



PURPOSE OF MANUAL

This manual has been produced by the City of Brockville to assist applicants with the preparation of Site Plan Control Submissions. Specifically, this Manual provides requirements for submitting a complete Site Plan Control Application; fees and charges which are required to develop within the City of Brockville (Site Plan Process in the City of Brockville); and in for advises of various City By-laws which may apply to the proposed development.

SITE PLAN APPROVAL GUIDELINES

This document contains the standards and procedures employed by the City of Brockville to review and approve development projects pursuant to Section 41 of the Planning Act.

Table of Contents	Page
What is Site Plan Approval?	004
Key Steps <ol style="list-style-type: none"> 1. Initial Discussion of Development Proposal 2. Completion and Submission of Formal Application 3. Application Review and Circulation 4. Financial Security 5. Application Approval and Site Plan Control Agreement Preparation 6. Execution of Site Plan Control Agreement 7. Obtaining a Building Permit 	005
Other Agencies	009
Site Plan Requirements <ol style="list-style-type: none"> 1. Site Plan Legend 2. Site Plan Legend – Items 3. Submission Requirements 	009
Design Guidelines Planning and Building Requirements <ol style="list-style-type: none"> 1. Buildings (incl. Garbage Enclosures) 2. Parking Areas 3. Parking for Persons with Disabilities 4. Bicycle Parking 5. Fire Route Designation 	011
Design Guidelines Landscape Areas <ol style="list-style-type: none"> 1. Standard Planting Setbacks 2. Fencing/Planting Strips 3. Sidewalks 4. Curbs 5. Exterior Lighting 6. Signage 7. Parking for Persons with Disabilities and Signage 	014
Design Guidelines Operations and Environmental Services Requirements <ol style="list-style-type: none"> 1. Grading, Storm Sewer, Storm Drainage & Stormwater Management 2. Sanitary Sewer and Water Services 3. Utilities 4. Traffic 	021

Appendix A – Site Plan Control Requirements	027
Appendix B – Letter of Credit Example	032
Appendix C – Solid Waste, Refuse and Recycling	033
Appendix D – Parking (Bicycle)	035
Appendix E – Fire Safety Standards	036
Appendix F – Visibility Triangle Policies	037
Appendix G – Planting Standards, Species and Specifications - Planting Guidelines for the Cataraqui Region	038 075
Appendix H – Sidewalk & Curbing Details	082
Appendix I – Grading & Storm Drainage	093
Appendix J – Sanitary Sewer, Water Services & Stormwater Management - CRCA Stormwater Management Guidelines	098 126
Appendix K – Flow Calculations	138
Appendix L-1 - Site Plan Control Application Form • Residential Development	141
Appendix L-2 - Site Plan Control Application Form • Commercial/Industrial/Institutional Development	144
Appendix L-3 - Site Plan Control Application Form • Mixed Use Development (Commercial/Residential)	147
Appendix L-4 – Appendix “1” to Applications – Fees	150
Appendix L-5 – Appendix “2” to Applications – CRCA Fees	151

Note: Applicants are advised to read the Guidelines carefully to ensure that City requirements are satisfied. This will expedite both the processing and approval of the Site Plan Agreement.

As this manual will be modified from time to time, users should confirm that reference is made to the most up-to-date version of this document, and its policies and provisions. Confirmation can be obtained by contacting the City of Brockville Planning Department at (613) 342 – 8772 or by email at planning@brockville.com.

What is Site Plan Approval?

The City uses Site Plan Approval and these Guidelines to address and resolve design matters related to the proper development of any site. Site Plan Approval works in conjunction with other approvals such as Zoning or Building Permit approval to provide for well-designed and functional sites.

The City's general objectives for design are found in the City's Official Plan Chapter 6, Implementing Our City's Plan as well as throughout other parts of the Official Plan (Revitalizing Our City, Developing Our Thriving City Structure). Copies of the Official Plan or excerpts are available from the City of Brockville website (www.brockville.com) or by contacting the Planning Department (planning@brockville.com).

