirements of trees.
- Select species with respect to soil microclimate requirements.
- Select species with respect to salt tolerance and specific moisture requirements.

E1.5.2 Street Tree Location and Setback Requirements

The City's Tree By-law does not permit plantings in the boulevards, unless requested at the discretion of the City.

When planting near utilities, the location and species of the plant material must be coordinated to ensure the non-obstruction of storm and sanitary sewers, water service, hydro, telephone, gas lines and other services. The Developer / Contractor are

responsible for utilities locates prior to any excavation. Hydro-vac may be required near structural tree roots, at no additional cost to the City.

In order to reduce conflicts with utilities, entrances, curbs, sidewalks and other trees, the following setbacks shall be incorporated:

- Large crown trees are to be planted at intervals ranging from 15 to 18 metres apart.
- Small crown trees are to be planted between 6 to 8 metres apart.

E1.5.3 Supply and Installation

Trees shall be supplied and installed in accordance with the Canadian Standards for Nursery Stock and NPSCD.

E1.5.4 Tree Protection

Tree protection fencing shall be erected at the critical root zone or beyond, prior to commencement of any clearing, grading or other construction activity. Tree protection will be in accordance with NPSCD, OPSD 220.010 and OPSS 801, except where appended herein. Tree protection shall not be removed until completion of all construction activity.

The minimum required distances for determining a Tree Protection Zone (TPZ) is per the following Table. Some trees depending on health, the uniqueness of the species, soil type and competition from other trees may require larger TPZ at the discretion of the City.

Table 1 - Tree Protection Distances

Trunk Diameter (dbh)* (cm)	Minimum protection distances required (m)**
<10	1.8
11-40	2.4
41-50	3.0
51-60	3.6
61-70	4.2
71-80	4.8

81-90	5.4
91-100	6.0

* Diameter at breast height (DBH) measurement of tree trunk taken at 1.4 metres above the ground.

** Tree Protection Zone distances are to be measured from the outside edge of the tree base.

E1.5.5 Tree Compensation

Tree compensation plan will be initiated during the Site Plan and Subdivision planning stage. Tree compensation calculation methods will be at the discretion of the City on a case-by-case basis. City Staff will consider a combination of factors including but not limited to canopy area, lot size, tree density, cultural importance, and/or land designation.

The standard compensation rate for trees removed from a landscape setting are calculated using Table 2 below. The replacement value of a tree is determined by its caliper at breast height, corresponding replacement caliper range, and compensation rate. Trees that have been removed prior to being inventoried will be compensated at the discretion of the City, to ensure the principle of 'no net loss of trees' is followed.

Table 2 - Tree Compensation Ratios

Removed Tree Diameter at Breast Height (DBH)	Compensation Ratio
100mm - 150mm	1 to 1
151mm - 350mm	2 to 1
351mm – 500mm	3 to 1
>501mm	4 to 1

All replacement trees should be provided at nursery stock standards unless smaller stock is deemed appropriate.

A tree health coefficient is applied to each tree prior to calculation of total compensation. The coefficient is multiplied to the replacement rate for that tree to determine a compensation rate relative to a healthy specimen. The total replacement rate is accumulated and rounded to the next whole number.

Table 3 - Tree Health Coefficients

Heath of Tree	Health Coefficient
Dead	0
Hazard or Infected	0.25
Poor	0.5
Fair	0.75
Good	1.0

If the minimum number of replacement trees cannot reasonably be met, as determined by the City, tree compensation shall be in the form of shrubs at a compensation ratio of 5 shrubs to 1 tree. If compensation cannot be provided, a cash in lieu agreement may be entered by the Developer or Contractor. The rate for cash in lieu will be \$500 per replacement tree not planted on the site.

E1.6 Topsoil, Seed and Sod Requirements

E1.6.1 Topsoil

Topsoil material, construction and testing will be in accordance with NPSCD and OPSS 802, except where appended herein.

All topsoil may be subjected to a physical and chemical analysis by a qualified laboratory to determine its suitability for the intended purpose. The analysis shall be completed by a recognized laboratory specializing in soil analysis and all associated cost shall be at the expense of the Developer or Contractor.

Use of native topsoil requires approval from the City and must meet specified requirements. If native topsoil is inadequate in quantity, quality or both, use imported topsoil that meets specified requirements will be required.

Topsoil Stockpiles will be in accordance with OPSS 802 and NPSCD. Stockpiles are not to be located in open space or park areas.

E1.6.2 Seed and Cover

Requirements for seed and cover material, surface preparation, application, quality assurance, acceptance and maintenance will be in accordance with NPSCD and OPSS 804, except as revised in **Appendix A** – Approved Products List. Seeding rate shall be in accordance with the suppliers requirements for performance guarantee.

Naturalization Mixes

Seed mixes will be approved by the City on a site-by-site basis and will consider the following criteria:

- Water regime
- Soil conditions
- Human activity
- Existing vegetation
- Salt tolerance
- Sunlight availability
- Erosion control requirement
- Active or passive naturalization

The developer or contractor will provide the City and/or the NPCA with the packing receipts verifying the species content, percentages and supplier. The following table identifies suitable grass and forb species. The seeding rate will be specific to the proposed mix.

All interim seeding placed for quick cover must be compatible with, but not jeopardize, the survival of the approved seeding mix. The interim mix must consist of no-maintenance, native, non-invasive herbaceous species. Annual rye and winter wheat may be suitable.

E1.6.3 Sod

Requirements for sod material, surface preparation, application, quality assurance, acceptance and maintenance will be in accordance with NPSCD and OPSS 803.

E2 Parks and Open Space

E2.1 General

Parks are an essential component of the urban area. They provide opportunities for both residents and visitors to explore other aspects of daily life and to have social, educational, and recreational experiences in a designated outdoor setting.

Parks are a vital component of a well-planned community. Parkland that provides maximum benefit to the public, integrates existing natural features (such as streams and creeks) and cultural heritage resources (such as woodlots and hedge rows) in a functional manner. The ideal park will have a wide range of features and facilities and will accommodate use by residents with a variety of interests and capabilities.

Prior to the initiation of any design work, the City requires pre-consultation with the developer and contractor to address the design features for park and open space facilities.

Per the City of Port Colborne Official Plan, within the City's Urban Area Boundary, parks and open space shall be classified according to the following hierarchy:

- City Parks
- Community Parks
- Neighbourhood Parks
- Parkettes
- Tot-lots

Outside the Urban Area Boundary, existing parks and open space shall be classified according to the following hierarchy:

- Community Parks
- Neighbourhood Parks.

Definitions of each park classification and the standard requirement for provision for each parkland can be found in the City's Official Plan.

E2.2 Features

Required park and open space features include the following:

- a) Chain link fence (1.5m) where the Park property is adjacent to private lots. No gates into parks, open spaces, or stormwater management facilities are permitted from private property. Park frontage on streets is not fenced.

- b) Trails and park walkways are to be designed in accordance with Roads section of this manual.
- c) Park grading is to be a minimum slope of 1.5 to 2%, graded to a manner to maintain proper drainage. General grading of the site shall be in accordance with OPSS Division 2.
- d) Playgrounds must conform to the latest Canadian Standards Association (CSA) standards for play spaces and equipment.
- e) Playgrounds and walkways must conform to AODA standards in addition to CSA standards.
- f) At least one (1) light standard must be provided at playgrounds for security.
- g) A park sign indicating the name of the park is to be provided by and installed by the Developer / Contractor at a location approved by the City. Specifications for the park signs are to be submitted, reviewed and approved by the City.

The selection of site furnishings (e.g. picnic tables), hardware (e.g. door handles) and fixtures (e.g. drinking fountains) will be based on ease of use for a wide range of capabilities and age groups and is subject to review and approval by the City during the detailed design stage.

The City may require services to parkland parcels, as follows: 25mm water service, 125 mm sanitary sewer service, 250mm storm sewer service and a hydro service as minimum requirements.

E2.3 Parking

Parking lots will be determined by the City on a case-by-case basis. Adequate on-site parking including bicycle parking and drop-off areas shall be provided to accommodate the existing and proposed uses.

E2.4 Naturalization

E2.4.1 General

Areas of naturalization are encouraged within all parks and open space areas. Naturalization may be in the form of a low maintenance planting area, a buffer area for adjacent woodlots or stream corridors, or a stormwater management facility. The locations and design of these naturalization areas are to be coordinated with the stormwater management plan, the site's programming needs, and with consideration for any abutting natural areas or woodlots. Naturalization areas will consist of either open meadows of herbaceous plants, (grasses, forbs and native wild flowers) or of native woody plant material (shrubs, vines and trees) to eventually establish a woodlot.

Standard maintenance activities in the naturalization areas are to be limited to the removal of invasive non-native species, and a 1.0 metre mowed strip adjacent to all

trails and walkways abutting the naturalized area. NPCA should be consulted and the City must approve selection of all plant material for naturalized areas. All plant species are to be appropriate to the site. The use of native, noninvasive species indigenous to the region may be a requirement. These authorities will provide specific direction regarding stormwater management pond planting, species selection, and submission requirements.

The City encourages the preservation of existing vegetation within park blocks, regardless of classification. To preserve this vegetation, a naturalized planting area may be required. Naturalization may also be required for park areas that abut Greenlands systems and watercourses, regardless of park classification. Newly naturalized areas will incorporate the following design techniques:

- The use of several plant associations which are commonly found in that area.
- Clustering of plants to replicate natural communities.

E2.4.2 Active Naturalization

Active naturalization includes creating and managing biodiversity within newly planted areas. The following practices apply:

- Planting a variety of specific shrubs, trees and grass/forb mixes to closely replicate a naturally occurring undisturbed meadow, woodlot or riparian area. This encourages natural ecological processes and provides habitat to native birds, insects, amphibians and reptiles.
- Removing invasive, non-native plant species.

E2.4.3 Passive Naturalization

Passive naturalization is appropriate for existing naturalized areas within parks and open space. It focuses on retaining or conserving existing naturalization areas with little or no maintenance. The following practices may apply:

- no new planting
- may include removal of invasive species
- no removal of dead wood in trees except where a hazard to pedestrians exists (in order to allow for the natural process of decay and regeneration and to provide habitat for invertebrates and micro-organisms).



PORT COLBORNE

SCHEDULE F LIGHTING SYSTEMS

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F1.1 General

All roadways and public spaces in the City of Port Colborne are to be lit with light-emitting diode (LED) lighting. Street lighting shall be provided throughout all developments and may be required on roadways bordering developments if deemed necessary by the City.

The following section outlines the design requirements to which the Design Engineer must adhere. A qualified Design Engineer shall prepare the streetlight and lighting designs, including photometric plan. All drawings must be sealed by a registered Professional Engineer, licensed to practice in the Province of Ontario.

F1.2 Applicable Reference Documents, Standards and Legislation

All lighting systems are to be in accordance with the latest versions of all applicable legislation, industry standards and guideline documents, including by not limited to the following:

- Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting, ANSI/IES RP-8 Document
- Canada Safety Association (CSA) Standards
- City of Port Colborne Approved Products List (**Appendix A** of this manual)
- City of Port Colborne Official Plan
- Electrical Safety Authority (ESA)
- Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD)
- Ontario Regulation 22/04
- Transportation Association of Canada (TAC) Guide for Design of Roadway Lighting”, Volumes 1 and 2
- Other applicable standards and references

F1.3 Construction

Construction and installation of the street lighting system will be in accordance with the requirements of ESA, CSA, the Canadian Niagara Power (CNP), this manual, latest revision of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD) and the manufacturer’s installation instructions.

F1.4 Consultation and Involvement of Power Authority

Power supply shall be coordinated and arranged with Canadian Niagara Power (CNP) from the nearest feasible location. Power supply shall be unmetered and the streetlights shall operate at 120 volts 60 Hz AC. Maximum voltage drop at the end of the lighting circuit shall not exceed 5% of the supply voltage.

Energizing the lighting system will be subject to Electrical Safety Authority approval. Once ESA has authorized the system to be energized, CNP must be arranged to make all required connections at the supply points for the system by the Developer or Contractor. The streetlights must be energized and functioning prior to occupancy of any residence in the development.

Any attachments to hydro poles must have CNP approval and comply with all applicable standards.

F1.5 Temporary Lighting

Existing or temporary roadway lighting systems shall remain in operation until the new roadway lighting system is fully inspected and operational. Where temporary lighting systems are required, a lighting design and the associated calculations must be submitted to the City for review.

F1.6 Approved Products

All materials used for street lighting must be CSA approved. Refer to **Appendix A** of this manual for the City's Approved Products List.

F1.7 Right of Way Lighting Design Criteria

The design criteria requirements for lighting of roadways, sidewalks, pedestrian walkways, and bikeways on public rights-of-way within the City shall be in accordance with the latest version of ANSI/IES RP-8 Document. The Design Engineer should consult with the City and confirm all requirements prior to commencing the design. All roadway lighting design and construction will require inspection and approval by the City and CNP.

Light fixtures shall be cut-off type to reduce light pollution and shall be DarkSky compliant.

Light source for roadway lighting shall be long life (minimum 100,000 hours). Lighting should be controlled by photocells.

F1.8 Community Improvement Areas

Community Improvement Areas such as Downtown, Main Street, and the waterfront and canal lands are to receive decorative lighting equipment. These areas are defined in the City's Official Plan and Community Improvement Plans. A specific lighting design and the associated calculations must be submitted to the City for review in these areas.

F1.9 Submission Requirements

A complete design submission will be required to the City for review and approval and include the following:

- Design drawings:
 - all surface features
 - all street light pole complete with ID#
 - all power pedestals complete with ID#
 - the individual conduits from the power pedestal to the LED lights
 - the conduit from street light pole to street light pole
 - all utility road crossings with dimensions from the road crossing to either a side lot line or a street light pole
 - dimensions from the street light pole to the lot lines where the street light pole is not opposite a side lot line.
 - The LED street light ID# shall include the type of LED lighting fixture, the circuit number, and the power pedestal number to which it is connected.
 - The Legend shall include duct sizes and an explanation of the street light symbol/ID#'s.
- A single line drawing, including:
 - electrical schematic for each power pedestal showing the transformer that supplies power to the power pedestal
 - the power pedestal cabinet contents (service breakers, service panel, grounding rods, etc.), each circuit and all of the LED street lights (complete with ID#) connected to that circuit with conductor lengths from the pedestal to the first light and from light to light
 - all electrical components inside the LED street light fixtures. It should be noted that the maximum conductor length is 100 m.
- Lighting calculations

F1.10 Site Plan Design Criteria

F1.10.1 Parking Lots

Parking lot illumination is required for good visibility for drivers and pedestrians, to provide good colour rendition for security identification, and to leave sufficient impact for customer attraction. For illumination of parking spaces, aisles, and driveways, the

lighting shall be arranged to divert the light away from adjacent properties and streets and shall be downcast. Design will include a photometric plan subject to approved by the City.

F1.10.2 Site Roadways

Design will include a photometric plan subject to approved by the City.

F1.10.3 Pedestrian Walkways

Design will include a photometric plan subject to approved by the City.

F1.10.4 Site Restrictions

The recommended light levels projected onto a residential property (spill light) shall not exceed 0.1 vertical foot candles (FC), measured line-of-site at the property line. Designs should ensure that entrance to sites are well lighted, including 1 FC should be over the entrance to road edge. Light pollution, nuisance, and disability glare shall be restricted by use of full cut-off luminaires and shall be DarkSky compliant.

F1.10.5 Pylon Signs

Externally illuminated pylon signs shall have the light source aimed downward towards the sign.

F1.11 Park Lighting

For all parks and open space, a minimum electrical service is required for walkway lighting and future connections within the park. A single-phase service drop is to be installed one metre inside the park property line. Lighting priority is given to multi-use trails and pedestrian walkways which are seen as a link between residential areas and schools or other pedestrian/cyclist destinations.

Lighting of trails and walkways will only occur when trail is adequately populated by a continuum of users and can be sufficiently viewed from residential or public areas.



PORT COLBORNE

**SCHEDULE G
UTILITIES**

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G1.1 General

The location of all utilities must be established and resolved in conjunction with the City and the Utility Companies, while generally following the locations shown on the typical road cross-sections in **Appendix B**.

G1.2 Design Requirements

Composite Utility Plans must be prepared by the Design Engineer to secure approvals by all utility companies, including Canadian Niagara Power (CNP), Enbridge, Bell, and Cogeco. The plan must be included in the Engineering Drawings being part of Subdivision Agreement and / or detailed design submission for Capital Projects. Composite Utility Plans must be included for review in the 2nd submission of engineering drawings.

Electrical Vehicle Charging outlets and rough-in provisions shall be designed and installed by the latest version of the Ontario Building Code. The Design Engineer must be familiar with the most current charging facilities required by Code and by different manufacturers of electric or hybrid vehicles. The additional load on the electrical system must be included in the design of the entire network, including transformers and power cables. Joint consultation with CNP and City staff is required during the detailed design stages.

Compaction of backfill for utility trenches shall be 95% Standard Proctor within boulevards and 100% for driveways and road crossings.

The following shall apply:

1. Telephone, cable, and fibre optic services shall be designed in accordance with OPS, CSA and Electrical Safety Code, and be installed by the Utility provider or an approved Contractor of the utility.
2. Electrical plant and services shall be designed in accordance with OPS, CSA and Electrical Safety Code, and be installed by CNP or an approved Contractor of the utility.
3. Gas plant and services shall be designed in accordance with OPS and CSA, and be installed by Enbridge or an approved Contractor of the utility.



PORT COLBORNE

**SCHEDULE G
UTILITIES**

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PORT COLBORNE

DEVELOPMENT MANUAL

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Revision History

Section	Content	Author, Year

1 General

This section of the manual outlines the minimum requirements for application for Zoning By-law amendment, Official Plan Amendment, Site Plan Control and Plan of Subdivision. Applicants or agents are to become familiar with the contents of this section of the manual. Minimum design requirements are identified in the Design section of the manual and should be referenced when completing the Engineering drawings and supporting studies that will accompany the applications.

The design and all required engineering drawings and associated reports must be signed and sealed by a Professional Engineer registered with the Professional Engineers Ontario and competent in the discipline.

2 Purpose

2.1 Official Plan and Zoning By-law Amendment

If a new use or development is proposed that does not comply with the existing By-law, an application for a Zoning By-law Amendment will be required. A Rezoning or Zoning Bylaw Amendment can only be considered if the new use is permitted within the City's Official Plan. If required by the City due to the proposal, an Official Plan Amendment may also be required.

Prior to submitting an application, the Applicant is required to consult with the City to discuss the merits of the proposal and identify required supporting documentation. Requests can be made using the City's [pre-consultation request form \(link\)](#).

More information related to the Amendments, the application process and submission requirements can be found on the City's website [City of Port Colborne Zoning \(link\)](#) and in the latest version of the [City of Port Colborne Zoning By-law Amendment Application \(link\)](#) and the [City of Port Colborne Official Plan Amendment Application \(link\)](#).

For a complete guide to understanding Zoning By-laws and Zoning By-law Amendments, the City also offers the Citizen's Guide to Zoning By-laws.

2.2 Site Plan Control

The intent of Site Plan Control is to improve the efficiency of land use and servicing and to encourage compatible and attractive forms of development which:

- is functional for the intended use;
- is safe for vehicle and pedestrian movements including entering into and exiting the site;
- retains natural features of the site;
- provides compatibility of design between sites and minimizes adverse effects on adjacent properties;
- provides functional and attractive on-site facilities (lighting, screened waste receptacles, landscaping, etc.);
- provides for recreational and outdoor areas;
- controls the placement and provision of required services (loading facilities, snow removal, parking, driveways, etc.);
- secures easements and grading to provide for public utilities and site drainage; and
- ensures proposals are built and maintained as approved.

The Site Plan Control approval process allows City staff to review and approve the following:

- Building siting and site design
- Building massing
- Relationship of the proposal to surrounding land uses
- Driveways, curbing and traffic direction signs
- Loading and parking facilities
- Emergency vehicle routes
- All pedestrian accesses
- Landscaping for the site and for the protection of adjoining lands (to conform with Zoning by-law)
- Refuse and other waste material storage and collection
- Grading and servicing
- Need for City and Regional road-widening

Prior to submitting an application, the Applicant is required to consult with the City to discuss the merits of the proposal and identify required supporting documentation. Requests can be made using the City's [pre-consultation request form \(link\)](#).

2.3 Plan of Subdivision

The City of Port Colborne, through Subdivision Control under Section 51 of the Planning Act, encourages well-designed and attractive subdivisions. This document together with the City's Official Plan, Comprehensive Zoning By-law and various By-laws and Plans, provides guidelines and outlines the requirements and design standards for subdivision developments in the City of Port Colborne. Plan of Subdivision approval is required to ensure that:

- The subject land is suitable for the proposed use
- The proposal conforms with Municipal, Regional, Provincial and Regional Policies

During the Subdivision Approval process, the City will review design features and coordinate the following:

- Overall subdivision design
- Effect on surrounding neighbourhood and land uses
- Lot sizes
- Parkland or cash-in-lieu requirement
- Roadway and emergency access geometry
- Sidewalk and pedestrian access requirement
- Sanitary sewer, storm sewer and water services
- Stormwater management
- Utility Services and Streetlighting
- General Grading
- Streetscaping

More information related to the subdivision process can be found on the City's website under [Subdivision Application \(link\)](#) and throughout this manual.

2.4 Barrier Free Considerations

All design projects including new or replacement sidewalks, paths, trails, parks, etc. throughout the City must comply with the [Accessibility for Ontarians with Disabilities Act \(link\)](#) and must incorporate ways to remove barriers for the public.

3 Site Plan

3.1 Procedure

The following outlines the procedure for Site Plan Control application within the City of Port Colborne:

Process	Details
Step 1 - Draft Plan Approval	
1. Pre-consultation	a. Prior to the submission of an application, the Applicant or agent will be required to attend a pre-consultation meeting with City staff (and external agencies where applicable) in order to identify the information and material needed to process the application. Requests can be made using the City's pre-consultation request form (link). b. During the Pre-consultation process, key issues are identified such as water supply, sewage disposal; stormwater management; development standards; natural and cultural heritage resources conservation; any required studies.
2. Formal Submission of Site Plan Control Application	a. The application form, including all required materials, and fees is submitted to the City's Planning Division. All material and fees outlined in the pre-consultation notes including the application form must be submitted. b. The Lead Planner is responsible for the evaluation of the application and determining if an agreement or amendment to an existing agreement is required. c. An application or a request for amendment which is not minor is referred to technical staff for review and comment.
3. Appeal	a. The Applicant may appeal directly to the Ontario Land Tribunal if any of the terms of the Site Plan Agreement are unacceptable or if the City fails to make a decision on the application within 60 days of the submission of the application for Site Plan Control.
Step 2 – City Review	
4. Circulate Application to City Departments & Agencies	a. The Lead Planner circulates plans, reports, etc. to the Development Services Supervisor, other pertinent City departments, Niagara Region and other outside agencies. b. Comments are forwarded to the Lead Planner for consolidation.