Site Plan Approval is a site-specific type of development control authorized under Section 41 of the Planning Act. The Site Plan By-law of the City of Brockville was approved by Council 28 January 1986 to establish Site Plan Control within the City.

These guidelines are provided to assist a proponent to understand the City's requirements and the types of issues that will be reviewed before approval. Special consideration must be given for unique or special areas such as the Downtown and Central Waterfront Area and heritage properties. Items to be given particular attention include protection of easements and promotion of a high quality design and building material usage.

NOTE: The following guidelines do not exempt the developer from complying with any City By-law and should, in fact, be used in conjunction with such By-laws.

Applicability

Under Site Plan Control By-law 33-86, all land within the City is designated a Site Plan Control area and all development comes under Site Plan Control except for the following uses and types of construction.

- a) A single unit dwelling;
- b) A semi-detached dwelling;
- c) A duplex dwelling;
- d) A triplex dwelling;
- e) A townhouse dwelling containing not more than three (3) units;
- f) Additions containing less than 100 square metres, unless the original development was the subject of a Site Plan Control Agreement or Development Control Agreement;

- g) Barns, for agricultural uses, in rural zones;
- h) Signs, when not erected as part of a development;
- i) Underground fuel storage tanks; and
- j) A parking lot containing less than five (5) parking spaces.

Where development proposals fall under Site Plan Control, all plans must be approved by the City prior to any work commencing. The property owner must build according to the approved plans. The Site Plan Control Agreement also includes conditions relating to the construction of certain facilities ancillary to the development such as drainage, parking, landscaping, vehicular access, servicing, exterior lighting, and potential streetscape improvements adjacent to the site.

Agreement must be made between the City and the property owner on all matters before the City approves the improvements and, when applicable, issues a building permit allowing the development to begin. If an agreement cannot be reached, or the property owner is not satisfied with the Municipality's handling of the matter, the property owner may appeal to the Ontario Municipal Board (O.M.B.) under The Planning Act, R.S.O. 1990, c.P.13, Section 41(12).

The process of Site Plan Control Approval is, in essence, a technical review. Certain development conditions are expected to be met by developers. Developments which do not meet the guidelines in this manual will not be approved. If the Applicant satisfies these conditions, and modifications are not required, the process will usually be completed in approximately fifteen to twenty (15 - 20) days from the submission of a complete application, depending on the nature and complexity of the proposed development. **Applicants are advised to read this manual carefully to ensure that City requirements are satisfied. This will expedite both the processing and approval of the Site Plan Agreement.**

NOTE: The applicant should contact the Planning Department to determine whether a proposal is subject to Site Plan Approval.

Key Steps

1. Initial Discussion of Development Proposal

Before the formal application is submitted, the Applicant is required to have a pre-consultation meeting with Planning Department staff to:

- a) review the proposed development;
- b) determine its compliance with the current Official Plan and Zoning By-law;

- c) determine requirements of other Departments (Operations, Environmental Services, Building Division, Fire Department, CRCA etc.); and,
- d) establish whether Site Plan Control Approval is required for the development.

Should it be determined that Site Plan Control applies to the proposed development, the Applicant can then proceed with application.

- ***Time Frame.....Varies***

2. Completion and Submission of Formal Application

After consulting with City staff, the Applicant completes a Site Plan Control Application form.

The application is submitted to the Planning Department with the required fee(s) (refer to current City of Brockville User Fee By-law) and all materials and information specified under **Appendix "A"** of this manual.

- ***Time Frame.....Varies (Applicant to submit all required info)***

3. Application Review and Circulation

Once the application is received, the application is first reviewed by the Planning Department to determine the Application Stream. The Applicant will be notified if there is incorrect or incomplete information in the application. Acceptable applications are typically circulated to external agencies and City Departments for comments and additional information (if required).