Process	Details
	c. City Staff will review the comments and advise the Applicant of any requirements in writing.
5. Conditional Site Plan Approval	a. The Lead Planner, with the approval of the Chief Planner, may issue Conditional Site Plan Approval when requested by the applicant or deemed appropriate by the Lead Planner. b. A letter of Conditional Site Plan Approval is sent to the applicant with a list of conditions that are required to be met to obtain full site plan approval. c. Issuance of Conditional Site Plan Approval does not permit the issuance of a building permit
Step 3 – Final Site Plan Approval	
6. Approvals	a. Once all comments have been received, the drawings have been revised to address any comments and City Departments and required agencies have issued their clearance, the Lead Planner prepares a recommendation report for the Chief Planners consideration. If the Chief Planner agrees with approval of the site plan, the final plans are dated and signed by the Chief Planner.
7. Applicant submits securities, insurance certificate, certificate of title, etc.	a. The Applicant submits all required securities prior to execution of the Agreement by the City, in the form of a standard Letter of Credit from a chartered bank or a certified cheque payable to the City of Port Colborne, calculated based on the Engineer's cost estimates of the works. Securities are as follows: • On-site primary services 15% • Off-site primary services 100% • On-site secondary services 50% • Off-site secondary services 100%
8. Applicant to sign the Agreement and other requisite documents.	a. The Applicant ensures that all parties appropriately sign the agreement and other requisite documents prepared by the City and its solicitor.
9. Mayor and Clerk to execute the Agreement	a. City staff forwards the signed Agreement and requisite documents to the Mayor and Clerk for execution. b. The City arranges registration of the Agreement and other requisite documents

Process	Details
10. Site Plan Control Agreement registered on title by City's solicitor	a. The Site Plan Control Agreement requires that the proposed development follow the approved plans and drawings and is subject to conditions set out in the agreement. b. The Site Plan Control Agreement may be registered on the title of the property at the Applicant's expense.
11. Issuance of Building Permit	a. If the Building Permit application is complete and to the satisfaction of the Chief Building Official, a Building Permit can be issued upon registration of the Site Plan Control Agreement and upon the achieving the requirements of the Chief Building Official.
12. Letter / Certificate of Compliance	a. After completion of the work required under the Site Plan Agreement, a Letter/Certificate of Compliance and an "As Constructed" Grading Plan must be submitted to the Planning Division. b. The letter and "As Constructed" Grading Plan certify that all aspects of the Site Plan Agreement and drawings have been complied with and must be written, signed and stamped by a Professional Engineer. The Letter of Compliance and "As Constructed" Grading Plan are required in all situations except where otherwise exempted by the City because of the specific nature of the proposed works or project, to receive a refund of securities.
13. Reduction of Securities deposited with the City	a. Upon satisfactory completion of works, the Applicant may apply for a reduction in securities held by the City. b. Design Engineer is required to certify the works and are to verify the works completed and if found satisfactory, recommends reduction of securities being held.

3.2 Formal Submission of the Site Plan Control Application

Site Plan Control applications must be accompanied by the following information:

- 1) Application Fees
- 2) Pre-consultation notes
- 3) One completed application form
- 4) Deed
- 5) Parcel Register

- 6) Cost estimate for on-site and off-site primary and secondary services (not required until second submission)
 - a. Primary services are considered to be underground items such as watermains and sewers (including services and appurtenances) and base roadways and hydro servicing including appurtenances.
 - b. Secondary services are considered to be aboveground, including curb, top asphalt, sidewalks, trees, boulevards, etc.
- 7) Title page
- 8) General Notes
- 9) Plan of Survey
- 10) Site Plan, including Site Plan Summary Schedule
- 11) Landscape Plan
- 12) Preliminary Site Servicing and Grading Plan
- 13) Stormwater Management Report and Plan
- 14) Functional Servicing Report
- 15) Photometric Plan
- 16) Building Elevations
- 17) Floor or Roof Plan
- 18) Any other plans/reports/studies deemed necessary at the pre-consultation stage.

Note: Section 3.2.5 below provides additional detail on the requirements of each drawing.

The City aims to limit the Site Plan application process to two submissions prior to final approval. Adequate review of the application package by the Applicant or agent should be provided to assist in this goal. The City will not accept the application package by the Applicant or agent if the submission:

- 1) is substantially incomplete or not adequately reviewed by the Design Engineer
- 2) does not conform to this manual or industry standards
- 3) is provided in imperial units (all drawings must be provided in metric units).
- 4) fails to implement previous commentary from City staff.

A reply letter will be sent back to the Applicant or agent for their review, revision and resubmission for review.

Where a Site Plan Control Agreement is required to be registered on title, the Applicant is responsible for the registration fees. Where the City requires special services or

expertise beyond those normally required in the Site Plan review process, the Applicant will be responsible for any fees incurred.

3.2.1 Circulation and Review by City Departments & Agencies

The Site Plan Application will be reviewed by the Lead Planner and circulated to the following groups for review and comment:

- 1) City's Development Services Supervisor for compliance with design manual and by-laws, and includes review of:
 - a. Parking area design
 - b. Access to property/walkways, landscaping, garbage collection and/or storage areas, and accessibility
 - c. Water supply, sanitary sewage, and storm drainage systems
 - d. Street access and traffic control
 - e. Sidewalks, curbs, and pavement
 - f. Other engineering aspects
 - g. Road upgrading
 - h. Road widening
 - i. On-site traffic
- 2) Fire Chief and/or Fire Prevention Officer for compliance with the Ontario Fire Code, and includes review of:
 - a. Fire access routes
 - b. On-site fire hydrants
 - c. Water service requirements
 - d. Other items necessary for adequate fire protection
- 3) Chief Building Official for compliance with the Ontario Building Code, and includes review of:
 - a. Sign By-law Standards
 - b. Building Code requirements
 - c. Plumbing Code requirements
 - d. Other applicable provincial legislation and municipal by-laws

The City may circulate the application and plans to outside agencies considered appropriate by the City which may include, the Niagara Region, the St. Lawrence Seaway Corporation, the Ministries of the Environment and Transportation and the Niagara Peninsula Conservation Authority.

3.2.2 Second or Subsequent Submission

Following the first submission, the Applicant or agent will submit one paper copy and one electronic copy of the package for the second submission. All drawings and

required supporting studies must be sealed by a Professional Engineer registered with the Professional Engineers Ontario.

- 1) Letter with comments tracked and responded to demonstrating that comments received in the first submission of the package have been incorporated, and where they have not been incorporated, rationale as to why.
- 2) Revised Design Drawings and Calculation (if applicable)
- 3) Revised Supporting Studies (if applicable)
- 4) Cost estimate of primary and secondary services for the Site Plan, verified and signed by the Engineer.

3.2.3 Permits and Approvals

Once the Applicant or agent have addressed the comments from the first submission comments to the satisfaction of the City, the Design Engineer may submit the following:

- 1) Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) Application for any proposed storm sewer, sanitary sewer or watermain construction to the City for review and processing.
- 2) Necessary plans and information to obtain the required approvals from any other agencies, such as the Ministry of Transportation, the Niagara Peninsula Conservation Authority, St. Lawrence Seaway, etc.

All permit and application fees be paid directly by the Applicant.

3.2.4 Final Submission

The Applicant or agent will submit one paper copy and one electronic copy of the Final Application package to the City. All drawings and supporting studies must be sealed by a Professional Engineer registered with the Professional Engineers Ontario and be subject to the following:

- 1) All drawings incorporating all changes as referred to in the first, second and subsequent submissions
- 2) All drawings in PDF format
- 3) Final sewer design calculation sheets
- 4) Final cost estimate of primary and secondary services for the Site Plan, verified and signed by the Engineer.

After the drawings have been accepted and all approvals have been received, the final drawings, stamped, signed and dated by the Design Engineer and/or Architect, must be submitted to the City.

Once the cost estimates are approved, securities for the on-site and off-site primary and secondary services as detailed in the cost estimate is required.

Properly signed and executed deeds for grants, easements or any property to be conveyed to the City or Region, if applicable, should be provided.

Once the drawings have been approved by the City, they can be used as the base for all drawings required during the Building Permit application process. In the event that conformity is not maintained, an amendment to the Site Plan Control approval may be required.

3.2.5 Design Drawings Requirements

The following are the minimum required drawings to be submitted with the Application package. The City may request additional drawings or studies during the pre-consultation stage depending on the requirements of the site.

- 1) Title Page
 - a. A key plan at a scale of 1:5000 outlining the proposal site plan in relation to surrounding buildings, roadways and natural features and encompass a large enough area to show the proposal in context with the immediate neighbourhood. The key plan shall contain a north arrow.
 - b. A drawing index list of the plans contained within the engineering set.
 - c. The name and contact information of the developer and engineering consultant.
- 2) General Notes
- 3) Base Plan
 - a. Key Plan
 - b. Scale in metric units
 - c. Property boundary information including azimuths and distances as derived from an Ontario Land Surveyor drawing.
 - d. Any easements on the subject property.
 - e. property lines, land uses, and building locations of adjoining properties.
 - f. Location of all existing features as noted in 'Topographic Survey' below.
- 4) Grading Plan
 - a. Based on the topographic survey, with base plan underlain

- b. Existing and proposed on-site elevations (geodetic metric units referencing project benchmark) at regular intervals (20 metres maximum spacing).
 - c. Land drainage (shown by arrow and confirmed by grades) and stormwater management arrangements, including catchbasins, soakaways, ponding areas, impediments to the free flow of water and an indication of the intended direction of surface flows;
 - d. Existing and proposed elevations along all property lines, roads, catchbasins, manholes, parking lot high points, corners, drive aisle entrances, building entrances, ditches, curbs and curb cuts, sidewalks/multi-use trails walkways, ramps, stairs, on-site and adjacent corners of buildings and floor levels, edges of driving surfaces, top and bottom of curbs, retaining walls, and slopes.
 - i. Proposed grading must match the adjoining property existing ground elevations at the property boundary. No fill or cutting will be permitted on adjoining properties unless written permission is received from the affected property owner.
- 5) Site Plan
- a. General Plans drawn at a scale of 1:200 (max) and 1:1000 (min) and details drawn at a scale 1:100 (min).
 - b. Key Map with north arrow
 - c. Scale in metric units
 - d. Dimensions of parcels for dedication as easements or road widenings to the City, Region or Utilities;
 - a. Dimensions and area of the property showing any road widenings, right-of-way widths and easements.
 - b. Parks
 - c. Proposed property divisions with dimensions of property lines
 - d. Proposed staging or phasing of the development for both the property and the buildings
 - e. Location of all buildings and structures showing all building uses, outside dimensions, setbacks, separations, entrances, stairwell, emergency egress, equipment housings, number of floors, height (m) and yard dimensions.
 - f. Existing and proposed access ramps, service or delivery accesses, primary driveway or entrance, curbs, including driveway cuts, returns, and medians,
 - g. Proposed direction of traffic flow;
 - h. Proposed parking stalls, including barrier-free parking stalls, number and dimensions of, as well as barrier free path to main entrance

- i. Proposed walkways, sidewalks, entrances, protective railings, retaining walls, fences,
 - j. Existing trees to remain and to be removed, and proposed tree planting and landscaping plan
 - k. Location of all signs and lighting;
 - l. Existing and proposed grading, including topographic survey elevations, benchmarks and elevations of roads and adjacent properties at the lot boundary.
 - m. Location of existing and proposed septic systems, fire hydrants and other utilities both above and below ground within 90 metres of the subject property;
 - n. Existing and proposed garbage collection or storage location, dimension and details
 - o. Design Vehicles Templates where requested by the City
 - p. Existing and proposed stormwater management facilities such as ditches, swales, ponds, etc.
- 6) Site Plan Summary Schedule (table format) to confirm conformance with By-laws:
- a) Applicable zoning of the property
 - b) Area of the site covered by buildings;
 - c) Total area of the site (existing and proposed);
 - d) Total gross floor area of proposed buildings and existing buildings to be retained in square metres;
 - e) Calculation of the percent of the site to be covered by buildings;
 - f) Calculation of the floor area ratio (gross floor area divided by site area);
 - g) Total number of parking spaces required per the zoning by-law;
 - h) Total number of parking spaces provided;
 - i) Number of parking spaces for visitors, tenants, employees and barrier-free
 - j) Calculation of the percent of the site area to be paved;
 - k) Total site area to be landscaped, including walkways and courts;
 - l) Calculation of the percent of the site area to be landscaped;
 - m) Ontario Building Code matrix with classification and fire protection requirements (existing and proposed buildings);
 - n) Total number of dwelling units, including barrier free
 - o) Site/development density.
 - p) Comparison of proposed with existing zoning requirements
- 7) Landscape Plan
- a) Buildings
 - b) Parking areas
 - c) Driveways
 - d) Patios

- e) Earth mounds
 - f) Steps
 - g) Benches
 - h) Paved areas
 - i) Location and type of lighting standards
 - j) Fences
 - k) Ornamental pools
 - l) Free standing sculptures or other exterior construction as part of the landscape design
 - m) Loading areas
 - n) Physical features to establish relationships with landscaping
 - o) Tree preservation and compensation plan (where applicable)
 - p) Existing trees, accurately located on the plan and clearly specified as to the type, calliper and condition
 - q) Existing trees designated for removal (shown with a broken line)
 - r) Plant list, using a key system, to show the:
 - i. Full botanical name
 - ii. Common name;
 - iii. Quality
 - iv. Quantity
 - v. Calliper
 - vi. Height when planted
 - vii. Height at maturity
 - viii. Spread
 - ix. Special remarks
 - s) Dimensioned natural and constructed features such as berms, swales, ponds, and ditches.
 - t) Details and specifications of the following items:
 - i. Planting details for trees, shrubs, sod, gardens, etc.;
 - ii. Walls;
 - iii. Fences;
 - iv. Screening;
 - v. Walkways;
 - vi. Curbs;
 - vii. Ramps;
 - viii. Stairs;
 - ix. Paved areas;
 - x. Special features or areas; and
 - xi. Recreation areas;
 - xii. Playlots; and/or
 - xiii. Facilities.
- 8) Preliminary Site Servicing

- a) Based on the topographic survey, with base plan underlain
 - b) Land drainage and stormwater management arrangements, including catchbasins, soakaways, ponding areas, impediments to the free flow of water and an indication of the intended direction of surface flows;
 - c) Sanitary servicing including sizing, grades, invert elevations, maintenance holes
 - d) Water servicing arrangements sizing, grades, invert elevations, valves, chambers, meters, backflow prevention, and location and sizes of fire fighting connections, access routes, hydrants
 - e) All existing and proposed underground and overhead utility locations, utility pole, anchor, and transformer locations.
- 9) Building Elevations
- a) All sides of all main and accessory buildings, showing all foundation lines and roof structures, such as penthouses, chimneys, vents and air handling units,
 - b) The design concept of the building, including finishes
 - c) Details of public areas and other special features
 - i. Entrances
 - ii. Doors
 - iii. Arcades
 - iv. Any recesses, projections and special features
 - d) Finished grade, floor and roof elevations
 - e) Proposed signs, lights, equipment and equipment housings
 - f) Outline elevations of adjacent buildings
- 10) Lighting/Photometric Plan
- a) Location of all exterior light fixtures both wall mounted and freestanding pole mounted or bollard type.
 - b) Location and type of lighting for site and building signage.
 - c) Type of luminaire, light levels, and wattage.
 - d) Lighting shall be directed as not to glare or otherwise adversely impact adjoining properties, including lighting calculations and photometric plan
 - e) Lighting shall accommodate safe access from sidewalks/multi-use trails, walkways, accessible parking spaces, exterior passenger loading zones, transit stops, and parking areas to site buildings, facilities and amenities.
- 11) Floor and Roof Plans
- a) Proposed use of each room, location of all windows and doors; and the elevation of the ground and basement floors.
 - b) A roof plan showing the location of all rooftop equipment and screening should also be provided.

3.2.6 Topographic Survey

A topographic survey is required for each Site Plan application. The survey shall be prepared by a licensed Ontario Land Surveyor (OLS) to legally define the land. The OLS should also confirm through research if other parties are entitled to partial use of the property through easements for utilities or right-of-way. The survey will include the following:

- 1) Legal description of the land
- 2) Area of the site, including property boundary
- 3) Reserves
- 4) Rights-of-way
- 5) Easements
- 6) Geodetic benchmarks
- 7) Existing grade conditions
- 8) Locate existing features such as: utility and lighting poles, signs, servicing, fire hydrants, ditches, surface types, sidewalks, curbs, ramps, fences, trees, buildings and building corners, gardens, embankments, vehicle areas, driveways, entrances, top and bottom of slopes and retaining walls, manholes, catchbasins, swimming pools, house additions and other property improvements on the property and identify location, width and names of all roads, road allowances, rights-of-way within or abutting the property.
- 9) Location of all adjacent stormwater drainage features, if any exist.
- 10) Elevations at 15 metre intervals along the centre line of all adjacent roads
- 11) Size, species, elevations at the base and geodetic locations of all existing trees

3.2.7 Supporting Studies

Other studies or reports, such as market survey, geotechnical, drainage or stormwater management reports, traffic impact study, archaeological assessments, environmental site assessment, etc. developed to support the site plan application shall be provided to the City for review. The City may require such supporting studies to be completed upon request.

3.3 Drafting Requirements

All drawings shall be drafted in accordance with the latest version of the Niagara Peninsula CAD Standard, that is available online. All digital drawing files are required to be provided in .pdf and .dwg formats.

3.4 Construction Commencement Requirements

A minimum of 48 hours notice should be given to the City, before the commencement of any construction work. Utility companies and agencies, listed below, may have to be contacted directly by the owner/contractor for utility locates or areas of specified concerns.

- 1) Bell Canada
- 2) Cable TV
- 3) Canadian Niagara Power (CNP)
- 4) Enbridge Gas
- 5) Niagara Region
- 6) Ontario Ministry of Transportation (MTO)
- 7) Ministry of Natural Resources (MNR)
- 8) Niagara Peninsula Conservation Authority (NPCA)

3.5 Certificate of Compliance

After completion of the work required under the Site Plan Agreement, a Letter or Certificate of Compliance and an “As Constructed” Grading Plan must be submitted to the Planning Division for review and acceptance.

The letter and “As Constructed” Grading Plan certify that all aspects of the Site Plan Agreement and drawings have been complied with and it should be written, signed and stamped by a Professional Engineer. The Letter of Compliance and “As Constructed” Grading Plan are required in all situations except where otherwise exempted by the City because of the specific nature of the proposed works or project, to receive a refund of securities.

4 Plan of Subdivision

4.1 Procedure

The following outlines the procedure for Draft Plan of Subdivision and Final Approval of Plan of Subdivision within the City of Port Colborne:

Process	Details
Step 1 - Draft Plan Approval	
1. Pre-consultation	a. Prior to the submission of an application, the Applicant or agent will be required to attend a pre-consultation meeting with City staff in order to identify the information and material needed to process the application. Requests can be made using the City's pre-consultation request form. b. During the Pre-consultation process, the subdivision proposal will be circulated to internal staff and applicable external agencies in order to scope issues, determine compliance (or non-compliance) with local, regional and provincial planning policies and identify the plans, reports and studies required to submit a complete application.
2. Formal Submission of Draft Plan of Subdivision Application	a. Upon receipt of an application for Draft Plan Approval, as per Section 51(17) of the Planning Act, the application will be reviewed and determined by Planning staff as to whether the application is complete or not (refer to Section 4.3 below). b. If the application is determined to be incomplete, a letter will be issued to the applicant, indicating the outstanding material(s). The application will not be further considered as per Section 51(19) of the Planning Act until all required information is submitted.
3. Circulate Draft Plan of Subdivision to City Departments & Agencies	a. The Lead Planner circulates plans, reports, etc. to the Development Services Supervisor, other pertinent City departments, Niagara Region and other outside agencies. b. Comments are forwarded to the Lead Planner for consolidation. c. City Staff will review the comments and advise the Applicant of any requirements in writing.
4. Public Notice of Application and Public Meeting (if applicable)	a. Developer to erect at least one (1) sign on the lands for the proposed Plan of Subdivision in accordance with City requirements.

Process	Details
	b. The Lead Planner will arrange a public meeting in accordance with the Planning Act.
5. Report to Council Prepared for Draft Plan approval and Official Plan Amendment/ Rezoning (if applicable)	a. The Lead Planner will prepare a report to Council with a recommendation to approve or deny the Draft Plan of Subdivision subject to conditions imposed by the City and other agencies. b. The conditions identify the studies, reports and approvals required for the engineering and planning review of the subdivision for Final Approval.
Step 2 – Engineering Package	
6. Submission of Engineering Package for Approval	a. Applicant or agent submits engineering package to the Development Services Supervisor and pays required fee and legal deposits. b. City staff will review the submission and comments will be discussed directly with the Applicant or agent. c. If plans are acceptable, proceed to Step #8 d. The Director of Public Works may endorse the MECF Certificate of Approval applications as the operating authority in advance of engineering approval. e. If revisions are required, the Applicant or agent will receive feedback or comments from the City in the form of a letter outlining what additional documents or revisions are required to the various plans submitted.
7. Re-submission of Engineering Package for Approval	a. Applicant or agent resubmits Engineering package to the City Planning. b. If the revisions/redesign are major, the submission is re-circulated to specific departments who made the initial comments. c. City staff will determine if 3rd submission is required.
Step 3 – Final Subdivision Approval	
8. Approvals	a. The applicant will be required to submit the engineering package for final approval by the City. Clearance letters from other agencies will be required, such as schoolboards, utilities, Canada Post. b. The Applicant to provide a letter from NPCA and the Region clearing any conditions. c. The submission package for Final Approval must include: i. approval of the engineering package by the City ii. a table indicating how each condition has been addressed

Process	Details
	iii. all clearance letters obtained iv. application fee paid
9. Report & By-law prepared	a. Report and By-law prepared and presented to Council to Approve the Subdivision and authorize the Mayor and Clerk to execute the Agreement.
10. Applicant to sign the Subdivision Agreement and other requisite documents.	a. The Applicant ensures that all parties appropriately sign the agreement and other requisite documents prepared by the City and its solicitor.
11. Applicant submits securities, insurance certificate, certificate of title, etc.	a. The applicant submits all required securities (Letter of Credit), cash payments, Certificate of Title, etc., pursuant to the Subdivision Agreement. Securities are as follows: • Primary services 10% • Secondary services 110%
12. Mayor and Clerk to execute Subdivision Agreement	a. City staff forwards the signed Subdivision Agreement and requisite documents to the Mayor and Clerk for signing and execution by the City.
13. Subdivision Agreement registered on title by the City's solicitor	a. City staff arranges the registration of the executed Agreement and other requisite documents with the City's solicitor. b. City solicitor to provide copy of registered documents to City staff for distribution.
14. Issuance of Building Permit	a. Engineering staff will notify the Lead Planner that the Certificate of Completion of Primary Services is issued. b. Assuming Building Permit application and drawings are satisfactory; Building Permit could be issued subject to meeting the requirements of the Chief Building Official.
15. Monitor Construction	a. Engineering staff monitors construction to ensure works is carried out in accordance with the approved plans and the Agreement.
16. Reduction of Securities deposited with the City	a. Design Engineer is required to certify the works and are to verify the works completed and if found satisfactory, and will request a reduction of securities being held.
17. Release of Securities at the conclusion of Maintenance	a. Upon satisfactory completion and maintenance of the works and the expiry of the Maintenance Guarantee period, the Applicant may apply for a release of the securities held by the City.

Process	Details
Guarantee & Assumption of Services by the City	b. Development Services Supervisor with the Applicant's representative will conduct final inspection and if found satisfactory, the Certificate of Final Acceptance for the works is issued by the Lead Planner. c. By-law for the assumption of the municipal services is prepared for approval by Council. d. If By-law passed, all securities being held by the City will be released and the subdivision will be considered assumed by the City.

4.2 Formal Submission of Draft Plan of Subdivision Application

Following the pre-consultation stage, the Applicant may submit the draft plan of subdivision application. The City may return the application package to the Applicant without review or comments if the submission is deemed to be incomplete.

Submission requirements and the application can be found at this link: [City of Port Colborne Plan of Subdivision and Condominium](#).

The following supporting studies may be required to support the Draft Plan of Subdivision Application. It should be noted that the information provided is the minimum requirement and the studies and reports may need to include further details depending upon site specific conditions. Additional reports or studies may be required at the discretion of the City.

4.2.1 Supporting Studies for Draft Plan of Subdivision

Planning and Land Use Justification (Background) Report

The Applicant is required to submit a Planning and Land Use Justification (Background) Report when a Zoning Bylaw Amendment is required. The Report should include the following:

- 1) Proposed integration of roadways within the subdivision and vehicular and pedestrian circulation pattern in surrounding area.
- 2) Inventory of physical features (wetlands, watercourses, tree stands, etc.) on the site and adjacent lands.
- 3) Inventory of existing and proposed utilities and water, sanitary and storm facilities serving uses proposed in the subdivision.
- 4) Location of parklands and other public lands (other than traveled roadways) in the vicinity of the site.

- 5) Likely uses of all lots and blocks within the subdivision and the number of people to be accommodated.
- 6) Existing public transportation serving the site.
- 7) Whether the Official Plan and/or Zoning By-law need to be amended.
- 8) All information provided by Agencies and Departments pre-consulted by the Applicant.
- 9) If a residential development is proposed, location of schools serving the subdivision and access routes to those schools.
- 10) Opportunities for affordable housing provided in the proposed subdivision.
- 11) All information required to satisfy the needs of Provincial Policy (i.e., Provincial Policy Statement, Places to Grow).
- 12) Planning analysis and recommendation by a Registered Professional Planner (RPP)

Functional Servicing Report (FSR)

A Functional Servicing Report prepared by a qualified Engineer may be required outlining the servicing viability of the proposed subdivision at the discretion of City Staff. This Report shall identify different options of servicing the development and recommends the best servicing alternatives, including the estimated costs of servicing works and impact to adjacent networks. Any confirmation of capacity will be the responsibility of the Applicant or Developer. The City does not provide this service as part of the application process.

- 1) Roadway Network
 - a. Impact of the development on any roads within 2 km of the site.
- 2) Sanitary Sewer System
 - a. Drainage areas and proposed flows;
 - b. Sewer sizing, location and outlets;
 - c. Treatment facilities and pumping stations (if required).
 - d. Confirmation that the existing system can accommodate the development, including drawings and design calculations
- 3) Storm Sewers and Stormwater Management
 - a. Drainage areas and proposed flows;
 - b. Designation of major and minor drainage systems – direction of flow and outlet;
 - c. Sewer sizing, location and outlets;
 - d. Stormwater management facilities – sizing, location, paths and roadways and outlets.
 - e. Confirmation that the existing system can accommodate the development, including drawings and design calculations

- 4) Water System
 - a. Watermain sizing, location and looping;
 - b. Pressure boundaries, booster stations and treatment facilities (if required).
 - c. Confirmation that the existing system can accommodate the development, including drawings and design calculations
- 5) Preliminary Lot Grading Plan
- 6) Geotechnical and Hydrogeological desktop assessment
- 7) Cost Sharing
- 8) Any proposed cost sharing schemes.

Environmental Impact Study (EIS)

An Environmental Impact Study may be required from a qualified environmental consultant to identify potential impact of the Subdivision to existing topography, tree coverage and environmental conditions of the property. Preservation and proximity to natural features such as wetlands, woodlots, historical sites, natural watercourses and Lake Erie shoreline may significantly affect the proposed development.

The Applicant should consult with the Niagara Region and/or NPCA to determine the impacts and acceptable mitigation measures of the subject development.

Tree Inventory and Preservation Plans

For the entire property to be developed, the Applicant or agent shall submit a tree inventory drawing for all trees on the subject property as well as for any trees on adjacent property whose critical root zones extend onto the property to be developed. Where there is more than one tree to be removed, the trees must be numbered. These numbers must correspond to an arborist report and the Tree Protection plan as outlined below.

A report prepared by an ISA Certified Arborist in good standing or a Landscape Architect licensed with the Ontario Association of Landscape Architects which details the following is required:

- 1) specific and accurate information about trees that may be impacted by the development initiative
- 2) identifies the nature of the work to be undertaken and appropriate protection measures.
- 3) include location, species, size, condition, structural integrity, disease, infestations and vigour.

A Tree Protection Plan will also be required, which designates trees to be preserved and trees to be removed on the subject and adjacent property. Replacement trees for those removed should also be indicated and clearly summarized in a tabular chart directly on the Plan.

Archaeological and Cultural Heritage Assessments

An Archaeological Assessment of the proposed development may be required from a licensed archaeologist to conduct an assessment of the site in accordance with the Ontario Heritage Act, to ensure preservation, management and documentation of any archaeological resources found on site. The study shall follow the Ontario Ministry of Tourism, Culture and Sport guidelines for determining the archaeological potential of the area impacted by construction. As a minimum, the report shall follow the requirements of a Stage 1 Archaeological survey and proceed with Stages 2 to 4, as deemed necessary. The assessments must be accompanied by an acknowledgement letter from the Ministry of Tourism, Culture and Sport to confirm the assessment was conducted in accordance with Ministry standards.

A Cultural Heritage evaluation and assessment report in accordance with the Ontario Heritage Act Regulation 9/06 and 10/06 may also be required to provide an inventory and assessment for impact and mitigation of any historically or culturally significant structures within the affected area.

Traffic Impact Study

A Traffic Impact Study (TIS) may be required from a qualified transportation consultant to identify potential impact of the subdivision to existing road, bike lane and pedestrian walkway networks. The study should identify improvements required to mitigate any safety concerns and address connectivity between the proposed development and the existing transportation networks.

Noise and Vibration Study

A Noise and Vibration Study may be required to review all potential noise and vibration sources and evaluate mitigation requirements to achieve compliance with MECP guidelines and City requirements.

Environmental Site Assessment (ESA) – Phase I

For any lands that are to be dedicated to, or purchased by the City, an Environmental Site Assessment (ESA) may need to be completed. A Phase I ESA may be required and shall be undertaken and stamped by a Qualified Person (QP) as defined in the latest version of O. Reg. 153/04 and a report shall be completed in accordance with the

requirements set out in the same regulation as well as the guidelines published by the Canadian Standards Association (CSA).

If required by the Phase I ESA, a Phase II ESA will be required. The QP will be required to provide confirmation that the report may be relied upon by the City in making the decision to accept ownership of the property. This work will be required during the Engineering package submission.

4.2.2 Parkland Dedication

All subdivision developments, either residential, industrial or commercial, require that parkland, or cash-in-lieu, be conveyed to the City free and clear of any encumbrance in accordance with the City's by-law.

4.3 Submission of Engineering Package for Approval

Following the pre-consultation stage and the draft plan approval, the Applicant will be required to submit the Engineering Package for approval.

The City aims to limit the engineering approval process to three submissions prior to final approval. Adequate review of plans and specifications by the Applicant or agent as well as the inclusion of detailed covering letters should be provided to assist in this goal. The City will not accept the application package by the Applicant or agent if the submission:

- 1) is substantially incomplete or not adequately reviewed by the Design Engineer
- 2) does not reflect the Draft Plan and/or the requirements of the Draft Plan conditions
- 3) is provided in imperial units (all drawings must be provided in metric units).
- 4) does not conform to this manual or industry standards
- 5) fails to implement previous commentary from City staff.

A reply letter will be sent back to the Applicant or agent for their review, revision and resubmission for review.

4.3.1 First Submission

The following outlines the requirements for the first submission of the Engineering package by the Applicant or agent. The City requires one paper copy and one electronic copy of the submission.

- 1) One copy of the signed Draft Plan of Subdivision.
- 2) One copy of the Draft Plan Conditions.
- 3) A covering letter providing an overview of the submission and confirmation that all drawings reflect Draft Plan conditions.
- 4) Engineering Drawings (as listed below)
- 5) Engineering Supporting Studies (as listed below)
- 6) Drawings for external site works required for the development.
- 7) Any other reports deemed to be necessary by the City.

When these drawings, documents and calculation sheets are reviewed, comments will be returned to the Applicant or agent for revisions as necessary.

4.3.2 Second and Subsequent Submissions

Provided all First Submission comments have been satisfactorily addressed as confirmed by the City, the Applicant or agent may submit one paper copy and one electronic copy of the ECA application package to the City for review and processing. MECP application fees will be paid directly by the Applicant.

The Applicant or agent will submit one paper copy and one electronic copy of the Engineering package for the second submission. All drawings and Engineering reports must be sealed by a Professional Engineer registered with the Professional Engineers Ontario.

- 1) Letter with comments tracked and responded to demonstrating that comments received in the first submission of the Engineering package have been incorporated, and where they have not been incorporated, rationale as to why.
- 2) Revised Design Drawings and Calculation (if applicable)
- 3) Revised Engineering Supporting Studies (if applicable)
- 4) Cost estimate of primary and secondary services, verified and signed by the Engineer
- 5) A draft copy of the Surveyor's M Plan and R plan for easements (if applicable).
- 6) Submit applications, fees and documentation to respective agencies and inform the City of any other approvals required, e.g. MTO, Seaway, pipelines, NPCA, MNRF, Niagara Region
- 7) Landscape Plan
- 8) Composite Utility Plan

4.3.3 Final Submission / Servicing Preparations

The Applicant or agent will submit one paper copy and one electronic copy of the Final Engineering package to the City. All drawings and Engineering reports must be signed and sealed by a Professional Engineer registered with the Professional Engineers Ontario.

- 1) All drawings incorporating all changes as referred to in the first, second and subsequent submissions
- 2) All drawings in PDF format
- 3) Completed Form 1 document with description of proposed watermain works and specific design drawing reference, signed by design engineer of record (as applicable)
- 4) Completed Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) Application for any proposed storm sewer, sanitary sewer or watermain construction (as applicable)
- 5) Final sewer design calculation sheets
- 6) Final cost estimate of primary and secondary services, verified and signed by the Engineer.

4.3.4 Permits and Approvals

Once the Applicant or agent have addressed the comments from the submission comments to the satisfaction of the City, the Design Engineer may submit the following:

- 1) Ministry of Environment, Conservation and Parks (MECP) Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) Application for any proposed storm sewer, sanitary sewer or watermain construction to the City for review and processing.
- 2) Necessary plans and information to obtain the required approvals from any other agencies, such as the Ministry of Transportation, the Niagara Peninsula Conservation Authority, St. Lawrence Seaway, etc.

All permit and application fees be paid directly by the Applicant.

4.3.5 Engineering Supporting Studies

Functional Servicing Report

The Applicant shall provide a final version of the Functional Servicing Report based on revisions to the servicing throughout the Application process. The final report, including

calculations and drawings should be signed and sealed by a Professional Engineer registered with the Professional Engineers Ontario.

Stormwater Management Report

Evaluation of the Storm Water Management (SWM) requirement is critical in order to identify the proposed location and size of the entire stormwater management facility. This will affect the general layout of the subdivision.

The Stormwater Management Report is to provide details and supporting calculations associated with the design of the minor and major drainage systems as well as the required stormwater management measures in accordance with criteria of MECP, NPCA and this manual.

At a minimum, the following details must be included in the Report:

- 1) Background Information;
- 2) Stormwater Management criteria to be met;
- 3) Stormwater Management Strategy including a review of feasible Low Impact Development measures;
- 4) Pre-Development and Post-Development Drainage Areas;
- 5) Storm Drainage System Design – major and minor conveyance systems, including roadside ditching and culverts when applicable;
- 6) Design of End of Pipe Controls;
- 7) Erosion and Sediment Control;
- 8) Inspection and Maintenance Requirements;
- 9) Operation Manual outline; and
- 10) Calculations, Tables, Figures, Modeling, and Drawings.

Geotechnical Report

The Geotechnical Report shall examine and confirm subsurface conditions including soil type(s) and stratification, groundwater levels, depth to bedrock, soil bearing capacity, permeability, conductivity, and presence of any contaminants.

The report shall:

- 1) Address the adequacy of the City's standard minimum pavement structure and sub-drainage system or recommend a higher standard of design if conditions warrant;
- 2) Assess the suitability of native soils for trench backfill and building foundation construction. It shall also address requirements for imported fill as well as construction methods for the use of both native and imported materials;

- 3) Discuss the requirements for pipe bedding as well as engineered fill where necessary for building construction;
- 4) Be accompanied by a scaled drawing showing test pit and/or borehole locations complete with a detailed test pit and/or borehole log;
- 5) Be signed and sealed by a Professional Engineer registered with the Professional Engineers Ontario.

A copy of a geotechnical report and hydro-geotechnical report (updated from the Draft Plan Approval stage reflecting detailed design parameters) indicating soil and groundwater conditions, recommendations for pavement and sub-base design, building foundation requirements, including requirements for engineered fill, estimate of water balance confirmation with the proposed subdivision and stormwater management designs, expected seasonally high groundwater levels in relation to proposed infrastructure and final grading, and provision of infiltration rates for site LID designs on the rear lots. The water balance design alternatively may be contained within the stormwater management report.

Hydrogeological Assessment

Hydrogeological studies by a Professional Engineer registered with the Professional Engineers Ontario or by a Professional Geoscientist registered with the Professional Geoscientists Ontario to characterize the groundwater regime from a site specific and regional perspective in order to address issues related to the following aspects (as applicable):

- 1) Impacts to existing well water supplies within the project influence area;
- 2) Soil permeability and associated properties where the design of septic systems are concerned;
- 3) Water balance;
- 4) Groundwater impact assessment to area aquifers from construction activities and/or discharge of waste or wastewater;
- 5) Test wells and associated testing in accordance with MECP guidelines to address water taking impact sustainability;
- 6) Impacts to nearby surface water bodies; and
- 7) Specific technical review of well field or wellhead protection areas.

The report should consider depth of services and identify likely areas where dewatering will be required, the rate of dewatering, requirements for dewatering, permits and the strategy to achieve the required groundwater levels. If dewatering is necessary, the report should contain sufficient data on groundwater quality and temperature of the receiving watercourse.

4.3.6 Engineering Drawing Requirements

The following are the required drawings to be submitted with the Engineering Package for Approval:

- 1) Title Page
 - a. A key plan at a scale of 1:5000 outlining the project location in relation to surrounding streets and major features. The key plan shall contain a north arrow.
 - b. A drawing index list of the plans contained within the engineering set.
 - c. The name and contact information of the developer and engineering consultant.
- 2) General Notes
- 3) General Servicing Plan(s)
 - a. Drawn at a scale of 1:500.
 - b. The proposed lot and block layout, dimension, and numbering matching the final M Plan.
 - c. Lot frontage dimensions.
 - d. Driveway locations.
 - e. Storm sewers and catchbasins, manholes and catchbasin manholes.
 - f. Sanitary sewers and manholes.
 - g. Watermains and hydrants.
 - h. Roads, curbs, sidewalks and multi-use trails.
 - i. Storm, sanitary and water services for each lot.
 - j. All external watermains, sanitary sewers, storm sewers and drainage courses that are required to service the subdivision.
- 4) Lot Grading Plan(s)
 - a. Drawn at a scale of 1:500. In the event the entire subdivision cannot be contained on one sheet, additional drawing(s) shall be provided and the drawing areas may overlap.
 - b. Overall subdivision drainage and individual building site and grading plans.
 - c. Proposed lot and block layout, dimensions, and numbering matching the final M Plan.
 - d. Lot dimensions on all lot lines.
 - e. Existing and proposed lot and block corner elevations.
 - f. Existing contour lines (lightened but legible) at a 0.5m vertical interval.
 - g. Drainage arrows on all lots indicating general proposed lot grading patterns.
 - h. Catchbasins, storm manholes, and storm sewers including pipe sizes, and drainage outfalls, and outlines of stormwater management facilities.

- i. Sanitary sewers and manholes, watermains, valves and hydrants, particularly the above ground features.
 - j. General drainage pattern arrows of adjoining properties.
 - k. Proposed front and rear building grading elevations for each lot.
 - l. Lots requiring engineered fill should be indicated on the plans.
 - m. Slope locations and top and bottom of slope elevations.
 - n. Side lot line elevation break points in split drainage lots.
 - o. Proposed retaining walls including top and bottom grades.
 - p. Proposed longitudinal swale slopes for all lot lines of adjoining properties.
 - q. Proposed centreline elevations every 20 metres on the even 20 metre chainage as well as at horizontal and vertical start and end of curves and at all crests and sags.
 - r. Detailed existing and proposed elevation information required where proposed subdivision abuts existing development.
 - s. Rear yard catchbasin locations and top of grates with dimensioned offsets and easements outlined.
 - t. Proposed Lot Grading Types e.g. A, B, C, WO etc. shown for each lot. General lot grading schematics are required for each lot type which may be shown on either the Lot Grading Plan or the Standards page.
 - u. Rear yard sheet drainage patterns directing drainage to the side lot lines of downstream through drainage lots.
 - v. The high and low curb elevation at intersections where a high curb point is required to ensure min. 0.5% slope to adjacent catchbasins.
 - w. Proposed lot servicing.
 - x. Driveway locations and widths.
 - y. Travelled road curbing, sidewalk/multi-use trail, and tactile attention indicators where required.
 - z. Minimum basement elevations on each lot where applicable. Title block with full legend, north arrow, and complete revision block.
 - aa. Vertical Benchmark and UTM information required within title block. At least one vertical benchmark and two UTM horizontal control points must be established and shown within or adjacent to the site.
 - bb. Any applicable easements.
 - cc. Fencing around Open Space and Parkland blocks. Unless otherwise requested by City staff, fencing shall be 1.5m high commercial grade black vinyl coated chain link fence.
 - dd. General LID information.
 - ee. Contractor staging areas to remain after Interim Acceptance.
- 5) Plan and Profile Drawings
- a. Required for all for roads, watermain, sanitary sewer.
 - b. Arranged within the set such that all streets have their own drawing(s).

- c. Drawn at a scale of 1:500 horizontally and 1:50 vertically.
- d. Where a street requires more than one plan, match lines with stationing should be provided with NO overlap of information. The plan and profile portions of the drawing should be in line vertically with each other and shall have consistent stationing.
- e. Proposed lot and block layout within the plan component
- f. Lot frontage dimensions on all lots and blocks.
- g. Chainage stationing shown every even 20 metres on the profile component (in sync. with grid lines) and 100 metres on the plan component.
- h. Chainage stationing at all road intersections for both roads.
- i. Existing ground profile along centre of right of way and existing left and right elevation marks corresponding to the edge of the right of way at even 20 metre stations.
- j. Proposed centerline profile including all longitudinal slopes, crest and sag K values, PVI station and elevations and vertical curve lengths. Horizontal centerline radii and BC and EC data should be shown on the plan portion. Where change in vertical grade is less than 1.5%, no vertical curve is required.
- k. Where plan and profile is an extension of an existing road, show profile extending at least 40 metres into the existing road to ensure proper profile transition. Lesser distances of existing road may be permitted where there is little change in the grade. The limits of construction including stationing must be shown on both the plan and profile portion.
- l. All storm sewer, sanitary sewer, and watermain information including structures such as manholes, catchbasins, hydrants, valves, etc., should be shown. The profile portion should include: size, material type, class, length and slope of pipes, manholes sizes, related OPSD numbers, and inverts at manholes, catchbasin lead crossings, etc. Non-standard manhole details or manhole benching must be shown on the drawings.
- m. Grading details of cul-de-sac where minimum gutter grades are proposed.
- n. Watermain bends and vertical clearances must be shown at crossings.
- o. All water, storm and services should be shown (in different linetypes) as well as driveway locations.
- p. All manholes, catchbasin manholes and catchbasins shall be numbered as provided by the City after second submission with stationing indicated and shall include all pipe inverts and top of grating information.
- q. Rear yard catchbasin profiles shall be drawn in conjunction with the proposed surface lot grading and minimum underside of footing. Manholes required at the main line intersection with rear yard catchbasins.