- a) Environmental Services (Engineering and Solid Waste)
- b) Operations Department (Public Works, Transportation, Parks)
- c) Planning Department (Planning, Building & By-law Services)
- d) Fire Department
- e) Police Department
- f) Brockville Cyclist Advisory Committee
- g) Brockville Municipal Accessibility Advisory Committee
- h) EMS
- i) Hydro One
- j) Enbridge
- k) Bell Canada
- l) Cogeco
- m) CN Railway (CN and CP), if required

- n) Pipelines (Trans Northern, TransCanada), if required
- o) School Boards
- p) Cataraqui Region Conservation Authority (CRCA), if required
- q) Health Unit, if required
- r) Ministry of Transportation, if required
- s) Municipal Property Assessment Corporation
- t) Ministry of Environmental and Climate Change, if required.

- ***Time Frame.....15-20 Business Days (First Submission)***
- ***Time Frame.....10-15 Days (Subsequent Submissions)***

The CRCA, and in certain instances, the Health Unit may require a fee for the review of applications. Please contact both agencies directly regarding their fee requirements.

These agencies review the proposal and submit comments and required changes to the Planning Department for further review. If changes to the proposal are required, the Planning Department informs the Applicant in writing. The applicant should contact the Planning Department for clarification on any comments or changes required to be made by any department or agency. If changes to the plans and/or proposal are necessary, the Applicant shall make such changes and resubmit the development proposal to the Planning Department. The Planning Department, in conjunction with the appropriate agency or department, then reviews the modified proposal. Fees for subsequent submissions may be required and are in accordance with the current City of Brockville User Fee Schedule.

4. Financial Security

(See Appendix "B" for example or a Letter of Credit)

If required, and prior to the authorization of the Agreement by the City, an Irrevocable Standby Letter of Credit or Cash Deposit in the value of 50% of the estimated value of all landscaping, drainage facilities, fencing, paving, curbing, parking space demarcation, and exterior lighting proposed to be installed on the Owner's Land by/on behalf of the Owner, in favor of the City, shall be provided. In the case of a cash deposit, no interest will be paid by the City.

- ***Time Frame.....Varies (Determined by Applicant)***

5. Application Approval and Site Plan Control Agreement Preparation

Once the Planning Department has confirmed that the drawings are acceptable, the Chief Planning Officer will provide an approval

letter, or a report will be prepared and forwarded to City Council for approval (determined through Step 3 - Application Review and Circulation). Be advised that should any City Councilor wish to have the proposal presented on the Council floor, or should it be determined by the Planning Department that a proposal should go forward to Council, one (1) coloured site plan (full size 24" x 36"), elevation(s) (full size 24" x 36") and landscaping (full size 24" x 36") drawing(s) and one reduced set of the mentioned drawings (8.5" x 11") are required for presentation to the Economic Development and Planning Committee, a standing Committee of Brockville City Council.

- ***Time Frame.....Determined during Step 3.***

6. Execution of Site Plan Control Agreement

When the development proposal is acceptable to both the Applicant and the City, the Planning Department prepares a Site Plan Control Agreement and forwards eight (8) copies to the Applicant. After the Applicant reviews and signs all copies of the Agreement, eight (8) full size paper sets of the drawings along with the signed agreements needs to be forwarded to the Planning Department.

Upon acceptance of the development proposal (Chief Planning Officer or Council), the Mayor and Clerk will execute the Agreements on behalf of the City. Following execution of the Agreement, the Clerk's Office or the applicant will have the Agreement registered on title (please refer to City of Brockville User Fee By-law for associated fee for the City to register).

Should the City register the agreement, a copy of the duly executed documents will be forwarded to the Applicant by the Clerk's Office. Should the applicant decide to register the documents, a copy of the executed registration document and four (4) of the signed agreements and drawings are to be forwarded to the City for our files.