- r. Title block required with street name indicated and stationing limits where more than one plan is required to encompass a street. Where the final street name has been established prior to 'As Built' submittal, the 'As Built' drawing should indicate the final street name. Revision Block should list all revisions and dates.
 - s. Vertical Benchmark and UTM information required within title block. At least one vertical benchmark must be shown within or adjacent to the site and at least two fixed UTM horizontal control points are needed. Where additional benchmarks have been established within the subdivision since final approval, these benchmarks should be indicated on the drawing prior to 'As Built' submission.
 - t. Road, boulevard, sidewalk/multi-use trails and right of way widths, sidewalk/multi-use trail locations and curb and right of way radii at intersections and bends.
 - u. Curb ramps, depressed curbs, tactile attention indicators where required, gates, bollards, and surface materials.
 - v. In addition to all of the required manholes to meet typical City Design Standards, an additional straight-through manhole with similar upstream and downstream sloped sewers shall be provided between the subdivision and the existing City sanitary sewer system, or at any other appropriate location(s), as deemed by the City, for the purposes of flow monitoring from the new subdivision. The manhole must either include or allow for the insertion of flow monitoring equipment.
 - w. Above ground utility information.
- 6) Storm and Sanitary Sewer Area Drawings
- a. Drawn at 1:500 in relation to the Lot Grading Plans or can be drawn at either 1:750 or maximum 1:1000 to encompass a greater area.
 - b. Storm Sewer Area drawings shall outline and indicate the tributary area and runoff coefficient for each location (typically a catchbasin) being analyzed.
 - c. The Sanitary Sewer Area drawing should outline and indicate catchment areas and assumed population parameters (and landuses where mixed) for each manhole.
 - d. The storm and sanitary sewer design sheets shall be consistent with these drawings.
 - e. Storm drainage area plan and design sheets for both 5 year flows and 100 year hydraulic grade line calculations, including external areas and contours;
- 7) Cross-section drawings where roads are being widened or extended;
- 8) Traffic signal drawings or drawings indicating underground works (conduits, maintenance holes, hand wells, etc.) for future traffic signal installation;

- 9) Traffic Control Plan and the Pedestrian Routing Plan (include bicycle lane requirements), including pavement marking and signage
- 10) Sediment and Erosion Control Plan
 - a. All proposed erosion control measures including details and timing of installation, inspection, maintenance and removal.
 - b. Prepare in conjunction with the Lot Grading Plans and Stormwater Management Reports.
 - c. Temporary stockpiling areas must be noted on the plan.
 - d. In accordance with NPSCD and OPS.
- 11) Stormwater Management Pond Plan
 - a. Location, size, grading, and berming for the proposed facility.
 - b. Maximum allowable slopes are 3:1 and slopes within 3 horizontal metres of the permanent pool level should be 5:1 maximum with 7:1 preferred.
 - c. Permanent pool, extended detention, 5 and 100 year ponding levels as well as regulatory floodplain elevations (where applicable) should be indicated.
 - d. Seasonally high groundwater table levels.
 - e. Details and elevations of inlets and outlets including overflows must be provided. Pipe inlets should be above the 5 year level and pond outlets should be outside of the regulatory floodplain and at the very least above the 100 year level. Valve operated gravity permanent pool drainage is preferred by the City to facilitate maintenance.
 - f. The proposed berm widths and berm compaction and any water liner requirements should be noted.
 - g. Proposed maintenance access roads, easements, pipe, valve and overland outfall details.
 - h. Sediment Drying Areas.
 - i. Vegetative cover and any proposed wet pond plantings and vegetative landscaping.
 - j. Proposed walkways, multi-use trails, benches, gates, bollards associated with the SWM pond.
 - k. Adequate buffer from any pond infrastructure to a property line.
 - l. Fencing to meet City requirements.
- 12) Landscape Plan (to be submitted in second submission)
 - a. Prepared by a Landscape Architect in good standing with the Ontario Association of Landscape Architects.
 - b. Drawn at a scale of 1:500
 - c. Indicate location, species and specifications of the proposed boulevard trees, parkland plantings and any landscape areas for the subdivision including turf grass (applicably labeled as sod or seed), fencing, benches, shade structures, hardscape landscape features, surface materials, play

places, trails, sports fields, wayfinding signage, transit stop amenities, bike racks and waste/recycling bins.

- d. Traffic signs, light poles, and surface utility features should also be provided

13) Composite Utility Plan (to be submitted in second submission)

- a. Drawn at a scale of 1:500
- b. Include all underground electrical, communications, gas, and hydro servicing including trenching details, road crossing, street lights, aboveground structures, transformers and other street 'furniture' such as hydrants and proposed Canada Post box locations.
- c. The final composite utility plan shall be signed by all utilities.
- d. Building envelopes
- e. Boulevard Trees and driveways should be shown on these plans.
- f. Traffic signals and signs

14) Street Lighting and Photometrics Plan

- a. Detailed Streetlighting Design Drawing
- b. Photometric Analysis shall be included on these sheets in a table format.
- c. General Streetlighting Detail Drawing (SL-(x+1))
- d. Clearly demonstrate that the lighting levels meet TAC Guide for the Design of Roadway Lighting Standards or approved equivalent.
- e. Design approach (i.e. Luminance or Illuminance) should be stated on the drawing as well as Average Luminance (or Illuminance) and Uniformity Ratios for all streets.
- f. Illustrate the lighting levels (metric units) on all proposed streets within the subdivision at a maximum grid spacing of 2.5 metres.
- g. A signed and sealed covering letter or report in support of the design should accompany the plans.
- h. The City may also request lighting calculations be provided for sidewalks, multi-use trails, walkways, exterior passenger loading zones, and off-street parking lots on City owned land.

15) Standards Drawing

- a. Should illustrate all specifications, drawing notes, NPSCD, OPSD, bedding, cover and backfill details, right of way cross-sections including pavement and subbase design, and any other non-standard details not shown on other plans.

4.4 Drafting Requirements

All drawings shall be drafted in accordance with the latest version of the Niagara Peninsula CAD Standard, that is available online.

4.5 Construction Commencement Requirements

Prior to the commencement of construction, the City requires confirmation that:

- 1) All applicable City securities have been paid;
- 2) Acceptable insurance is in place. All Contractors working within the right-of-way must provide proof of liability insurance, minimum \$5.0 million limit, naming the City of Port Colborne as additional insured;
- 3) All easement documents and deeds have been received;
- 4) All external easements have been registered prior to any work outside the limits of the development;
- 5) The development agreement is executed by the Applicant and returned to the City, together with all financial securities and any other deliverables defined in the agreement.

The Applicant shall:

- 1) Provide notification to the City a minimum of 5 days prior to the commencement of construction;
- 2) Arrange a pre-construction meeting with the contractor, consultant and City. This meeting is required to determine schedule, approvals, main service connections and testing methods. The name and contact information of the Consultant's full-time Inspector are to be provided to the City at the pre-construction meeting;
- 3) Supply full time inspection required to ensure that the work is performed as specified. Any changes or deviation from the plans and specifications will require clearance from the City and/or other agencies if required;
- 4) Shop drawings reviewed and signed off by the Design Engineer shall be supplied to the City for review and approval prior to construction (i.e, watermain, streetlighting assemblies, etc);
- 5) Ensure all "As-Built" drawings and service record sheets are completed and submitted to the City including all service ties as required;
- 6) In general, the Applicant's consultant shall be responsible to ensure the requirements in the development agreement and in this manual are carried out.

4.6 "As-Built" Drawings

In general, the Applicant's consultant shall be responsible for ensuring the requirements in the development agreement and in this manual are carried out.

Upon completion of the installation of underground services, the City shall require "as-built drawings" before issuance of the Certificate of Substantial Completion and the

Certificate of Final Acceptance for any of the works as defined in the City's standard subdivision agreement, as well as a digital copy of the plans in PDF and AutoCAD formats.

Upon completion of the maintenance period and before issuing the Certificate of Maintenance and Final Acceptance as defined in the City's standard subdivision agreement, two full sets of "as-built" engineering drawings are to be forwarded to the City Engineer for review and comments. Revisions must have been made to the drawings to reflect any changes to the line and/or grade of the roadways and services, and to incorporate all the grading modifications resulting from final lot grading. All water and sewer valves, hydrants, curb stops and service connections shall be properly tied into fixed reference points.

If any revisions are required, one set of red lined drawings will be returned to the Developer's Engineer. When all revisions and/or corrections have been made a complete set of "as-built" hard copies shall be submitted to the City Engineers as well as digital PDF and AutoCAD drawings. The "as-built" drawings shall include the following information:

- 1) Road System
 - a) Elevation of centreline of roadway every 20 metres;
 - b) Revised horizontal and vertical curve information;
 - c) Any additional information that has been required for construction after approval of engineering drawings;
 - d) Revised benchmarks located in a permanent location throughout the new development at sufficient intervals such as on fire hydrants and/or other permanent structures.
- 2) Storm System
 - a) Invert elevations of all storm sewers;
 - b) Invert elevations of all storm manholes;
 - c) Revised percentages of all storm sewers along with "as-built" distances between manholes;
 - d) Revised storm sewer design sheets;
 - e) Location measurements to all storm sewer connections to each individual lot. These should have swing ties from property corners or other fixed structures such as fire hydrants and manholes;
 - f) As-built elevations of road cross culvert inverts;
 - g) Any additional information that has been required for construction after approval of engineering drawings.
- 3) Sanitary System
 - a) Invert elevations of all sanitary sewers;

- b) Revised percentages of all sanitary sewers along with “as-built” distances between manholes;
 - c) Revised sanitary sewer design sheets;
 - d) Location measurements to all sanitary sewer connections (or pressure sewer valves where applicable) to each individual lot. These should have swing ties from property corners or other fixed structures such as fire hydrants and manholes;
 - e) Any additional information that has been required for construction after approval of the engineering drawing.
- 4) Water System
- a) Elevations of top of watermain every 30 metres;
 - b) Location measurements to all water service boxes for each individual lot. These should have swing ties from property corners, buildings or other fixed structures such as fire hydrants and manholes;
 - c) Location by measurement of tees, bends, valves and dead ends;
 - d) Any additional information that has been required for construction after approval of the engineering drawing.
- 5) Lot Grading
- a) Any major revisions to the approved lots;
 - b) Invert elevations of all swales, sufficient to confirm intermittent swale grades;
 - c) Invert elevations of all culverts;
 - d) Invert elevations of all ditches at 20 metre intervals.

4.7 Maintenance Period(s)

Maintenance periods shall be in accordance with the Subdivision Agreement. The two maintenance periods are the Primary and Secondary maintenance periods. Primary services are considered to be underground items such as watermains and sewers (including services and appurtenances) and base roadways and hydro servicing including appurtenances. Secondary services are considered to be aboveground, including curb, top asphalt, sidewalks, trees, boulevards, etc.

Prior to the commencement of the Maintenance Period for primary services, the Owner shall arrange for an inspection by the City of all primary services. Prior to the inspection, all services shall be cleaned, and all sewers flushed in accordance with MECP and City requirements, including CCTV inspection. The Design Engineer shall submit the video inspection to the City for review and acceptance. Any repairs shall be carried out immediately and the affected sewers video inspected again. When all of the deficiencies are rectified, the City will establish a date for the commencement of the twelve (12) month Maintenance Period.

4.7.1 Owner's Responsibilities During the Maintenance Period(s)

During the maintenance period(s), the Owner shall be responsible for the maintenance of all public services and new parks, if applicable. As the end of the maintenance period(s) approaches, the Design Engineer shall arrange for an inspection of the works where necessary. Any deficiencies noted are to be rectified to the satisfaction of the City. When the Design Engineer is satisfied that the work is complete and acceptable, the City shall be notified, and a final inspection with the City shall be arranged.

If, in the opinion of the City, it is necessary to make emergency repairs immediately to remediate damage or hardship to persons or property, the City may enter the development site, without notice, and make any repairs deemed necessary. The cost of any emergency repairs shall be borne by the Owner as invoiced by the City. Unpaid invoices will be deducted from the Owner's Letter of Credit if payment has not been made within 30 days.

4.8 Assumptions

4.8.1 Process for Assumption

Following completion of all construction, expiration of the Maintenance Period and acceptance of the work by the City, the City may request Assumption of the subdivision through the Design Engineer.

Three (3) months prior to assumption, the Applicant must conduct flow monitoring within the system to the satisfaction of the City.

All stormwater management facilities are to be cleaned and surveyed, brought back to their original state and certified as to their design depths and volumes prior to assumption. All inlets and outlets are to be cleaned and flushed and have CCTV inspection completed.

All deficiencies noted by the City and other applicable Agencies must be rectified prior to Assumption. Prior to Assumption, the Applicant or agent shall request a final inspection of all public services by the City and shall correct all deficiencies to the satisfaction of the City. Inspection for landscape works will not be conducted after October 31 or before May 1.

A Statutory Declaration is to be supplied by the Owner, verifying the payment of all accounts pertaining to the construction of the subdivision. The Design Engineer is to

certify that all subdivision works have been constructed according to the approved plans and specifications including a final storm water management analysis and submission of the computer files. A circulation for clearance will be distributed to Departments within the City as well as the following agencies, as required:

- Niagara Peninsula Conservation Authority
- Canadian Niagara Power
- Regional Municipality of Niagara
- Other operating authorities as required (i.e. MTO, Seaway)



PORT COLBORNE

DESIGN AND DEVELOPMENT MANUAL APPENDICES

Appendix A – City of Port Colborne Approved Products List

Appendix B - Typical & Detailed Cross-Sections

Appendix C - Standard Drawings

Appendix D - Sanitary Sewer Design Sheet Template

Appendix E - Storm Sewer Design Sheet Template

Appendix F - City of Port Colborne CCTV Inspection Specifications



PORT COLBORNE

APPENDIX A
CITY OF PORT COLBORNE APPROVED PRODUCTS LIST

1.1 General Purpose

The Approved Products List (APL) is available for each section of the manual. The APL is intended for reference by Proponents, including applicants, developers, design engineers, and Contractors 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 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.

All materials shall be as specified or equivalent as approved by the City.

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
SANITARY SEWER SYSTEM		
Polyvinyl Chloride (PVC) Pipe - 200mm to 600mmD	SDR35, CSA B182.2, 320 KPa Stiffness, 50 psi Joints Rubber gasket in integral bell and spigot joints Green in colour	IPEX, Next, Westlake (Formerly Napco)
Polyvinyl Chloride (PVC) Pipe- 100mm and 150mm Service Laterals	SDR28, CSA B182.2, 625 KPa Stiffness, 50 psi Joints	IPEX, Next, Westlake (Formerly Napco)
Concrete Pipe -300mm and Larger	Reinforced, CSA A257.2	Rinker (Formerly Forterra), Concast, Coldstream
Precast Maintenance Holes	CSA A257.4, OPSS 407 and 1351	Rinker (Formerly Forterra), Concast, Coldstream
Maintenance Holes Frames and Covers	OPSS 1850, OPSD 401.010 Type A Closed Cover, with the date and "SANITARY" cast into the cover.	Bibby, EJ (McCoy), Mueller Canada, Sigma, Star
Maintenance Hole Adjustment Units	Adjustable/Autostable Frame, C-50M-ONT (all new; preferred elsewhere where feasible) Precast Concrete (may be accepted in existing areas) Polyethylene or Polypropylene (adjustment rings for top lift asphalt)	SELFLEVEL – MC401010243 Armtec, Rinker (Formerly Forterra) IPEX (Lifesaver Adjustment Unit), Turner
Fittings	PVC CSA B182.2	IPEX, Westlake (Formerly Napco), Galaxy/Tigre
Saddles	compatible with PVC CSA B182.2 pipe	ADS Canada, Fernco, IPEX
Couplings and Adapters	ASTM D 5926, C 1173 and CSA B602	Fernco

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
STORM SEWER SYSTEM		
Polyvinyl Chloride (PVC) Pipe - 200mm to 600mm	SDR35, CSA B182.2 ,320 KPa Stiffness, 50 psi Joints	IPEX, Next, Westlake (Formerly Napco)
Polyvinyl Chloride (PVC) Pipe - 100mm and 150mm Service Laterals	SDR28, CSA B182.2 ,625 KPa Stiffness, 50 psi Joints	IPEX, Next, Westlake (Formerly Napco)
Concrete Pipe - 300mm and Larger	Reinforced, CSA A257.2	Rinker (Formerly Forterra), Concast, Coldstream
HDPE - Subdrain	OPSS 1840210 kPa pipe stiffness Perforated, with geo-textile sock filter	Armtec, Big “O”
Culverts Concrete CSP HDPE (up to 600mm)	CSA A257.2 CSA G401 CSA B182.6-02	Armtec
Precast Maintenance Holes	CSA A257.4, OPSS 407 and 1351	Rinker (Formerly Forterra), Concast, Coldstream
Maintenance Holes Frames and Covers	OPSS 1850, OPSD 401.010 Type A Closed Cover, with the date and “STORM” cast into the cover.	Bibby, EJ (McCoy), Mueller Canada, Sigma, Star
Maintenance Hole Adjustment Units	Adjustable/Autostable Frame, C-50M-ONT (all new; preferred elsewhere where feasible) Precast Concrete (may be accepted in existing areas) Polyethylene or Polypropylene (adjustment rings for top lift asphalt)	SELFLEVEL – MC401010243 Armtec, Rinker (Formerly Forterra) IPEX (Lifesaver Adjustment Unit), Turner



PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Fittings	PVC CSA B182.2	IPEX, Westlake (Formerly Napco), Galaxy/Tigre
Saddles	compatible with PVC CSA B182.2 pipe	ADS Canada, Fernco, IPEX
Couplings and Adapters	ASTM D 5926, C 1173 and CSA B602	Fernco
Catch Basin Frames and Covers	OPSD 400.010, OPSD 400.020 and OPSD 400.082 (inlet)	Bibby, EJ (McCoy), Mueller Canada, Sigma, Star
Catch Basins	OPSS 407 and OPSS 1351; Form 700	Rinker (Formerly Forterra), Concast, Coldstream
Ditch Inlet	OPSS 407 and OPSS 1351; Form 700	Rinker (Formerly Forterra), Concast, Coldstream
Culvert Pipe	High Density Polyethylene; CSA B182.6, 320 Kpa Stiffness	Armtec, Ideal Pipe
WATER DISTRIBUTION SYSTEM		
Polyvinyl Chloride Pipe (PVC) ≤ 300mm	Pipe: AWWA M23, AWWA C900, CSA 137.3 FM 1612 approved UL 1285 listed NSF 61 certified Fittings: (100 to 300mm) AWWA C907, CSA B137.2 (250 to 300mm) AWWA C900, CSA B137.3 FM 1612 approved UL 1285 listed NSF 61 certified (Designer shall determine pressure class and rating based on project requirements. Use of PVC for distribution main only. Service saddles or service tees shall be used when connecting services to PVC mains)	IPEX Blue Brute, Centurion, TerraBrute AWWA C905-DR18, OPSS 441 Westlake (Formerly Napco)
Ductile Iron Pipe (DI)	Project specific basis as accepted by the City and determined by design review process. AWWA C104, C105, C110, C111, C115, C150, C151, C153	Canada Pipe Company US Pipe Class 52&54, Pressure Class 350, Tyton Joint, AWWA C104/A21.3, C110/A21.10, OPSS 441 Cement Lined

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Concrete Pressure Pipe (CPP)	AWWA C301 (L), C303, 304, 400 mm & 500 mm AWWA C301(E) & C304, > 1350 mm	Rinker (Formerly Forterra) AWWA C300, C301, C302 & C303, OPSS 441 Plant prequalified by OCPA All pipe and grout for diaphraging must be Type 50 Cement
Molecularly Oriented Polyvinyl Chloride Pipe (PVCO) 150 - 300mm	Pipe: NSF 14 & 61 ASTM D1784, D3139, F477 & F1483 AWWA C909, CSA B137.3.1 FM1612. Fittings: Match PVC (Use of PVCO for distribution main only. Service saddles or service tees shall be used when connecting services to PVCO mains)	IPEX Bionax AWWA C909-DR18 PC150, OPSS 441
High Density Polyethylene (HDPE)	AWWA C906 (Project specific basis as accepted by the City and determined by design review process.)	N/A
Metallic Fittings	Cast iron or ductile iron as per A.W.W.A. Specification C110 Cement lined as per A.W.W.A. C104 Mechanical joint type as per A.W.W.A. C111 "Tyton" rubber gasket joints conforming to A.W.W.A. Specification C104	Sigma Bibby Star Pipe
PVC Fittings	100mm-200mm AWWA C907, B137.3, OPSS441, Injection moulded 250mm and 300mm AWWA C900 and C905, B137.3, OPSS441 Bonded and over-wrapped with fiberglass and reinforced polyester	IPEX Westlake (Formerly Napco) Galaxy/Tigre

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Joint Restraints	Ductile Iron Pipe PVC	EBAA Iron, Inc. Mega-lug Series 1100 (Ductile Iron) Series 2000 PV (PVC) Ford Meter Box Company, Inc. Uni-flange restrainers Series 1300, 1350, 1390, & 1400 (Ductile Iron) Series 1300, 1350, 1390 & 1500 (PVC) US Pipe Mueller Co. M.J. Field Lok Romac Grip Ring Restrainer Tyler Union TufGrip Restrainer Series 1000 (Ductile Iron) Series 2000 (PVC) Clow Series 300 Sigma One-Lok Wedge Action Restraint, Series SLDE (Ductile Iron) Series SLCS, PWM, PWP-C & PWPF-C (PVC) IPEX Bionax PVCO Star Pipe Stargrip Series 3000, Allgrip Series 3600 Smith-Blair Cam-Lock 111/120 Service



PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Couplings		Georg Fischer - Multi Joint 3000 Plus Smith-Blair -Top-Bolt Coupling Model 421 Krausz Industries - Hymax 2
Gate Valves (100mm - 300mm)	Gate valves as per AWWA. Standard C-500 Resilient seat gate valves as per AWWA. Standard C-509	McAvity - 20075-0 & 20075-R Mueller - A-2360 Clow - F6100 AVK - Series 25 Resilient Seated Gate Valve EJ - Flowmaster resilient seated gate valve
Butterfly Valves (≥ 300mm)		Mueller Line Seal III Pratt 2FII Val-Matic Keystone M&H
Combination Air Release / Vacuum Valves		Dezurik - Model D-040 (metal clad) Vent-O-Mat - Series RBX - Model RBX 2521 & 2531
Check Valves	All valves shall conform to and meet the latest version of AWWA C508 for Swing Check Valves	Mueller - A-2600-6 Ludlow Val-Matic Series 500 Kennedy Valve Ken Flex(FIG.506)
Valve Boxes	130mm (5 1/4") slide type only	Mueller - A759TF Bibby - VB625 Star -VBDF514-48 Sigma- VB5400, VB5401, VB5253, VB4500



PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Road Leveller		Star - VB514AP McCoy- VB919TW-D mushroom Sigma- VB6500-D lid
Caps and Plugs	NSF61 certified epoxy coated All mechanical joint/tyton caps or plugs used on watermain installations are to be epoxy coated on the inside	
Water Sampling Station		Kupferle Eclipse #88-SS
Automated Flusher	c/w 50mm connect from the Watermain and a 100mm drain to the Sanitary Sewer.	Kupferle Eclipse #9800 Mueller Hydro-Guard
Tapping Sleeves (Ductile Iron ≥ 100mm) (Ductile iron Hyprotec coated ≥ 100mm) (PVC and Cast Iron Watermain ≥ 100mm)		Mueller H615 M.J. Tapping Sleeve M.J. Tapping Sleeve Canada Valve Ford Fast Robar 6606 Stainless Steel Tapping Sleeve Romac SST Smith-Blair 663 All Stainless Steel Tapping Sleeve Power Seal 3480 All Stainless Steel Tapping Sleeve



PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Tapping Sleeves (Asbestos Cement Watermain $\geq 100\text{mm}$)		Robar - 6606 Stainless Steel Tapping Sleeve Rockwell Smith-Blair - 622 Tapping Sleeve / 663 All Stainless Steel Tapping Sleeve
Tapping Sleeves (Concrete Pressure Pipe $\geq 100\text{mm}$)	Gasket: 1" dia. on Gland Flange (EPDM). Grout seal – $\frac{3}{4}$ " x $\frac{3}{4}$ " Rubber Gasket Studs & Nuts: Stainless Steel Type 304 Coating: An average of 20 ml thick of Thermoplastic A- 571 is applied on sleeve, gland and straps with extra thickness in the waterway of gland. Body: Mild Steel ASTM A36 Flange: Combination Flange with ANSI 150 lb. drilling recessed for Tapping Valves MSS SP-60	Forterra Ayotte - A-900 Saddle and A-Saddle
Water Service Materials Pipe-Copper (New service min. 25mm)	All service pipe shall be Type 'K' soft copper tube, nominal diameter of 19mm, 25mm, 38mm or 50mm Kinked, crushed or distorted tubing shall not be used Solder type fittings shall not be used.	Type 'K' Soft Copper

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Water Service Materials Service Saddles (ductile iron, hypotec coated and asbestos cement watermain)	Service saddles shall be used on all services larger than 25mm on ductile iron watermain pipe All service saddles will use a double bolt closure	Rehau Robar 2616 DB Cambridge Brass Series #403 teck clamp (S.S. Double Bolted) Romic 306 Smith-Blair 373-375 (Double Bolted) Powerseal 3412 AS (Double Bolted)
Water Service Materials Service Saddles (PVC Watermain Pipe)	Service saddles shall be used on all services installed off of PVC C900 or C905 and asbestos cement watermain pipe All service saddles will use a double bolt closure	Rehau Robar 2606 DB Cambridge Brass Series #403 teck clamp (S.S. Double Bolted) Romic 306 Smith-Blair 373-375 (Double Bolted) Powerseal Ford RS 303 (Double Bolted) Preper H-Tech (S.S. Double Bolted)

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Water Service Materials (PVC Watermain Pipe Service Tee)		IPEX Blue Brute Tapped Coupling
Water Service Materials Corporation Stops (19 mm)	CSA Classified to NSF Standard 61 A.W.W.A. inlet thread and copper flare or compression style outlet. Corporation ball stops are required to use No-Lead brass	Mueller Ball Main (Low Lead)- B25008.20NPB Cambridge Brass Ball N/L - 301NL-A3H3 Ford Ball Main No Lead - FB1000-3-NL
Water Service Materials Corporation Stops (25 mm)	CSA Classified to NSF Standard 61 A.W.W.A. inlet thread and copper flare or compression style outlet. Corporation ball stops are required to use No-Lead brass	Mueller Ball Main (Low Lead) - B25008.25NPB Cambridge Brass Ball N/L - 301NL-A4H4 Ford Ball Main No Lead -FB1000-4-NL
Water Service Materials Corporation Stops (38 mm)	CSA Classified to NSF Standard 61 A.W.W.A. inlet thread and copper flare or compression style outlet. Corporation ball stops are required to use No-Lead brass	Mueller Ball Main (Low Lead) - B25008.38NPB Cambridge Brass Ball N/L- 301NL-A8H6 Ford Ball Main No Lead - FB1000-6-NL
Water Service Materials Corporation Stops (50 mm)	CSA Classified to NSF Standard 61 A.W.W.A. inlet thread and copper flare or compression style outlet. Corporation ball stops are required to use No-Lead brass	Mueller Ball Main (Low Lead) - B25008.50NPB Cambridge Brass Ball N/L -301NL-A7H7 Ford Ball Main No Lead - FB1000-7-NL
Water Service Materials Curb Stops (19 mm)	Curb stops are required to use No-Lead brass All Ball curb stops shall come complete with an electrical grounding clamp Curb stops are required to be CSA Classified to NSF Standard 61	Mueller Ball Main (Low Lead) - B25008W88.20NPB Cambridge Brass Ball N/L- 202NL-H3HE3 Ford Ball Main No Lead -B44-333-Q-NL

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Water Service Materials Curb Stops (25 mm)	Curb stops are required to use No-Lead brass All Ball curb stops shall come complete with an electrical grounding clamp Curb stops are required to be CSA Classified to NSF Standard 61	Mueller Ball Main (Low Lead) - B2500W88.25NPB Cambridge Brass Ball N/L- 202NL-H4HE4 Ford Ball Main No Lead- B44-444-Q-NL
Water Service Materials Curb Stops (38 mm)	Curb stops are required to use No-Lead brass All Ball curb stops shall come complete with an electrical grounding clamp Curb stops are required to be CSA Classified to NSF Standard 61	Mueller Ball Main (Low Lead) - 2500W88.38NPB Cambridge Brass Ball N/L -202NL-H6HE6 Ford Ball Main No Lead -B44-666-Q-NL
Water Service Materials Curb Stops (50 mm)	Curb stops are required to use No-Lead brass All Ball curb stops shall come complete with an electrical grounding clamp Curb stops are required to be CSA Classified to NSF Standard 61	Mueller Ball Main (Low Lead) - B2500W88.50NPB Cambridge Brass Ball N/L -202NL-H7HE7 Ford Ball Main No Lead- B44-777-Q-NL
Water Service Materials Service Boxes (19 and 25 mm services)	Service boxes shall be for 1.7m to 2.0m bury, but shall be extended if special depths are encountered. Service boxes will come complete with type 304 stainless steel rods and stainless steel cotter pins	Mueller -A726 Bibby - VSB1 Clow -D1-9 Sigma- CBA 178 Star Pipe - D & D1 - #9
Water Service Materials Service Boxes (38 and 50 mm services)	Service boxes shall be for 1.7m to 2.0m bury, but shall be extended if special depths are encountered. Service boxes will come complete with type 304 stainless steel rods and stainless steel cotter pins	Mueller - A753 Bibby- VSB2 Clow - D2-9 Star Pipe - D2 - #9



PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
Zinc Anodes	The anode must have a metallic core, or fusion bonded sleeve and have a depolarizing gypsum base material surrounding the anode An insulated copper (AWG 10-14) wire 3 metres in length shall be brazed to the end of the core wire. High Purity Zinc 99.99% pure as per A.S.T.M. B-418-73 type 11	Packaged Zinc Anodes
Test Points	Colour coded grey and the cover labelled 'WATER' City's Standard Drawings W-308-B and W-308-C	Mueller -A753 Bibby - VSB2 Clow -D2-9 Star Pipe- D2 - #9
Tracer Wire	#8 gauge, stranded, insulated copper wire with 60mil of white, cross-linked polyethylene (XLPE) insulation specifically manufactured for direct burial applications.	
Tracer Wire (Coating Pad for Cadweld connection)		Royston Handy Cap IP
Tracer Wire (Spliced or Repaired)		Dryconn Waterproof Connector Wing Nut Wire Connector, Model Number 454, Catalogue Number 30-454 Klik-It II Number C8816 Buried Service Wire Closure Raychem GHFC-2-90 H-Frame Gel Closure Approved equivalent
Temporary Watermain and Servicing Material	All materials will be delivered new to the site or used material will be pressure washed and capped at the site prior to installation. NSF/ANSI Standards 61	Victaulic International Pipe

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
		Aquamine high impact PVC as per OPSS 493 Yelomine CertainTeed Impact PVC Polyethylene DR 9 pipe PEX pipe Copper Type 'K' pipe
Petrolatum Coating Systems		Denso Petrolatum Tapes and Paste Premier Coatings Premtape Systems Trenton Tape Products Petrowrap Anti-Corrosion System
Hydrants	- Two (2) 63.5mm (S.A.A.B.-89-2) male hose connections and one (1) 100mm quick-connect (STORZ) male front pumper port. - Depth of bury: 1.8m - Boot: 150mm diameter mechanical joint - Colour: per pressure rating (AWWA) - All hydrants installed on private property will be painted a City approved red colour. Storz connection to remain black. - Approved Red – Safety Red #OM2221 supplied by Mayfair Paint - Approved Yellow – Safety yellow #KM2215 supplied by Benjamin Moore 32mm square operating nut and tapped drain ports, stainless steel type 304 - Inside of the hydrant boot will be epoxy coated complying with AWWA C550 and certified to NSF 61 - Secondary valve: 150mm diameter - Joint: mechanical	Canada Valve Century McAvity M-67 Bibby Sentinel AVK High Pressure Dry Barrel Hydrant

PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
	- Open clockwise - Tee off watermain shall be anchor type (150mm). Secondary valve shall be fastened to anchor tee. All piping required (from tee to valve to hydrant) shall be Class 150 PVC - Bends in fire hydrant leads will not be allowed unless site conditions warrant and with written approval by the City	
Water Meters	•	
Backflow Preventer	•	
STREET LIGHTING		
Street Light Pole	Spun concrete pole; round tapered; Eclipse black etched finish (Colour 11)	StressCrete Group
Street Light Pole	Spun concrete pole; decorative (classic); Eclipse black etched finish (Colour 11)	StressCrete Group
Cobra Head LED Luminaire	ELR luminaire of various wattages (ERL1, ERL2, ERLH)	General Electric(Anixter Canada / Robertson Electric / Westburne Electric)
Post Top LED Luminaire	Holophane LED post top luminaire	(Gerrie Electric / Westburne Electric)
Lantern Style LED Luminaire	Post top / side mount lantern LED luminaire	King Luminaire (King Luminaire / Gerrie Electric / Westbourne Electric) Acuity Brands (King Luminaire / Gerrie Electric / Westbourne Electric)
LED Photocell	LED photocell - CUL1	(Anixter Canada / Robertson Electric / Westburne Electric)
LED Photocell	Standard Twist Lock - Button Type	DTL Fisher-Pierce (Anixter Canada / Robertson Electric / Westburne Electric)

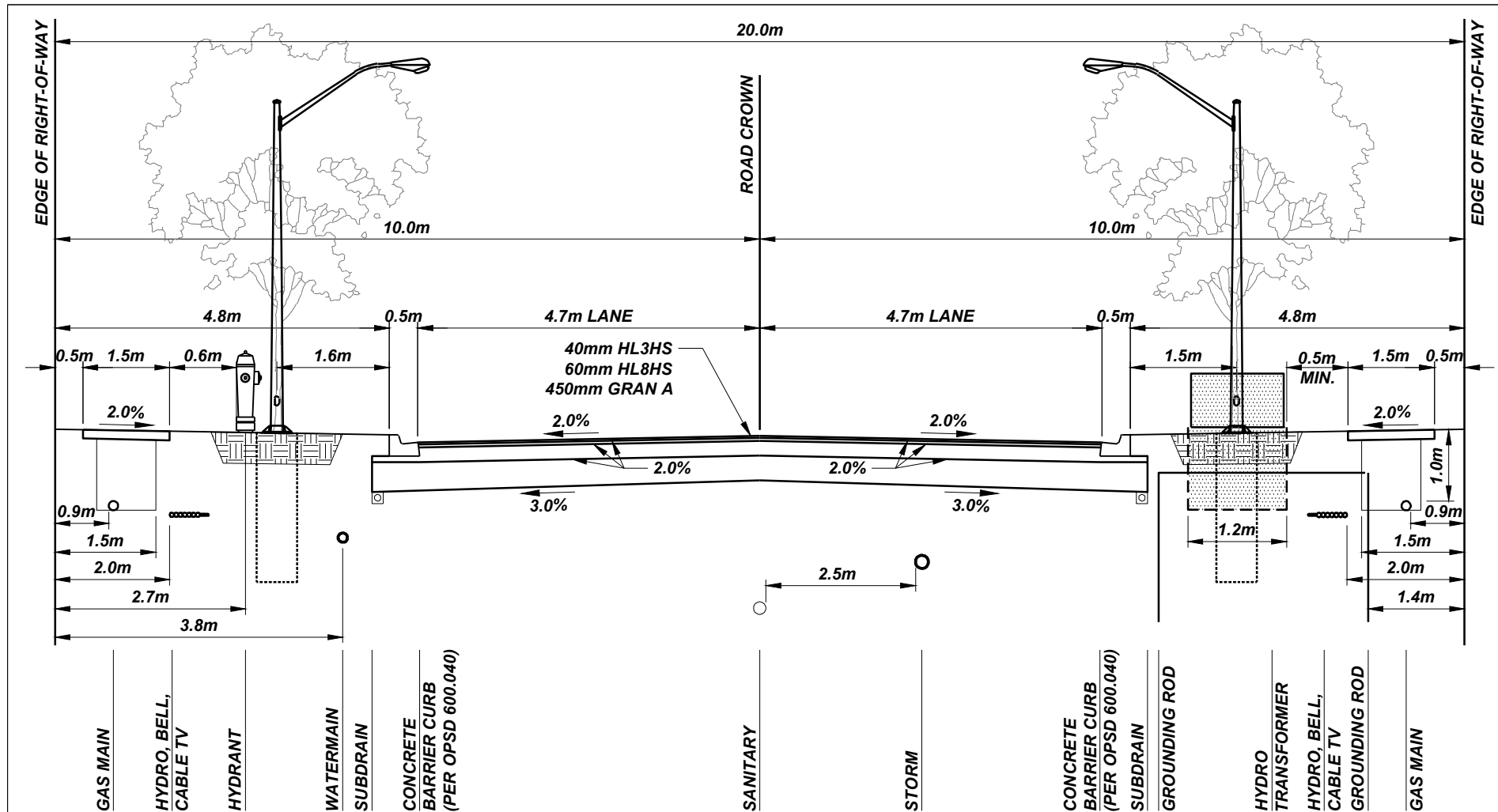


PRODUCT	SPECIFICATION	APPROVED MANUFACTURER/MODEL
TREES, LANDSCAPING AND PARKS		
Tree Species	Manitoba Maple Silver Maple All Poplar Species All Willow Species All Ash Species All Coniferous Species	
Seed Mixtures	For non irrigated parkland and open spaces: • 45% Creeping Red Fescue • 30% Kentucky Blue Grass • 25% Perennial Rye Grass For stormwater management ponds and channels, refer to the Conservation Authority planting Guidelines or use: • 30% Perennial Rye Grass • 30% Meadow Foxtail • 25% Fowl Meadowgrass • 15% Fox Sedge	



PORT COLBORNE

APPENDIX B TYPICAL & DETAILED CROSS-SECTIONS



NOTES:

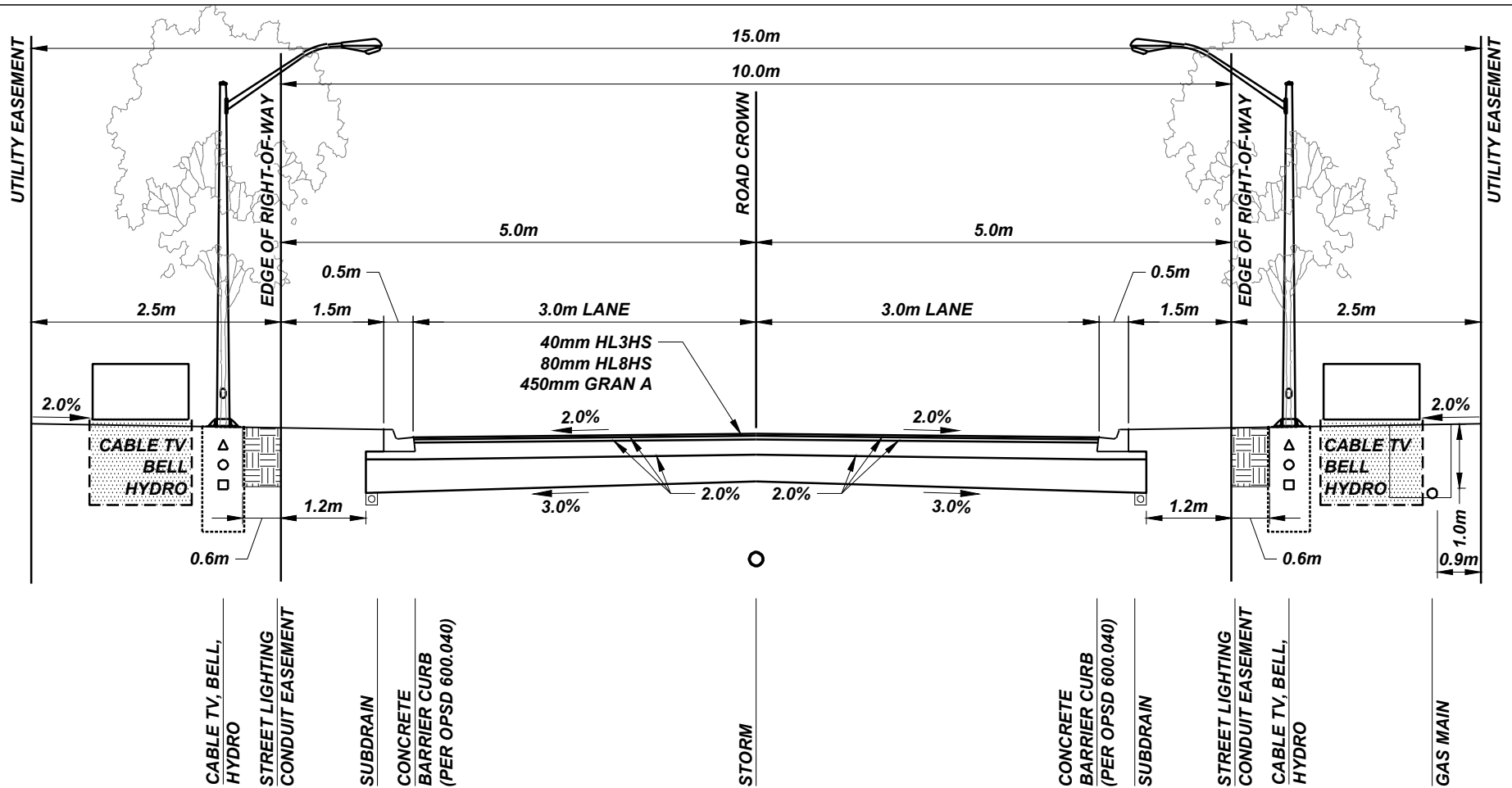
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. WASTEWATER SYSTEMS, STORMWATER SYSTEMS, INCLUDING LOW IMPACT DEVELOPMENT FACILITIES, AND WATER DISTRIBUTION AND TRANSMISSION SYSTEMS TO BE DESIGNED IN ACCORDANCE WITH THE CITY OF PORT COLBORNE DESIGN MANUAL.
3. REFER TO THE CITY OF PORT COLBORNE ROADWAY LIGHTING SYSTEMS MANUAL.
4. REFER TO THE ROAD SECTION DESIGN MANUAL FOR PAVEMENT DESIGN METHODOLOGY.
5. TREES TO BE PLACED IN LOCATIONS APPROVED BY THE PARKS, PLANNING, AND DEVELOPMENT DEPARTMENTS.



PORT COLBORNE

THE CITY OF PORT COLBORNE
CROSS SECTION
20.0m LOCAL ROAD

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LR20



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. STORMWATER SYSTEMS TO BE DESIGNED IN ACCORDANCE WITH THE CITY OF PORT COLBORNE DESIGN MANUAL.
3. STREET LIGHTING IS TO BE PLACED IN A 2.4m WIDE BY 2.525m DEEP EASEMENT FROM THE EDGE OF THE RIGHT-OF-WAY (3.0m DEEP FROM THE OUTSIDE EDGE OF CURB). CONDUIT AND POWER FEEDS ARE TO BE PLACED IN A 0.6m LINEAR EASEMENT ALONG THE OUTSIDE EDGE OF THE RIGHT-OF-WAY. REFER TO THE CITY OF PORT COLBORNE LIGHTING SYSTEMS MANUAL.
4. REFER TO THE ROAD SECTION DESIGN MANUAL FOR PAVEMENT DESIGN METHODOLOGY.
5. TREES/LANDSCAPING ARE TO BE ACCOMMODATED WHEREVER POSSIBLE IN LOCATIONS APPROVED BY THE PARKS, PLANTING, AND DEVELOPMENT DEPARTMENTS AND IN ACCORDANCE WITH THE CITY OF PORT COLBORNE GUIDELINES.
6. STRAIGHT RUNS PREFERRED.
7. UTILITIES AND SITE SERVICING ARE TO BE PROVIDED FROM FRONT FACING STREET (WHEREVER POSSIBLE).