- ***Time Frame.....Varies.***

7. Obtaining a Building Permit

A building permit can be obtained from the Chief Building Official **after** the following conditions have been satisfied:

- a) the City has granted Site Plan Approval and has executed (signed and sealed) the Site Plan Control Agreement;
- b) the Owner has provided the required security;

- c) the application for a building permit is complete with application form, required drawings and all applicable fees and other required government approvals; and
 - d) the requirements of The Ontario Building Code and Act have been met and other applicable law has been satisfied (e.g. Ontario Regulation 148/06 pursuant to the Conservation Act, where applicable).
- **Time Frame.....Determined by the Chief Building Official – subject to provisions of Division C – Table 1.3.1.3 of the Ontario Building Code.**

Other Agencies

The Applicant is encouraged to also consult with the Cataraqui Region Conservation Authority, Lanark Leeds and Grenville Health Unit, Hydro One, Bell Canada, Cogeco Cable, the Ministry of Transportation, Ministry of Natural Resources, Ministry of the Environment and Enbridge Gas prior to making application in order to ensure compliance with relevant local, municipal, Provincial and Federal regulations and requirements.

The City of Brockville does circulate to the above agencies within our circulation process; however, pre-consultation may prevent costly and timely delays in processing the application or construction of the development at a later time.

The approvals by these agencies may vary according to the project. Not all agency approvals will be required for all projects. Be advised that some agencies have separate fee requirements for plans review.

Site Plan Requirements

1. Site Plan Legend

- A legend is to be completed and included on the Site Plan.
- Plan Scale at a minimum of 1:250 unless written permission from the City is obtained for alternative scale.
- All measurements are to be represented in metric. Drawings completed in Imperial measurements will not be accepted.

2. Site Plan Legend – Items

- Municipal Address, if available
- Legal Description and Parcel Identification Number

- Ontario Building Code Classification
- Building Area, m²
- Mezzanine area (if applicable)
- Building Use & Classification Number of storey's
- Sprinklered?
- Designer Information, Declaration of Designer
- Zoning and use(s)
- Lot area, frontage and depth
- Setbacks – front, side(s), rear
- Parking spaces required & provided (Dimensions & Detailed calculations to be shown)
- Loading spaces required and provided (Dimensions & Detailed calculations to be shown)
- Landscaped area m², percentage of site
- Paved area m², percentage of site
- Snow Storage area must be shown or a note describing how snow will be removed
- Signed stamp of a Professional Engineer in the Province of Ontario.
- Space for City of Brockville Approval Sticker (2" (h) x 4" (w))

3. Submission Requirements (See Appendix "A" for Details)

Please consult with the Site Plan Coordinator at the Planning Department before submitting an application. Before an application will be considered as complete, it will be necessary for the applicant to submit all the following required documentation to the Site Plan Control Coordinator.

The Site Plan submission requirements include, but are not limited to:

- Covering letter or brief description of project
- Completed Site Plan Application Form, including the estimated construction value
- Owner's Authorization (if applicable)
- Application Fee(s) (see current user fee schedule)
 - Planning
 - Engineering
 - Cataraqui Region Conservation Authority (if applicable, on separate cheque).
 - Registration Deposit
- 8 Full-size (24" x 36") copies of Required Plans - Plans are to be folded in sequence
 Include: existing development (if applicable), Site Plan, Landscaping Plan, Site Servicing, Grading and Drainage Plan including detention pond calculations. Refer to checklists contained in this package for information to be shown on plans.

- 4 Folded Copies of Elevations and Floor Plans (Full size)
- 1 copy of all drawings at 11 x 17
- 1 Folded Copy of Survey (reference plan)
- Digital copy of all drawings (pdf)
- Storm Water Management Report (if required, determined during pre-consultation)
- Erosion and Sediment Control Plan (where applicable)
- Tree Preservation Plan (where applicable)
- Environmental Impact Assessment (where applicable)
- Estimate for Irrevocable Stand-by Letter of Credit or Cash Deposit
 - Financial security, in favour of the City of Brockville, shall be provided to 50% of the value (as determined by the City) of the proposed work, specifically being the installation of all landscaping, fencing, drainage facilities, paving, curbing, parking space demarcation, and exterior lighting proposed. Such financial security shall be in the form of an Irrevocable Standby Letter of Credit, prepared to the specifications of the City, or cash deposit, or other alternative financial security as deemed appropriate by the City Treasurer, and shall be provided to the City prior to the authorization of the Agreement by the City. In the case of a cash deposit, no interest will be paid by the City.
- Submitted drawings need to be folded to 8½" x 11" or 14"

Upon approval of the Site Plan Control Agreement Drawings, the City will require the following:

- 8 Full-size (24" x 36") copies of Approved Plans, folded and in sequence
- A digital copy of approved final plans (CAD and pdf)
- Irrevocable Stand-by Letter of Credit or Cash Deposit or Alternative
- Cash-in-Lieu of Parkland Payment (if applicable).
- 8 signed copies of Approved Site Plan Control Agreement (written text) signed by the Owner(s).