PORT COLBORNE

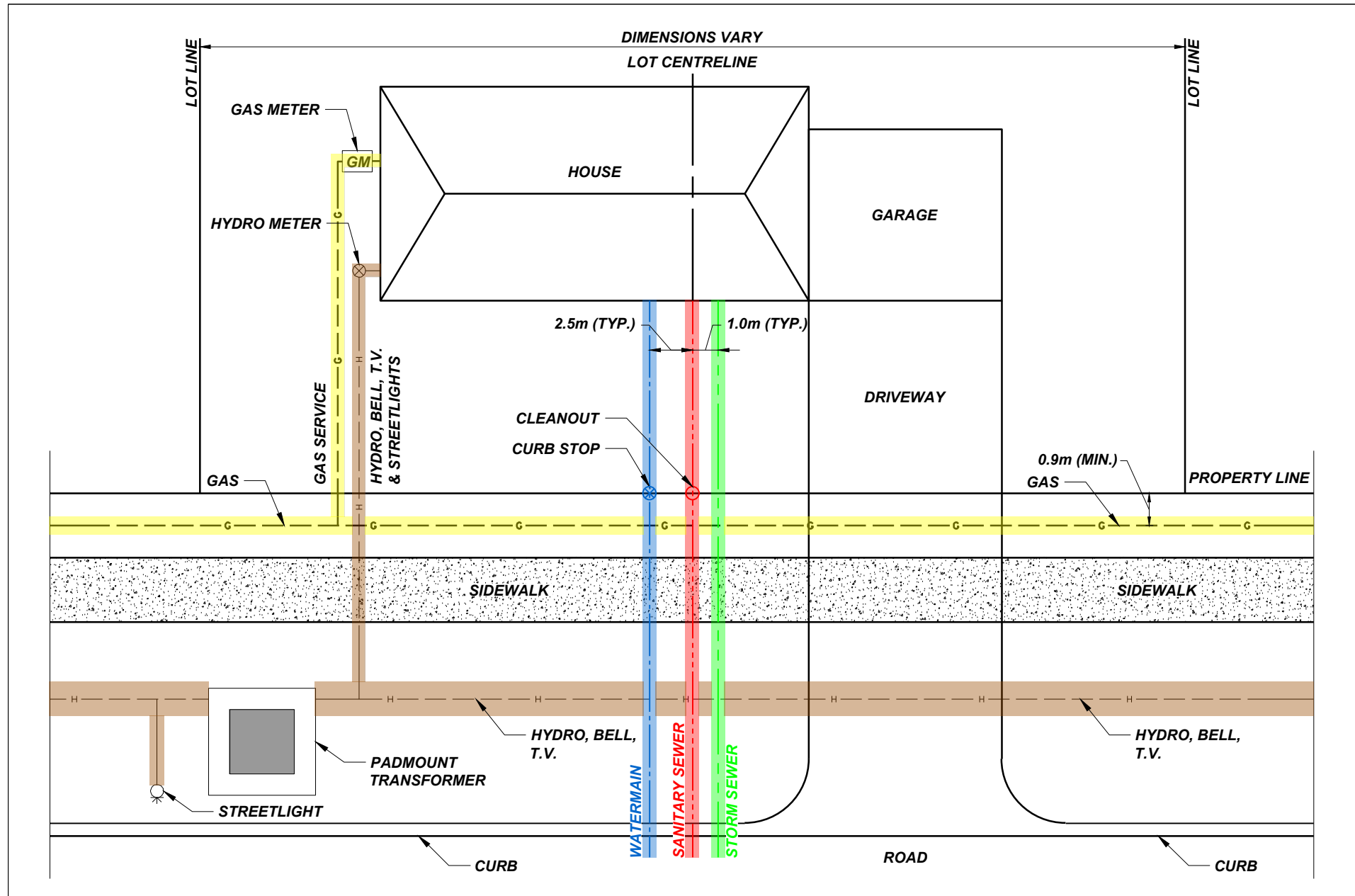
THE CITY OF PORT COLBORNE CROSS SECTION 10.0m LANEWAY

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LWY10



PORT COLBORNE

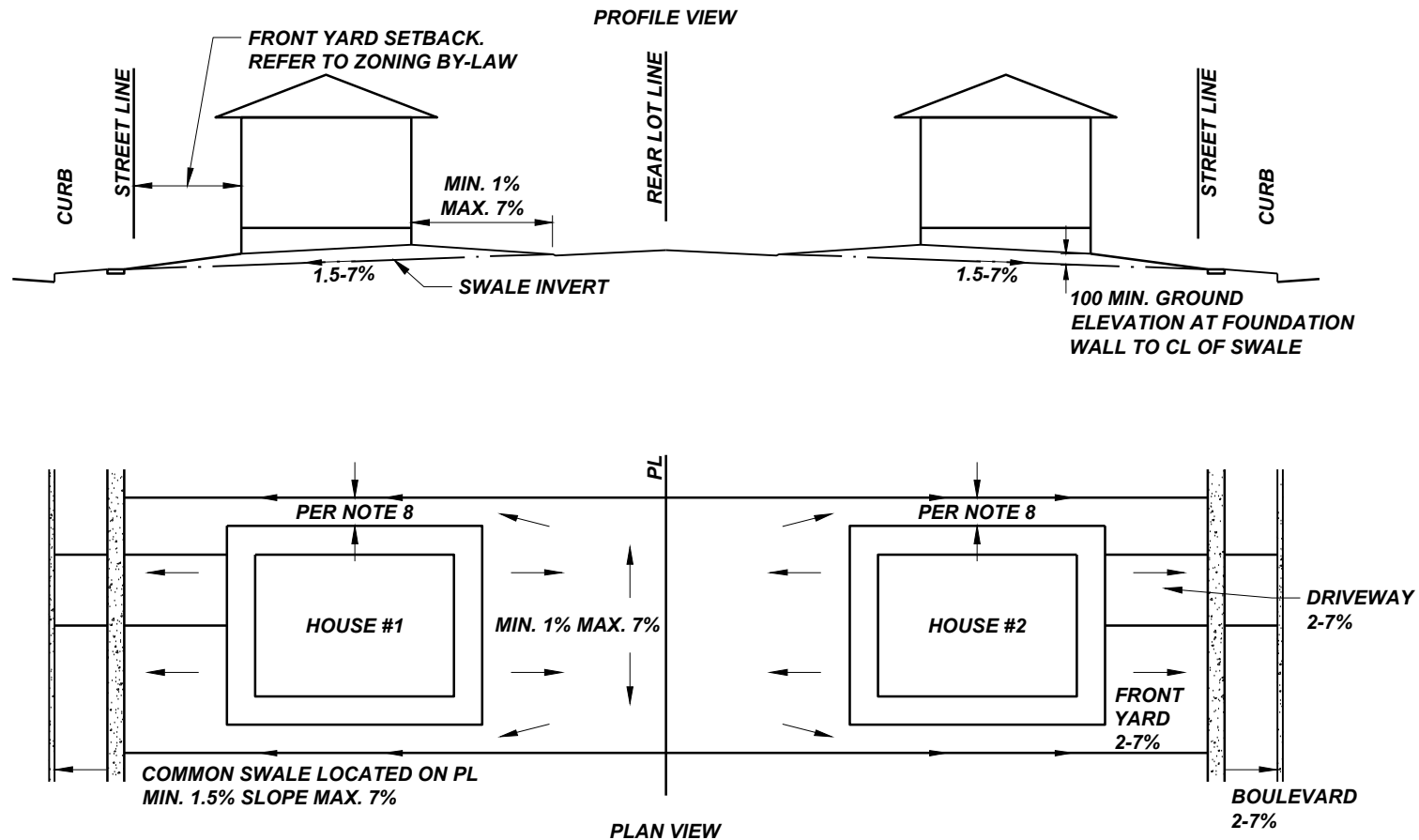
APPENDIX C STANDARD DRAWINGS



PORT COLBORNE

THE CITY OF PORT COLBORNE
LOT PLAN LAYOUT
SINGLE FAMILY HOME

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LP-SFH



NOTES:

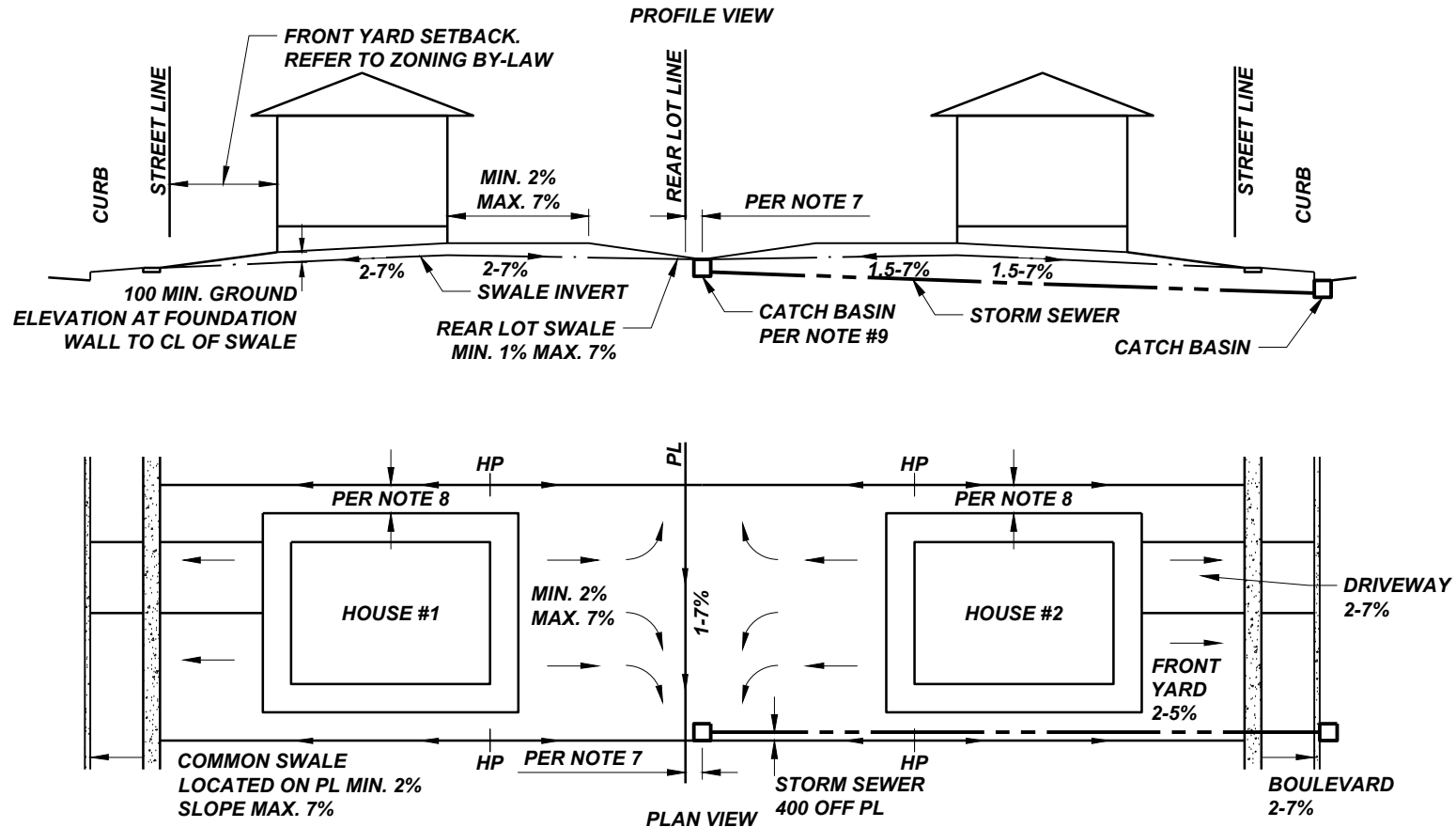
1. ALTHOUGH MAXIMUM SLOPES ARE SHOWN, THEY SHOULD BE AVOIDED UNLESS NO OTHER ALTERNATIVE IS AVAILABLE.
2. THIS STANDARD IS FOR URBAN LOTS AND GENERAL IN NATURE. CERTAIN LOTS MAY REQUIRE CHANGES.
3. THIS STANDARD IS MEANT TO BE READ IN CONJUNCTION WITH THE CITY OF PORT COLBORNE LOT GRADING AND DRAINAGE STANDARDS.
4. HOUSE STYLES USED TO SUIT LOT GRADING.
5. REAR TO FRONT YARD DRAINAGE IS DISCOURAGED FOR STREET TOWNHOUSE DEVELOPMENT TO AVOID MID-YARD SWALES ACROSS THE UNITS.
6. BELOW GRADE WALKOUTS AND REVERSE GRADE DRIVEWAYS WILL NOT BE PERMITTED.
7. THE REAR LOT LINE SHALL BE THE HIGH POINT OF THE LOT.
8. GRASSED WALKWAY AS PER LOT GRADING AND DRAINAGE STANDARDS.



PORT COLBORNE

**THE CITY OF PORT COLBORNE
LOT DRAINAGE
REAR TO FRONT**

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LD-RTF



NOTES:

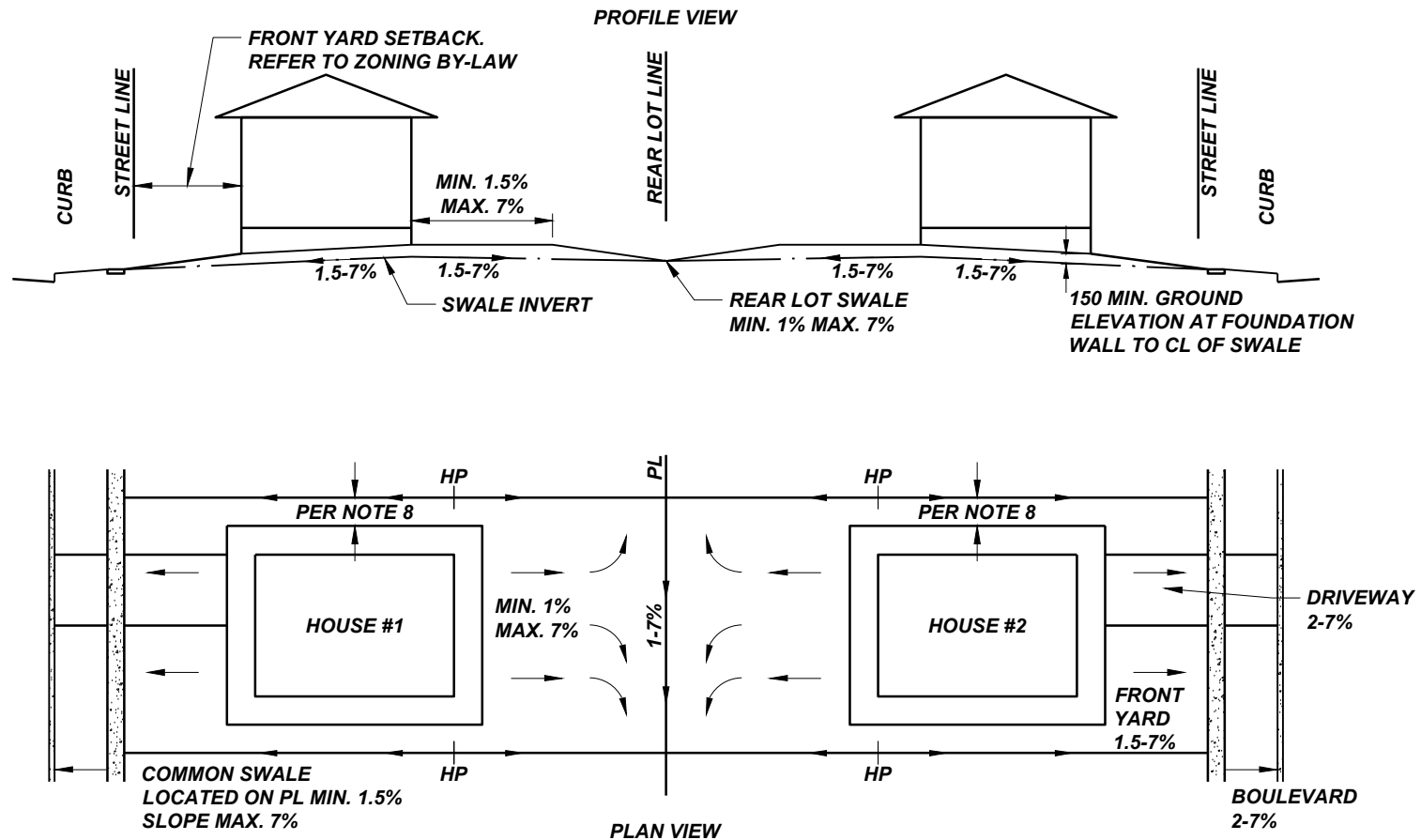
1. ALTHOUGH MAXIMUM SLOPES ARE SHOWN, THEY SHOULD BE AVOIDED UNLESS NO OTHER ALTERNATIVE IS AVAILABLE.
2. THIS STANDARD IS FOR URBAN LOTS AND GENERAL IN NATURE. CERTAIN LOTS MAY REQUIRE CHANGES.
3. THIS STANDARD IS MEANT TO BE READ IN CONJUNCTION WITH THE CITY OF PORT COLBORNE LOT GRADING AND DRAINAGE STANDARDS.
4. HOUSE STYLES USED TO SUIT LOT GRADING.
5. REAR TO FRONT YARD DRAINAGE IS DISCOURAGED FOR STREET TOWNHOUSE DEVELOPMENT TO AVOID MID-YARD SWALES ACROSS THE UNITS.
6. BELOW GRADE WALKOUTS AND REVERSE GRADE DRIVEWAYS WILL NOT BE PERMITTED.
7. ALL REAR LOT CATCH BASIN PLACEMENT AS PER LOT GRADING AND DRAINAGE STANDARDS.
8. GRASSED WALKWAY AS PER LOT GRADING AND DRAINAGE STANDARDS.
9. REAR YARD CATCH BASIN MIN. PER OPSD 705.010.
10. REAR LOT CATCH BASIN LEADS TO BE DESIGNED PER CITY OF PORT COLBORNE STORMWATER STANDARDS.
11. SWALE LENGTH NOT TO EXCEED 60.0m WITHOUT AN OUTLET.



PORT COLBORNE

**THE CITY OF PORT COLBORNE
LOT DRAINAGE
REAR YARD CATCH BASIN**

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LD-RYCB



NOTES:

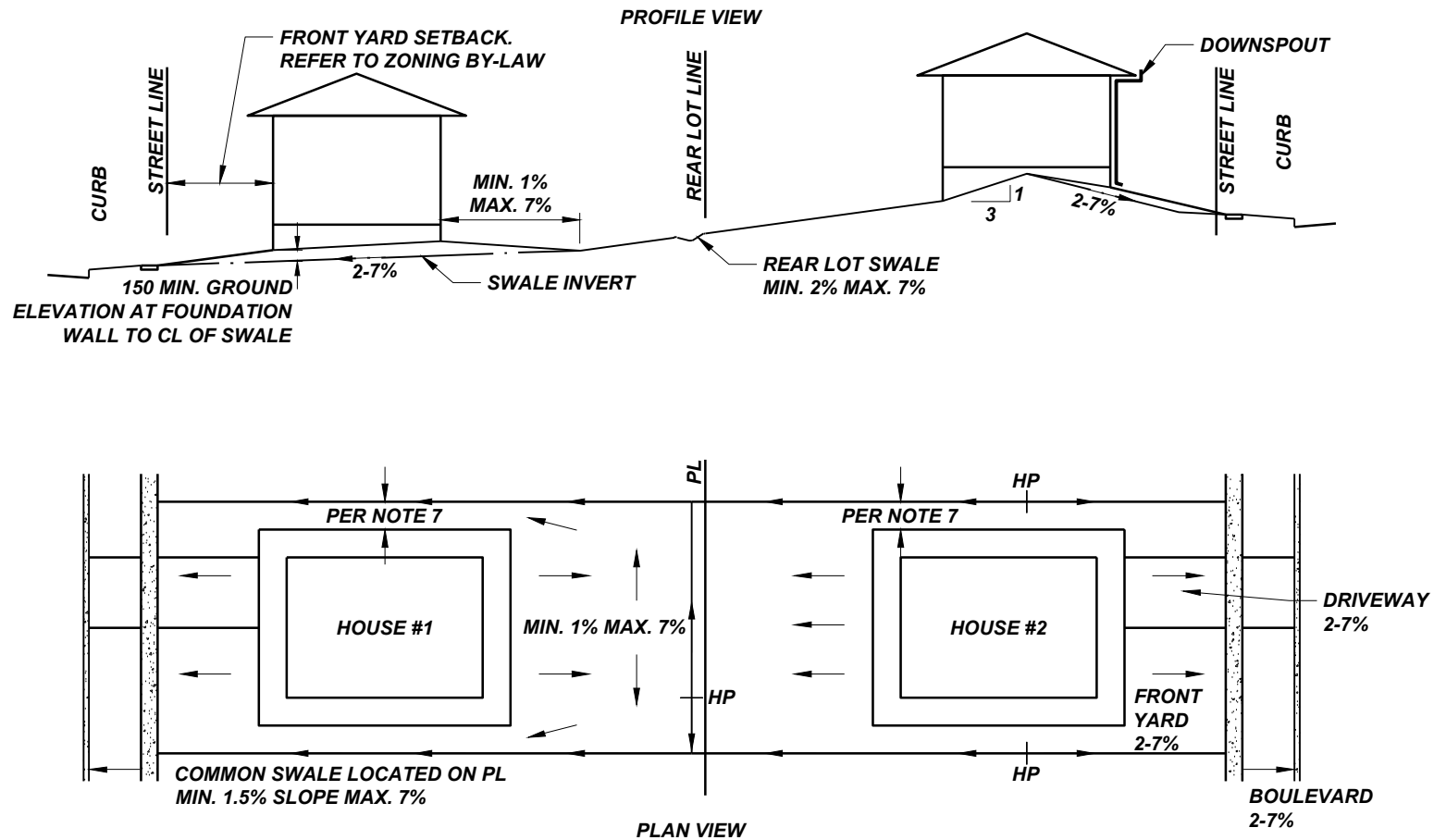
1. ALTHOUGH MAXIMUM SLOPES ARE SHOWN, THEY SHOULD BE AVOIDED UNLESS NO OTHER ALTERNATIVE IS AVAILABLE.
2. THIS STANDARD IS FOR URBAN LOTS AND GENERAL IN NATURE. CERTAIN LOTS MAY REQUIRE CHANGES.
3. THIS STANDARD IS MEANT TO BE READ IN CONJUNCTION WITH THE CITY OF PORT COLBORNE LOT GRADING AND DRAINAGE STANDARDS.
4. HOUSE STYLES USED TO SUIT LOT GRADING.
5. REAR TO FRONT YARD DRAINAGE IS DISCOURAGED FOR STREET TOWNHOUSE DEVELOPMENT TO AVOID MID-YARD SWALES ACROSS THE UNITS.
6. BELOW GRADE WALKOUTS AND REVERSE GRADE DRIVEWAYS WILL NOT BE PERMITTED.
7. ALL REAR LOT SWALES SHALL OUTLET TO CURBS, SIDEWALKS OR CATCH BASINS AS PER LOT GRADING AND DRAINAGE STANDARDS.
8. GRASSED WALKWAY AS PER LOT GRADING AND DRAINAGE STANDARDS.
9. SWALE LENGTH NOT TO EXCEED 60.0m WITHOUT AN OUTLET.