Design Guidelines

Planning and Building Requirements

1. Buildings

The siting, massing, orientation and design of buildings are to promote a compatible neighborhood, well designed sites and streetscapes and in general, to reflect good urban design principles and compliance with

the City of Brockville Downtown and Waterfront Master Plan & Urban Design Strategy.

In siting of buildings, one should ensure that the more objectionable aspects of a development such as loading, service and delivery areas, parking ramps, blank walls, garbage receptacles, air handling units and the like, are properly screened from view and/or occupy less prominent areas of the site and do not adversely affect adjacent land uses or pedestrian/vehicular flows. *Please refer to Zoning By-law 050-2014 for specific regulations pertaining to the above aspects.*

Building form might show variety, quality and relief in design and materials to enhance the development. Materials such as plain metal siding or plain concrete block will be discouraged.

Entrances to buildings should be clearly defined and so noted on the drawings submitted. Rooftop mechanical units are to be located out of view or screened from sight. The method of screening shall be compatible with the building design.

Garbage enclosures should be integrated into a building; failing this, the enclosure design (material, finish etc.) is to be sympathetic to that of the building. Garbage receptacle storage must be properly screened and located in such manner as to not create a nuisance/detriment to abutting landowners. See **Appendix "C"** for further details relating Solid Waste, Refuse and Recycling.

Note the position of other structures such as retaining walls, fences, recreational facilities and other ancillary structures must also satisfy the regulations contained in Zoning By-law 050-2014, as amended.

2. Parking Areas

Parking lots are to be designed to not only accommodate sufficient number of parking spaces but also allocate sufficient area not designated for parking for the manoeuvring of trucks on site including access to garbage receptacles.

Loading ramps, docks, areas and doors should be situated away from the front yard and not adjacent to residential uses, or the street frontage (except for areas within the I1 and I2 zones as described in Zoning By-law 050-2014, as amended).

Parking lots shall have a minimum gradient of 1.0% and a desirable gradient of 2.0%.

Paving and lining (when required by zoning) of driveways and parking lots (for more than four vehicles) is required with a clear definition of entrance ways.

Traffic islands to define ends of rows of parking are to be raised and should be designated for low maintenance; however, landscaping in parking lots is strongly encouraged to minimize the urban heat island effect.

Curbing, minimum 150 mm (6 inches) high, is required to separate all driveways and parking areas from landscape areas, traffic islands, sidewalks, and drainage purposes. For drainage purposes, in areas of rural road cross sections and roadside ditches, curbing may be optional.

Indicate location and overall size, width of aisles, number and size of stalls, and differentiate between employee/residential and customer/visitor parking area. Also indicate parking lot surface type, drainage direction and direction of traffic.

All parking and loading requirements are outlined in the City's Zoning By-law 050-2014, as amended.

Contact the Planning Department for assistance in determining parking requirements.

Typical parking space	Minimum width 2.75 metres Minimum length 5.5 metres
Off-street loading space	3.0 metres x 9.0 metres with a height clearance of 4.5 metres
Access Driveways	6.0 metres width for 2-way traffic 3.0 metres width for separate entrance and exit
Aisle Widths	4.5 metres for parallel parking 5.5 metres for diagonal parking – 60° 4.5 metres for diagonal parking – 30° or 45° 6.0 metres for 90-degree parking

3. Parking for Persons with Disabilities

When provision of barrier-free parking spaces is required: They shall be provided at the rate of one (1) parking space for every fifty (50) required spaces; minimum width of 3.5 metres and a minimum length of 5.5 metres are as per the Zoning Bylaw 050-2014, as amended. In addition, please consult the Accessibility for Ontarians with Disabilities Act (AODA) as their requirements may exceed the municipalities.