PORT COLBORNE

**THE CITY OF PORT COLBORNE
LOT DRAINAGE
SPLIT LOT**

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LD-SL



NOTES:

1. ALTHOUGH MAXIMUM SLOPES ARE SHOWN, THEY SHOULD BE AVOIDED UNLESS NO OTHER ALTERNATIVE IS AVAILABLE.
2. THIS STANDARD IS FOR URBAN LOTS AND GENERAL IN NATURE. CERTAIN LOTS MAY REQUIRE CHANGES.
3. THIS STANDARD IS MEANT TO BE READ IN CONJUNCTION WITH THE CITY OF PORT COLBORNE LOT GRADING AND DRAINAGE STANDARDS.
4. HOUSE STYLES USED TO SUIT LOT GRADING.
5. REAR TO FRONT YARD DRAINAGE IS DISCOURAGED FOR STREET TOWNHOUSE DEVELOPMENT TO AVOID MID-YARD SWALES ACROSS THE UNITS.
6. BELOW GRADE WALKOUTS AND REVERSE GRADE DRIVEWAYS WILL NOT BE PERMITTED.
7. GRASSED WALKWAY AS PER LOT GRADING AND DRAINAGE STANDARDS.



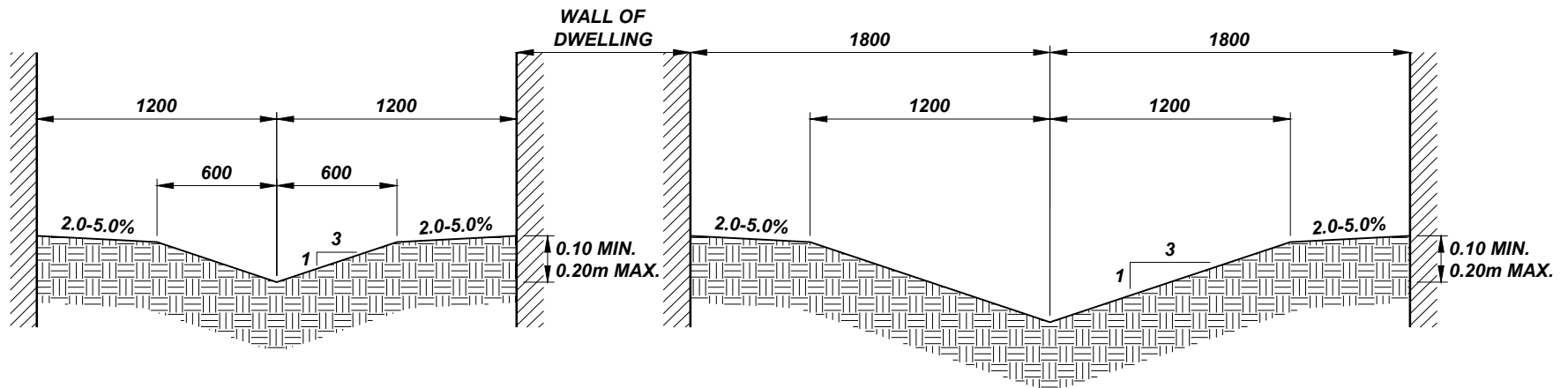
PORT COLBORNE

**THE CITY OF PORT COLBORNE
LOT DRAINAGE
UPPER TO LOWER**

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LD-UTL

**RESIDENTIAL OFFSETS
DETACHED & SEMI-DETACHED**

**RESIDENTIAL OFFSETS
STREET TOWNHOUSES**



NOTES:

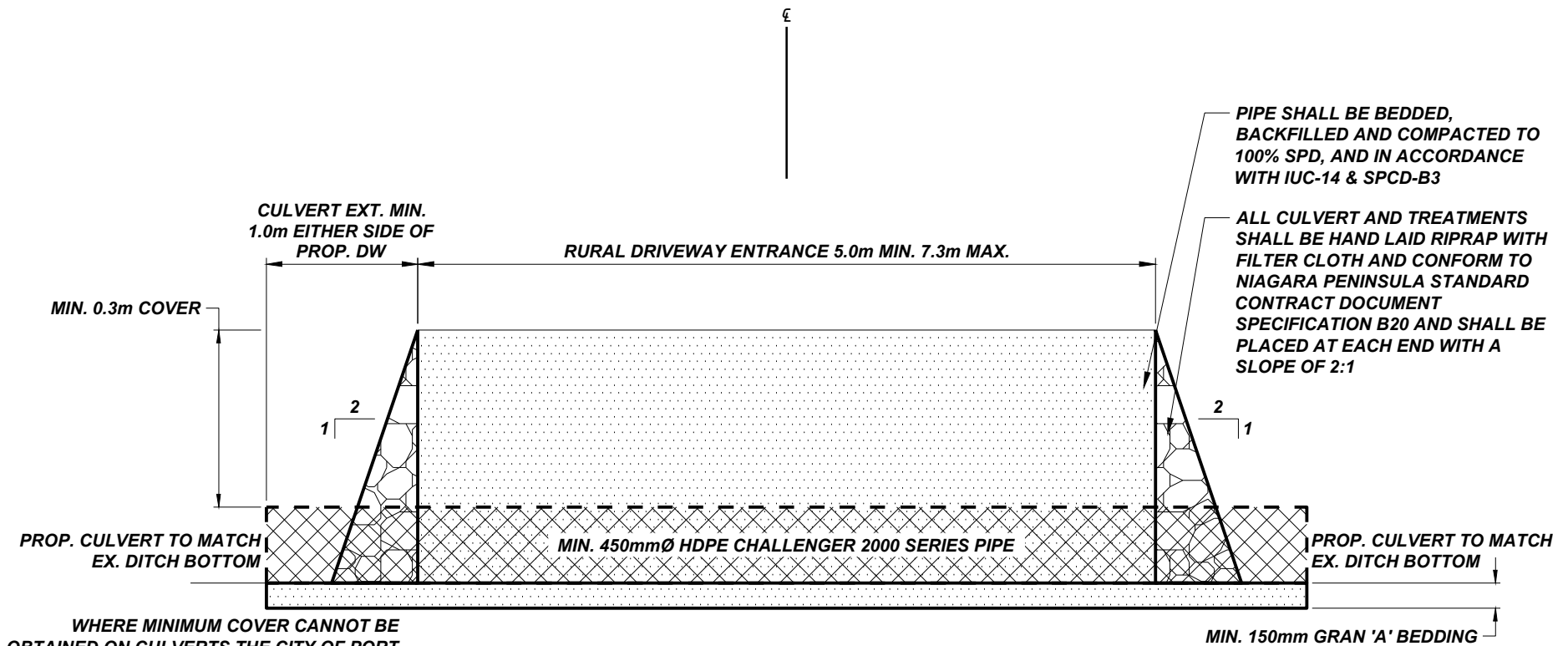
1. BUILDING OFFSETS FROM PROPERTY LINE AS PER ZONING BY-LAW TABLES 5.2 & 5.3.
2. THIS STANDARD IS FOR URBAN LOTS AND GENERAL IN NATURE. CERTAIN LOTS MAY REQUIRE CHANGES.
3. THIS STANDARD IS MEANT TO BE READ IN CONJUNCTION WITH THE CITY OF PORT COLBORNE LOT GRADING AND DRAINAGE STANDARDS.
4. HOUSE STYLES ARE TO BE USED TO SUIT LOT GRADING.
5. REAR TO FRONT YARD DRAINAGE IS DISCOURAGED FOR STREET TOWNHOUSE DEVELOPMENT TO AVOID MID-YARD SWALES ACROSS THE UNITS.
6. BELOW GRADE WALKOUTS AND REVERSE GRADED DRIVEWAYS WILL NOT BE PERMITTED.



PORT COLBORNE

**THE CITY OF PORT COLBORNE
LOT DRAINAGE
SIDE YARD**

DATE	MARCH 2024
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-LD-SY



WHERE MINIMUM COVER CANNOT BE OBTAINED ON CULVERTS THE CITY OF PORT COLBORNE ENGINEERING DEPARTMENT MUST BE CONTACTED FOR MODIFICATIONS AND RECOMMENDATIONS ARE REQUIRED.

NOTES:

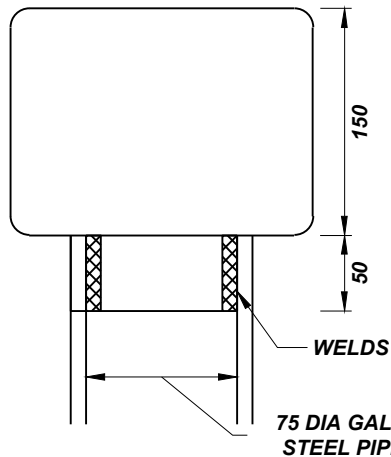
1. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY ON THE CONSTRUCTION DRAWINGS AND WHERE SHOWN THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.
2. BEFORE STARTING THE WORK, THE CONTRACTOR SHALL INFORM THEMSELF OF THE EXACT LOCATION OF SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
3. HYDRO AND BELL POLES ARE TO BE ANCHORED TO THE GROUND WHERE REQUIRED SO AS TO ENSURE THE STABILITY OF THE POLE LINES.
4. THE CONTRACTOR IS TO CHECK WITH ALL THE UTILITIES INVOLVED.
5. ALL MANHOLE FRAMES, CATCH BASIN FRAMES, WATER VALVES AND GAS VALVES ARE TO BE ADJUSTED TO FINISHED GRADE.



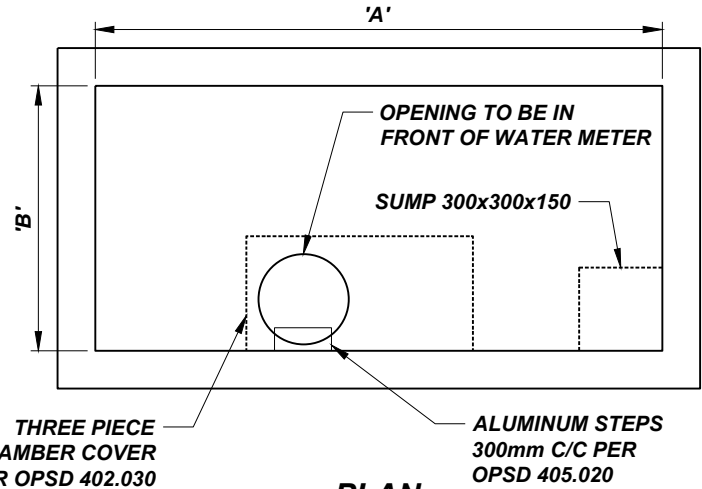
PORT COLBORNE

**THE CITY OF PORT COLBORNE
STANDARD DETAIL
TYPICAL CULVERT INSTALLATION**

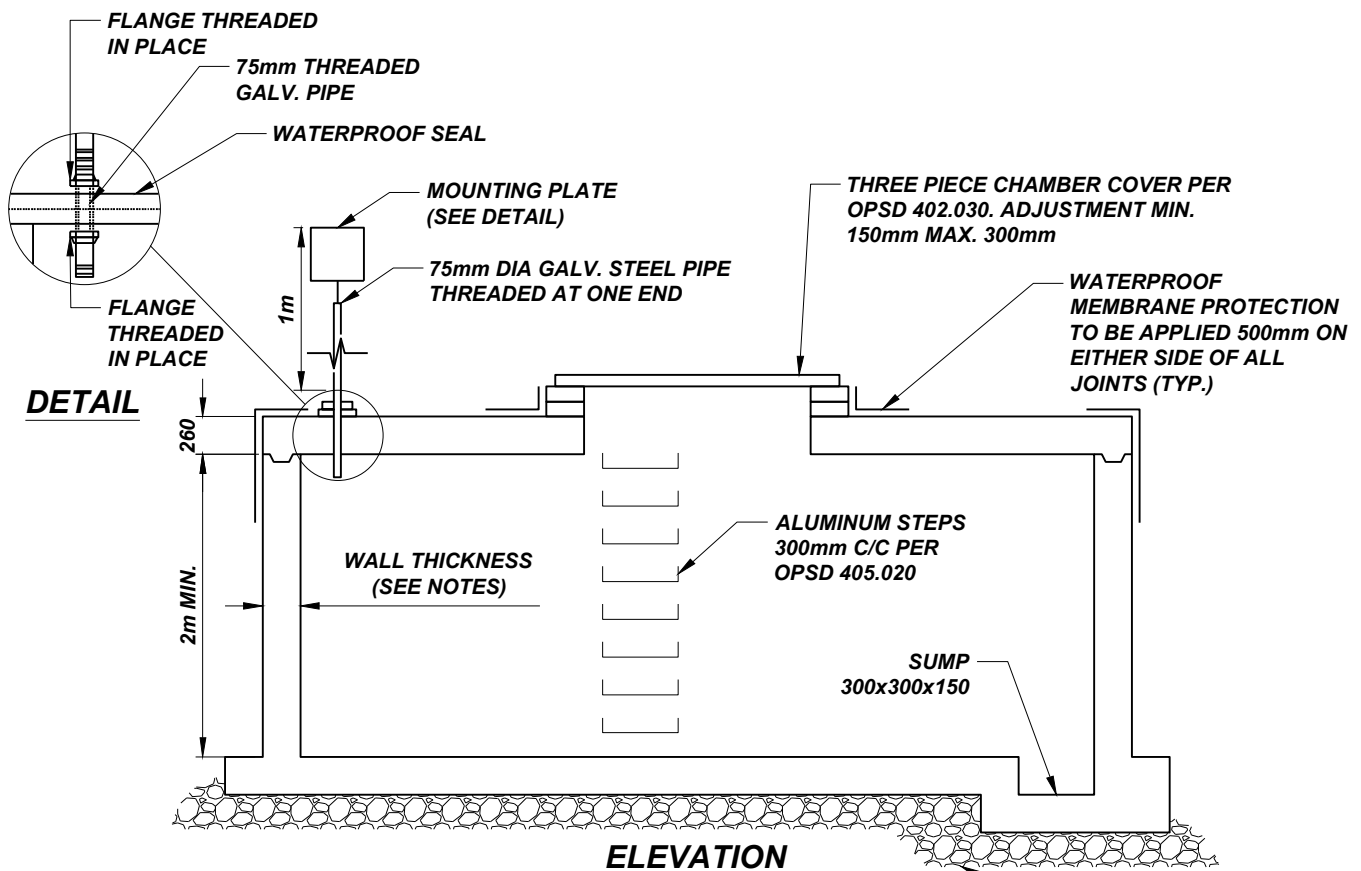
DATE	DECEMBER 2023
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-TCI



DETAIL OF MOUNTING PLATE



PLAN



ELEVATION

PIPE SIZE	MINIMUM INTERIOR DIMENSIONS	
	A (m)	B (m)
100mm	2.0	1.8
150mm	2.2	2.0
200mm	2.4	2.1
250mm	2.8	2.2
300mm AND GREATER	DESIGNED TO SUIT	

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

NOTES ON PC-STD-WMC-02 ARE
INTEGRAL TO THIS DRAWING



PORT COLBORNE

**THE CITY OF PORT COLBORNE
WATER METER CHAMBER
PRIVATE WATER SERVICE PIPE**

DATE	OCTOBER 2023
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-WMC-01

NOTES:

1. CONCRETE STRENGTH SHALL BE 35MPa WITH 6% AIR ENTRAINMENT.
2. REINFORCING BARS TO A MINIMUM 50mm CONCRETE COVER.
3. PRECAST SECTIONS TO BE AS PER OPSS 1351.
4. BASE CONCRETE STRENGTH SHALL NOT BE LESS THAN 30MPa.
5. ALL MORTAR MIX TO BE 1:3.
6. ALL JOINTS AND LIFT HOLES IN CHAMBER TO BE FILLED WITH MORTAR AND POINTED BEFORE BACKFILLING.
7. SOLID ALUMINUM STEPS AS PER OPSD 405.020 AT 300mm CENTRE TO CENTRE WITH FIRST STEP TO BE 300mm BELOW FRAME.
8. POLYETHYLENE BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS. AN APPROVED FLEXIBLE SEALANT SHALL BE USED WHERE THE PIPE GOES THROUGH THE CHAMBER WALL. INSTALLATION OF PIPE SEAL SHALL CONFORM THICKNESS.
9. ALL EXTERIOR AND INTERIOR BRICKWORK AND FRAME ADJUSTMENT RINGS TO BE PARGED TO A MINIMUM 15mm THICKNESS.
10. FLOOR TO SLOPE TO SUMP. SUMP TO BE POSITIONED IN EITHER CORNER OF THE FRONT SIDE OF THE WATER METER.
11. CIRCULAR COVER IN THREE PIECE FRAME AND COVER SHALL BE POSITIONED IMMEDIATELY ADJACENT TO THE WALL IN FRONT OF THE METER DIRECTLY OVER THE 900mm CLEAR SPACE IN FRONT OF THE METER.
12. REINFORCED CONCRETE DESIGN SHALL BE ADEQUATE FOR CHAMBER DIMENSIONS SHOWN UNDER H-20 LOADING.
13. THE WORDS "WATER METER" SHALL BE CAST ONTO THE SURFACE OF THE CHAMBER COVER USING MINIMUM 50mm HIGH LETTERS.
14. THE THREE PIECE CHAMBER FRAME AND COVER SHALL BE AS PER OPSD 402.030.
15. NO OTHER PIPING OR FITTINGS SHALL BE INSTALLED IN THE CHAMBER THAT MAY INTERFERE WITH THE CLEAR SPACE INFRONT OF THE WATER METER OR THE OPERATIONS OF VALVES OR THAT MAY OBSTRUCT THE METER OR VALVES IN ANY WAY.

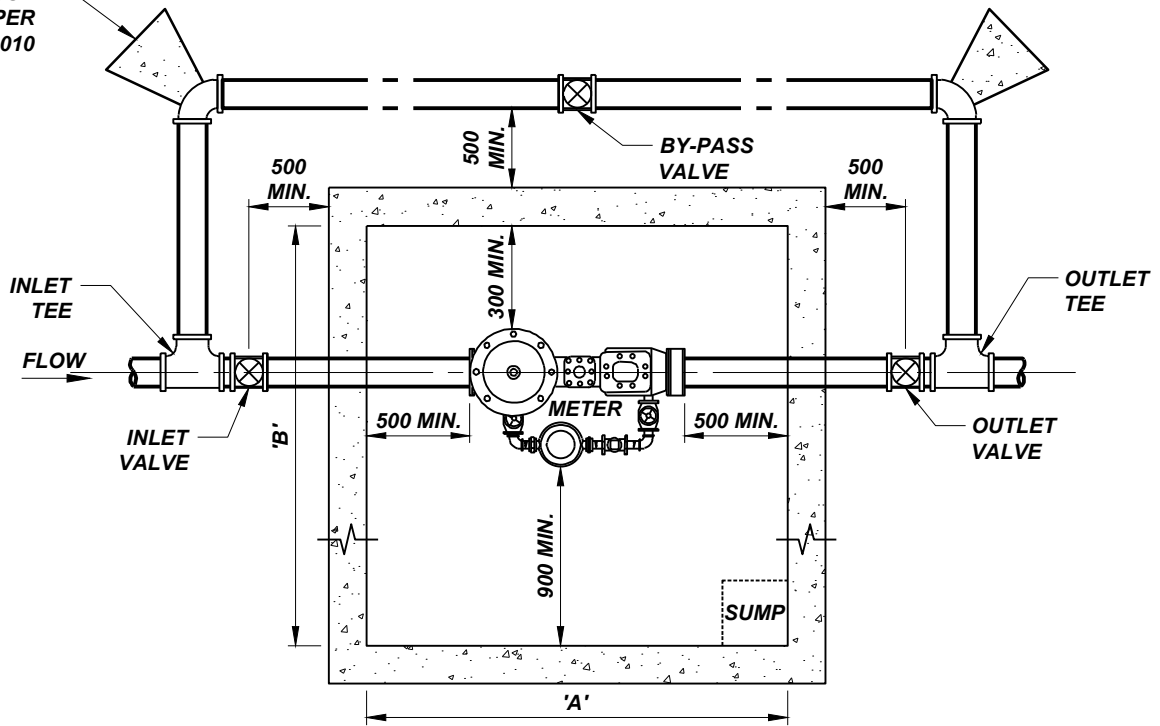


PORT COLBORNE

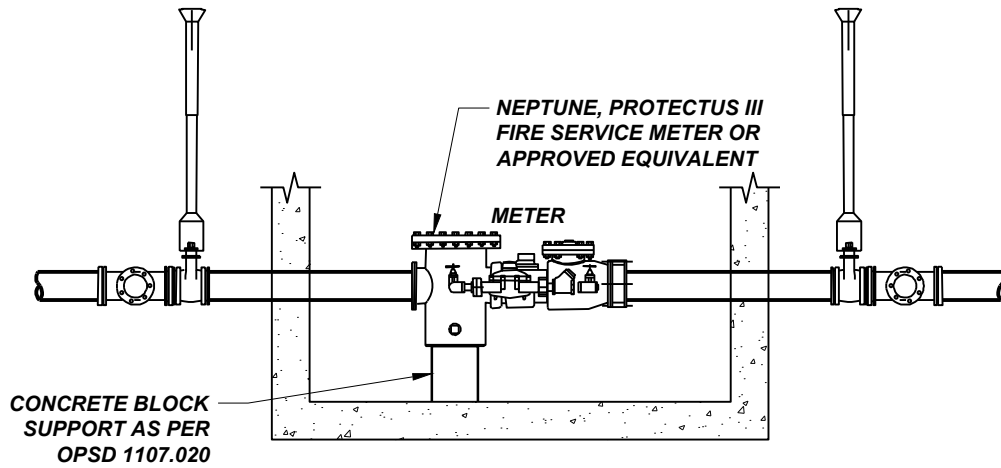
**THE CITY OF PORT COLBORNE
WATER METER CHAMBER
PRIVATE WATER SERVICE PIPE**

DATE	OCTOBER 2023
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-WMC-02

CONC. THRUST
BLOCK AS PER
OPSD 1103.010



PLAN



ELEVATION

PRIVATE WATER SERVICE PIPE SIZE	MINIMUM INTERIOR DIMENSIONS	
	A (m)	B (m)
100mm	2.0	1.8
150mm	2.2	2.0
200mm	2.4	2.1
250mm	2.8	2.2
300mm AND GREATER	DESIGNED TO SUIT	

NOTES ON PC-STD-WMP-02 ARE
INTEGRAL TO THIS DRAWING

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.