4. Bicycle Parking

In addition to the above parking and barrier-free parking spaces required, bicycle parking may also be required. Bicycle Parking must be provided for the uses specified in Table 3.9 of Zoning By-law 050-2014. Table 3.9 is attached as **Appendix "D"** to this document. For a full list of Bicycle Parking Regulations please refer to Section 3.9 of Zoning By-law 050-2014.

5. Fire Route Designation

(see Appendix "E" for Details on Fire Safety Standards)

- Fire route signs shall be mounted such that the maximum spacing of the signs does not exceed 30 metres.
- The fire route sign must be permanently legible.
- Sign posts and their foundations shall be constructed to hold the fire route signs in their property and permanent position.
- Fire route signs may be affixed to a building wall, pillar, fence post or other suitable backing, at a height of not less than 1.5 metres and not more than 2.5 metres, measured from the bottom of the sign to the sidewalk or parking lot surface.
- Where conditions do not permit the proper placement of a fire route sign at the height required above, the sign is to be placed at a height as close as possible to the required height, but in no case is the height of the signs to exceed 2.75m.
- Notwithstanding the provision of height requirement above, any official fire route sign erected or installed prior to July 31, 1987 which does not meet the specified height requirements shall be considered valid and fully enforceable.

Design Guidelines

Landscape Areas

Where a planting strip is required in accordance with sub clause 3.34 a) i) of Zoning By-law 050-2014, as amended, the planting strip shall have a minimum width of 3.0 metres unless otherwise provided therein.

High degrees of landscaping are encouraged on-site. This can include but is not limited to the planting of a variety of tree species and callipers. There is a key focus on landscaping major streets and city entrances.

Planting materials should be both low maintenance and able to withstand the physical conditions of their locations and our Canadian climate.

Sod is required in the front and exterior side yards, and any grading and landscaping features, if hydro seeding or seed mat is used, the Letter of Credit will be held for one additional full growing season.

Landscaped soft areas shall have a desirable gradient of:

- i. 2.0% minimum for all surfaces
- ii. 3:1 maximum side slope for all swales and slopes
- iii. 150 mm minimum swale depth, with a 1.0% minimum longitudinal gradient.

On corner lots, special landscape treatment will be required at the intersection of 2 or more streets. The proposed planting should not interfere with required sight triangles and are limited in height.

The landscape plan is to show all existing and proposed plant materials (trees, shrubs, beds and grassed areas). Plans shall include a plant list.

Every effort to protect and preserve existing mature trees shall be made where practical. It should be noted that removal of trees from the site will likely mean that a higher level of landscaping will be required to compensate. Existing trees on the site to be retained shall be protected during construction by means of a protection barrier erected no closer to the trunk of the tree than the drip-line.

All plant material to be nursery stock quality. The following are the minimum sizes for plant material. Larger sizes may be required to ensure survival or provide a landscape effect.

Shade trees	70 mm calliper
Ornamental trees	70 mm calliper
Evergreen trees	1.8 m height
Shrubs	14 litre container

Indicate swales and drainage pattern in sodded areas. No plantings are permitted within swales.

The planting of landscaped areas adjacent to parking areas should consider the effect of snow piling and salt/sand use during the winter season.

1. Standard Planting Setbacks

Suggested minimum distances between trees/large shrubs and the following typical roadway elements:

street intersections	10.0 m
light standards	3.0 m
traffic signs (stop, yield, etc)	3.5 m

private approaches (driveways)	1.5 m
fire hydrants / transformers	3.0 m
hydro poles	3.0 m
bus stops	3.0 m
manholes	3.0 m
sidewalks	0.75 m
underground utilities	1.0 m
buildings	1.5 m

At the intersection of roadways or vehicular access points, no plant material with a mature height greater than 1.0 m shall be planted within the visibility triangle (see **Appendix "F"**), along each of the intersecting roadways, measured from the point of intersecting street lines, except where engineering standards indicate and/or permit otherwise.

No tree planting is permitted where the distance between a curb and a detached sidewalk is less than 1.2m. In addition a planting area defined by two curbs, a curb and a fence or sidewalk and fence must be 1.2m wide if street trees are to be planted.

Public tree planting must be accomplished by the balled and burlaped, tree spade or container method. Bare root plantings are not permitted without written approval of the Director of Operations.

No street tree planting is to be made closer to the street than 0.75 m behind the face of the curb. The face of the curb is the street side of the curb.

Larger maturing trees should be spaced approximately 10.0 m apart, medium trees spaced approximately 8.0 m apart and smaller maturing trees spaced 6.0 m apart. The Director of Operations may require wider spacing if it is necessary for development of the tree or for safe use of the street or sidewalk. When space is limited, or to achieve certain design effects, closer spacing's may be considered.

No tree shall be planted closer than 1.5 m from any driveway or alley nor shall a tree or shrub be planted in such a manner that its eventual growth cannot be reasonably controlled so as to avoid interference with or obstruction to any improvements installed for public benefit.

Tree plantings made in the sidewalk must have a minimum of 3.0 m² of cut out area. The tree must be set back from the street a minimum of 750mm from the face of the curb.

Additional information relating to Tree's, Planting Standards, Acceptable Plant Species and Planting Specifications can be viewed in

the attached **Appendix "G"**. **Appendix "G"** also includes "Appendix A: Planting Guidelines for the Cataraqui Region".

Final decisions relating to any of the above landscaping items shall be at the discretion of the City of Brockville.

2. Fencing/Planting Strips

The type, height, location, and detail of all existing and proposed free standing walls, fencing and planting strips are to be clearly indicated on the site plans.

Screening fence and/or planting strips are required when industrial, commercial or multiple-residential development is adjacent to Residential development. Parking areas in particular are to be screened in such a case. Fence and/or planting strip screening is mandatory for certain zones.

Fencing and posts shall not obstruct or have a negative impact on any drainage course or drainage facility.

Fencing or screening is to be in accordance with Section 3.16 and 3.34 of Zoning By-law 050-2014.

3. Sidewalks **(See Appendix "H" for Details)**

On-site pedestrian access, particularly for shopping centres, should provide for an enhanced site by changes in materials and layout, while at the same time having regard for the specific needs of the physically challenged user (i.e. ramps).

Minimum widths of 1.5 m for sidewalk access from the parking area to the building entrance way are recommended. When a sidewalk runs adjacent to a row of parking, this minimum width should be increased to 1.8 m.

Surfaces for all walkways are to be of a hard surface material and have a minimum cross fall 2.0% and a maximum of 5.0%.

In some instances, the owner may be required to extend internal private sidewalks beyond the property to connect with existing or proposed public sidewalks, or extend public sidewalks to ensure complete pedestrian systems. This will be determined at the time of review by the Director of Operations.

Any Sidewalk placed within the City ROW as part of the site plan control shall meet City of Brockville standards and all costs shall be the responsibility of the developer. Any curb ramp placed within the City ROW as part of the site plan control shall include tactile walking surface indicators as specified by the Accessibility for Ontarians with Disabilities Act, 2005.

Applicable Standards:

City of Brockville; Detail 1.

OPSD; 310.010, 310.020, 310.033, 310.039, 310.050.

4. Curbs

(See Appendix "I" for Details)

Note: the curbing referred to in this section is for elevated poured-in-place or pre-cast interlocking types.

On the private side of a property abutting Municipal boulevards curbing is required.

Curbing to define Traffic Flow areas and access control (points of ingress and egress) is necessary.

The containment of storm water on-site in part by means of curbing may be necessary based on such matters as the extent of proposed parking area and nature of surrounding development.

The Protection of Walkways/Sidewalks, Building, Fencing, Landscaping and Landscaped Strips by means of curbing shall be required.

In conjunction with the Building section of the Site Design Guidelines, garbage receptacle areas shall be on elevated concrete pads, unless otherwise determined not be beneficial to the overall functioning of the development.