PORT COLBORNE

**THE CITY OF PORT COLBORNE
WATER METER CHAMBER
PIPING LAYOUT**

DATE	OCTOBER 2023
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-WMP-01

NOTES:

1. ALL WATER METERS SHALL BE INSTALLED IN THE HORIZONTAL POSITION, BY-PASS PIPING SHALL BE INSTALLED IN THE HORIZONTAL POSITION AROUND THE WATER METER CHAMBER. THE BY-PASS PIPING MUST BE INSTALLED AT LEAST 500mm OFF OF THE OUTSIDE CHAMBER WALL.
2. WATER METERS SHALL BE INSTALLED WITH A MINIMUM 900mm UNOBSTRUCTED CLEARANCE IN FRONT OF WATER METER TO NEAREST WALL.
3. BY-PASS PIPING SHALL BE INSTALLED WITH A MINIMUM 500mm UNOBSTRUCTED CLEARANCE FROM THE OUTSIDE WALL OF THE BY-PASS PIPE TO THE NEAREST WALL.
4. THE WORKING SPACE IN FRONT OF THE WATER METER SHALL HAVE A MINIMUM OF 2m UNOBSTRUCTED HEAD CLEARANCE.
5. THE METER SHALL BE FULLY SUPPORTED FROM THE FLOOR AND SUCH SUPPORT SHALL BE SUITABLE FOR THAT PURPOSE AND SHALL BE SUPPLIED AND INSTALLED BY THE PROPERTY OWNER AT THE TIME OF THE INSTALLATION OF THE WATER METER.
6. ALL VALVES, BENDS AND TEES SHALL BE FLANGED OR SOLDER TYPE. ACID CORE TYPE SOLDER IS NOT PERMITTED.
7. BY-PASS PIPING MAY BE ONE PIPE SIZE SMALLER THAN THE METER SIZE.
8. AFTER THE WATER METER HAS BEEN INSTALLED, THE BY-PASS VALVE SHALL REMAIN CLOSED AT ALL TIMES AND SHALL BE SEALED BY THE CITY.
9. ONLY GATE VALVES SHALL BE PERMITTED FOR INLET, OUTLET, OR BY-PASS VALVES. NO BALL VALVES OR BUTTERFLY VALVES SHALL BE PERMITTED. VALVES SHALL BE DESIGNED FOR A MINIMUM COLD WATER WORKING PRESSURE OF 1035 kPa. WHEN CEMENT LINED DUCTILE IRON PIPE IS USED, THE VALVES SHALL BE CAST OR DUCTILE IRON GATE VALVES AND SHALL BE ACCORDING TO AWWA C509.
10. ALL PIPE SHALL BE EITHER TYPE "L" COPPER PIPE (CERTIFIED TO ASTM B88) OR CEMENT LINED DUCTILE IRON PIPE (PIPE TO COMPLY WITH HANSI/AWWA C115/A21.15 OR ANSI/AWWA C151/A21.51 CEMENT LINING TO COMPLY WITH ANSI/AWWA C104/A21.4; FITTINGS TO COMPLY WITH ANSI/AWWA C110/A21.10, OR STAINLESS STEEL PIPE RATED TO A MINIMUM WORKING PRESSURE OF 1035 kPa). ALL PIPE FLANGES SHALL BE THREADED OR WELDED TO THE PIPE. GALVANIZED, POLYETHYLENE, PVC, AND OTHER PLASTIC PIPE END FITTINGS SHALL NOT BE PERMITTED.
11. ALL CHECK VALVES, BACKFLOW PREVENTERS, PRESSURE REDUCING VALVES, CROSS CONNECTION CONTROL DEVICES AND ALL OTHER SUCH DEVICES SHALL BE LOCATED DOWNSTREAM OF THE OUTLET TEE. NO OTHER FITTINGS OR CONNECTIONS SHALL BE ALLOWED UPSTREAM OF SUCH DEVICES.
12. ALL METER INSTALLATIONS SHALL CONFORM TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
13. ALL WATER METERS MEASURING BOTH FIRE AND DOMESTIC WATER CONSUMPTION INSTALLED ON A WATER SERVICE PROVIDING FIRE PROTECTION TO A PROPERTY SHALL BE UL (UNDERWRITER'S LABORATORY) OR FM (FACTORY MUTUAL) APPROVED ACCORDING TO AWWA C703-11.
14. ANY INSULATION PLACED IN OR AROUND ANY WATER METER SHALL BE EASILY REMOVABLE AND REPLACEABLE AND SHALL NOT CONTAIN ASBESTOS OR ANY OTHER TOXIC OR HAZARDOUS MATERIALS. SUCH INSULATION SHALL NOT COVER OR OBSTRUCT THE WATER METER REGISTER(S). THE CITY SHALL NOT BE RESPONSIBLE FOR ANY DAMAGES TO SUCH INSTALLATION DURING ANY REMOVAL OR REPLACEMENT OF SUCH INSULATION.
15. THE PRIVATE WATER SERVICE PIPE SHALL BE FLUSHED PRIOR TO AND AFTER THE INSTALLATION OF THE WATER METER.
16. FOR REMOTE READOUT DEVICE WIRE AND CONDUIT INSTALLATION, REFER TO THE CITY OF PORT COLBORNE SPECIFICATIONS.
17. ALL INTERNAL AND EXTERNAL VALVES, FITTINGS, THROUGH WALL METAL PIPING AND MECHANICAL RESTRAINTS TO BE c/w DENSO PASTE, DENSO MASTIC AND DENSO TAPE OR APPROVED EQUAL, APPLIED TO MANUFACTURER'S RECOMMENDATIONS.
18. IF THE METER CHAMBER CANNOT BE INSTALLED AS SHOWN (INLET AND OUTLET ORIENTATED AS SHOWN), THE CONTRACTOR MUST NOTIFY THE CITY AS SOON AS POSSIBLE TO ALLOW FOR THE WATER METER TO BE MODIFIED SO THAT IT CAN BE INSTALLED IN THE PROPER ORIENTATION. CONTRACTOR IS TO REQUEST INSTALLATION INSTRUCTIONS FOR THE SPECIFIC METER BEING INSTALLED FROM THE CITY CONTACT, AND A CITY CONTACT MUST BE PRESENT DURING THE METER INSTALLATION.



PORT COLBORNE

**THE CITY OF PORT COLBORNE
WATER METER CHAMBER
PIPING LAYOUT**

DATE	OCTOBER 2023
SCALE	N.T.S
REV. No.	0
DWG No.	PC-STD-WMP-02



PORT COLBORNE

APPENDIX D
SANITARY SEWER DESIGN SHEET TEMPLATE



FILE NO.: _____
CONTRACT / PROJECT: _____

$$M = 1 + (14 / (4 + (P / 1000)^{0.5}))$$

$$PF = 1 + 14/(4 + \frac{1}{P})$$

Peak population flow where; $q = L/\text{day}/\text{person}$; $P = \text{population}$

255 litres/person/day

Residential Flow Generation: 255 Lpcd

Employment Flow Generation: 310 Lpcd

Peak extraneous flow: I= 0.286L/s/ha new development area; 0.4L/s/ha

0.286 litres/second/hectare

Harmon peaking factor (PF): Min = 2; Max = 4

0.013 n

[illegible]

DATE:

CHECKED BY:



PORT COLBORNE

APPENDIX E STORM SEWER DESIGN SHEET TEMPLATE



2 Year

a 755
b 8
c 0.789

FILE NO.: _____
CONTRACT / PROJECT: _____

STORM SEWER DESIGN SHEET TEMPLATE

[illegible]

DATE:	CHECKED BY:
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PORT COLBORNE

**APPENDIX F
CITY OF PORT COLBORNE
CCTV INSPECTION SPECIFICATIONS**

1.1	General	1
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1.3	Flushing of Sewer Mains	1
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1.1 General

This specification is intended for any CCTV inspection that is completed for the City of Port Colborne. It outlines the requirements for traffic control, sewer cleaning, CCTV inspection and reporting.

Developers will be required to complete this work as part of the assumption process by the City. Contractors for capital works projects will be required to complete this work as part of the construction, and will be paid as specified in the form of tender that accompanies the said Contract.

1.2 Construction Signs and Traffic Control

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document SPCI A8, the following shall also apply:

The Contractor is responsible for all traffic control associated with the work in accordance with the Occupational Health and Safety (OHSA), Ontario Traffic Manual (OTM) Book 7, and the Ministry of Labour (MOL). The Contractor is responsible for the installation and removal of all construction signage and daily maintenance of all signs throughout the duration of the contract.

The work shall be sequenced to ensure that one lane of traffic remains open at all times. Vehicular and pedestrian access to all businesses, homes, and side streets must be maintained at all times. No road closures will be allowed, unless approved by the City.

It shall be the responsibility of the Contractor to notify Emergency Services, the Niagara Region (for household waste and recycling pick up), any school boards, or Canada Post, all of which may be affected, when necessary, as to the current status of construction as it pertains to safe passage of traffic within the construction limits.

The Contractor must provide copies of all traffic control plans required for construction at the pre-construction meeting for review and approval by the City prior to commencement of construction. The Contractor must provide copies of their staffing certification for traffic control and traffic protection training certification prior to the commencement of construction.

1.3 Flushing of Sewer Mains

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document SPCI C5, the following shall also apply:

Cleaning of sewers shall be accomplished by hydraulic powered cleaning equipment. Mechanical equipment which could cause damage to protruding lateral connections or main pipes will not be allowed.

The term “clean” or “cleaning” as used in these specifications shall mean the removal of grease, dirt sludge and semi-solid material from the gravity sewer and their respective maintenance holes by as many flushing’s as necessary to accomplish this.

Flushing and cleaning operations of sewers will be carried out and limited to that portion of the sewer pipe which spans between two adjacent maintenance holes. Prior to flushing, the Contractor may install at the outlet of the receiving maintenance hole such partial and temporary plugs as to ensure that all grease, dirt, sludge, semi-solid and other materials are deposited in this maintenance hole for the eventual removal of same by the Contractor. The Contractor shall prevent such deposited materials from by-passing the maintenance hole and finding its way to the next section of the sewer. Should this happen the Contractor at his own cost will effectively clean the affected section of sewer.

During inspection flushing and cleaning, the flusher nozzle must be present at all times within view of CCTV camera during video inspection to ensure proper cleaning has been achieved.

All materials deposited in the maintenance holes after the effective flushing of sewers shall be removed by the Contractor. It will be the responsibility of the Contractor to remove and dispose of the residual materials, at his expense, to an approved disposal site.

The Contractor is responsible to supply all water needed for the flushing of the sewers. Water supplies can be made available at one of the Bulk Water Stations by arrangement with the City. Arrangements and policies for the supply of water will be confirmed at the preconstruction meeting.

The Contractor will be responsible for locating and identifying the maintenance holes and sewer lines in the field. For existing areas, the City will provide all available drawings and GIS mapping. The Contractor shall advise the City of buried or non-locatable maintenance holes in writing. Any discrepancies found should be noted and reported to the City.

The Flusher Operator must contact the City every morning to verify their location.

Equipment shall consist, but not be limited, of the following:

- Water Tank (minimum 800 gallons capacity) truck mounted or trailer
- Adequate pump capacity
- High pressure cleaning gun to produce flows from fine spray to long distance solid stream to achieve desired cleaning
- Sewer- cleaning hose - minimum 150 metres long high pressure hose to safely withstand pumping pressure.

The Contractor shall conduct the sewer cleaning in an appropriate manner to prevent flooding of basements adjacent to the work area. Hydraulic pressure of flushing equipment shall be adjusted accordingly to ensure no basement flooding occurs. The contractor will be responsible for all costs associated with the clean up, disposal and replacement of items and restoration of property damaged as a result of basement flooding caused by the Contractor's operations.

1.4 Internal Inspection of Sewer Mains by CCTV Including Video & Data

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document SPCI C5, the following shall also apply:

Inspection of all sewers will be done by means of a Television Camera to determine the conditions of the pipe as regards to the following:

- Inspect sewers to observe and record structural defects, service defects and to assess thoroughness of cleaning.
- Reference each inspection to the supplied City of Port Colborne maintenance hole numbering system.
- Code the sewer condition in accordance with the National Association of Sewer Service Companies (NASSCO), Pipeline Assessment Certification Program (PACP) Version 6.0 or greater. All submitted documents and coding generated must use this same system and supply COPC with a Pipe inspection report listing Start of Survey, End of survey, Tap locations and distances and defects.
- Pictures must be clear and in focus and must not be hazy due to steam or water vapour. Level in sewer must be controlled by jetting, by-passing, etc. so that any significant occurrence or defect can be seen in enough detail for identification, including the invert of the line.

- Flushing and cleaning operations must be conducted during the inspection, and the flusher nozzle must be present at all times in the CCTV video to ensure proper cleaning has been achieved.
- The Flusher Operator and Sewer Television Inspection Technician must contact the City Administrator every morning to verify their location. The City will supply the contact name and phone number.

The Contractor shall provide a pan and tilt type camera, or approved equivalent, to ensure a better evaluation and inspection of the pipe walls, and of leaking joints and lateral connections. The camera shall have remote focus, auto iris, minimum 2 lux sensitivity, and minimum 460 lines of resolution and shall be self-propelled or skid mounted. Television equipment shall consist of a self-contained camera and a monitoring unit connected by a coaxial cable. This equipment shall be specifically designed and constructed for such inspection purposes.

Picture quality shall be such to produce as a minimum a continuous 460 line resolution picture in colour showing the entire periphery of the pipe. Picture quality and definition shall be to the satisfaction of the Owner. Camera speed shall not exceed 0.1 m / second in a 200 mm diameter sewer. The camera advance rate shall not exceed 6 metres per minute to allow adequate time for operator interpretation. A uniform rate of speed shall prevail.

The Contractor shall provide all equipment and operators required to satisfactorily perform all the work under this Contract. Specialized equipment required for the internal inspection of large diameter storm pipes (500mm to 1500mm in diameter) must be approved by the City before the work is carried out. All operators shall be well qualified and experienced and able to readily identify all defects and deficiencies in the sewer system.

Work shall not commence in a work shift until the City is satisfied that all items of the survey equipment have been provided and are in full working order.

The Sewer Television Inspection Technician must contact the City every morning to verify their location.

The Contractor shall install all required night lines in the sewers to enable the camera traction cable to be drawn through the sewer.

Location measurement of defects shall be made by devices having a proven accuracy of plus or minus 1%.

Equipment shall be mounted in an appropriate vehicle. Electrical power for the system shall be self-contained. Sound dampening shall be applied to the vehicle and equipment.

The City shall not be responsible for any loss or damage to the Contractor's equipment. The Contractor shall carry all necessary insurance to cover loss, damage, and/or retrieval during inspection.

The Contractor must provide adequate facilities for the City or other representative to view the television monitor together with the operator while the inspection is in progress. All obstructions must be fully inspected and reported. The City must be informed immediately of any obstruction encountered while the inspection is still in progress. The Contractor may install plugs in the sewers to prevent the flow of sewage during inspection for a period of no longer than ten (10) minutes for any given time. Plugs shall only be installed when approved by the City in locations where sewer flows hinder a proper television inspection. The Contractor will be entirely responsible for any flooding that may result from installing plugs in the sewer mains.

Pipe sections must not be abandoned by the Contractor.

The Contractor must maintain a daily log in duplicate, showing the location of defects and a detailed description of the defect. One copy of this log must be submitted to the City upon completion of one day's work.

1.5 Documentation

The Contractor shall provide a full record of the condition of the pipes, maintenance holes, and appurtenances along the designated section of sewer within 10 days of completion of the field work. All observation data must be recorded in the manner prescribed in the DATA FORMAT of this specification.

The final report shall include:

1. A detailed log of each sewer including:
 - a. Pipe inspection report listing Start of Survey, End of survey, Tap locations and distances and defects.
 - b. the location of every fault;

- c. the estimated extent of the fault;
 - d. a recommendation on whether the fault requires immediate repair;
 - e. a recommendation as to what must be done to repair the fault repair including the location, extent, and repair method and materials;
2. The log shall be provided in a printed report form
3. CCTV camera inspection videos documenting each of logged items
4. Digital/Printed photographs documenting each of the logged items

Video records shall display the sewer line ID number throughout the duration of the sewer line inspection. The Report shall include a cover page listing all the inspections included in the Report. The cover page shall include sewer line ID numbers, street locations and length in metres of sewers inspected.

The report shall include the location of all service connections together with the statement of opinion as to whether or not the service connections are leaking. Protrusions of service connections into the main line shall be noted with reference to the degree of protrusion.

Digital photographs of all sewer defects shall be taken and shall accompany each inspection report. Permanent colour thermal video prints of good quality shall be taken to show all encountered major defects in the system. The prints shall be catalogued and mounted in a suitable print file at the back of each final report. An External Hard Drive records of all the inspected sewers shall also be submitted with the final report and the required CCTV inspection database.

Each maintenance hole to maintenance hole section of pipe shall be located on the report form in such a way as to be readily identifiable. Identify such items as street names, maintenance hole numbers, type of pipe, joint length, direction of flows, pipe diameter, maintenance hole depth, inspection date, names of the inspection technician, persons viewing, and video identification numbers.

1.5.1 Data Format

All electronic deliverables shall be delivered on an External Hard Drive. Depending on the size of the work package, more than one External Hard Drive might be required.

The first External Hard Drive shall contain:

- The database file (.mdb) containing all inspection data under the work package.
- A video file can be included here but it is not mandatory and can be part of other External Hard Drives that are part of the package.
- All inspection header files will include two main sections; a Header Section and a Condition Details Section.

The database file (.mdb), picture files (.jpg), and all video files (.mpg) on all deliverables shall be in the root directory (no folders) of an External Hard Drive.

The database format is generally described in the database schema that follows:

- The database file shall be named NASSCO.mdb
- The database file shall contain all final inspections ordered in the Contract.

All data resulting from the contract shall be captured and stored in accordance with the following file structure, and not populated fields shall be NULL (empty):

1) HEADER Table Details

COLUMN	TYPE	REQUIRED	NOTES
ID	LONG	YES	MDB ASSIGNED UNIQUE IDENTIFIER
CONDITION CODE RATING	INTEGER	YES	A 1-5 GRADE IS TO BE BASED ON THE CURRENT NASSCO RATING SYTEM
SURVEYEDBY	CHAR(12)	YES	INSPECTOR NAME
CONTRACTNUMBER	CHAR(8)	YES	CONTRACT NUMBER AND YEAR
DATE	DATETIME	YES	DATE OF INSPECTION
TIME	DATETIME	YES	TIME OF INSPECTION
LOCATION	CHAR(30)	YES	STREET NAME
START MAINTENANCE HOLE	CHAR(10)	YES	START MAINTENANCE HOLE (Use Standard City Maintenance hole Numbering System)

SDEPTH	DOUBLE	YES	START MAINTENANCE HOLE INVERT DEPTH
FINISH MAINTENANCE HOLE	CHAR(10)	YES	FINISH MAINTENANCE HOLE (Use Standard City Maintenance hole Numbering System)
FDEPTH	DOUBLE	YES	FINISH MAINTENANCE HOLE INVERT DEPTH
DIRECTION	CHAR(1)	YES	DIRECTION OF INSPECTION (UPSTREAM OR DOWNSTREAM)
SIZE1	INTEGER	YES	DIAMETER OR WIDTH
SIZE2	INTEGER	YES	HEIGHT
SHAPE	CHAR(1)	YES	SHAPE CODE
MATERIAL	CHAR(5)	YES	MATERIAL CODE
PIPELENGTH	INTEGER	YES	PIPE SEGMENT LENGTH (JOINT TO JOINT DISTANCE)
TOTALLENGTH	DOUBLE	YES	LENGTH OF PIPE FROM MH TO MH
VIDEONUMBER	CHAR(5)	YES	VIDEO FILE REFERENCE (09121)
COMMENTS	CHAR(50)	YES	COMMENTS (AVOID USE OF " ' / \ CHARACTERS)
WEATHER	CHAR(1)	YES	WEATHER CODE (1 TO 5)

2) CONDDetails Table Details

COLUMN	TYPE	REQUIRE D	NOTES
ID	LONG	YES	MDB INDEX
VIDEONUMBER	INTEGE R	YES	ELAPSED TIME
PHOTOGRAPHNUMBE R	INTEGE R	YES	PHOTOGRAPH NUMBER (1,2,3)
DISTANCE	DOUBLE	YES	CHAINAGE (4.2)
CONTINUOSDEFECT	CHAR(2)	YES	CONTINUOUS DEFECT CODE (F1, F2, S1,S2)
CODE	CHAR(4)	YES	NASSCO OBSERVATION CODE
DIAMETER_DIMENSIO N	INTEGE R	YES	DIAMETER_DIMENSION OF OBSERVATION
CLOCKFROM	CHAR(2)	YES	CLOCK FROM OBSERVATION POSITION (01,06,11,12)
CLOCKTO	CHAR(2)	YES	CLOCK TO OBSERVATION POSITION (01,06,11,12)
PERCENTAGE	INTEGE R	YES	PERCENTAGE OF OBSERVATION (5,10,50)
INTRUSION	INTEGE R	YES	INTRUSION OF OBSERVATION
REMARKS	CHAR(34)	YES	REMARKS FOR OBSERVATION (AVOID USE OF " ' / \)
JOBNUMBER	CHAR(10)	YES	INSPECTION NUMBER PROVIDED BY CITY IN ORDER FORM
HEADERID	LONG	YES	LINKAGE TO HEADER INFORMATION FILE

1.6 Lateral Launch Inspection

In accordance with the requirements of the Niagara Peninsula Standard Contract Documents SPCI C5.