Curbing shall be required for all properties subject to Site Plan Control. In addition, minor roadways within private sites, whether for Commercial or Residential use, curbing on both sides of the street is required.

Any curbing placed within the City ROW as part of the site plan control shall meet City of Brockville standards and all costs shall be the responsibility of the developer.

Applicable Standards:

City of Brockville; Detail 1.

OPSD; 600.040, 600.060, 600.110, 603.020, 608.010.

5. Exterior Lighting

The nature, design, spread pattern and location of on-site exterior lighting should be designed to be directed down and away from adjacent and neighbouring properties and public roads; particularly where the amenity, enjoyment or proper usage of the nearby area is affected, to avoid light pollution.

Depending on the type of project and location, the City may require a lighting distribution plan, including expected luminance levels (minimums, maximums and averages) and compliance with criteria for acceptable levels for both the site and transient lighting (glare) towards adjacent properties and neighbourhoods. Applicants and Owners are to utilize dark sky friendly light techniques.

6. Signage

Property Owner(s) must affix municipal address number(s) that are assigned on their main building. These numbers must be clearly visible from the municipal roadway for emergency services. Please note that municipal addresses are only provided at the time of building permit issuance.

The design and location of free-standing and fascia signs is critical to the overall success of the development. Details and locations of all exterior signs are to be included on the plans.

For free-standing pylon signs reference should be made to the City's current Sign By-law for further details.

Separate permits for the erection of signs are required as per the current Sign By-law.

In addition, signs intended to be lit must not cause hazardous glare on traffic on adjacent roadways. No FLASHING lights of any kind will be permitted.

7. Parking for Persons with Disabilities and Signage

Parking spaces designated for the use of the physically disabled shall be provided and signed in accordance with the requirements of the Highway Traffic Act, Integrated Accessibility Standards of the Accessibility for Ontarians with Disabilities Act & Zoning By-law 050-2014 and its regulations; said spaces are to be:

- 3.5 metres minimum width with a minimum length of 5.5 metres.
- Calculated at a minimum rate of one (1) space per fifty (50) parking spaces required.
- Hard surfaced.
- Located so as to be readily accessible to physically disabled persons, whether via ramps, depressed curbs or other means, and, where the public parking areas are intended to serve a particular building or complex, located within easy access of said building or complex.
- Identified by signs conforming to the requirements of the Highway Traffic Act; and signs required under subsection (1) (e) to be mounted on a permanent post with the bottom of the sign a minimum of 1.2 m and a maximum of 1.8 m above ground level, with said post to be located at the end of the designated parking space at a point marking the midpoint in width of the parking space or spaces.
- All Parking Spaces for Persons with Disabilities must contain the international symbol for accessibility painted within the parking space and the remainder of the space painted blue or be unpainted.
- Kept free from obstructions, kept clear of snow, and be otherwise maintained to the same standards as all other parking spaces in the same public parking area.
- Every owner or operator of each public parking area in which signs are located pursuant to the Highway Traffic Act and this Section shall be responsible for the procurement, installation and maintenance of the said signs and for ensuring that said signs conform to the provisions of the Highway Traffic Act and this Section.

NOTE: Refer to Zoning By-law 050-2014, as amended, for all parking provisions, size of parking space and quantity required for all uses.

Provide barrier free access to the buildings as per the requirements of the Ontario Building Code including provision of parking spaces, curb depressions, and access to building entrances, ramps and railing.

Design Guidelines

Infrastructure and Municipal Works Department

1. Grading, Storm Sewer, Storm Drainage & Storm Water Management

(See attached Appendix "I" and "J" for details. Appendix "J" also includes "Appendix I: Guidelines for Stormwater Management" from the CRCA)

Low Impact Development (LID) is to be implemented for storm water management as per current MOECC guidelines. LID MOECC guidelines shall take precedent for all storm water management designs and is to be used in conjunction with the following;

Lot grading shall be such that runoff from paved areas and large grassed areas are directed toward adjacent lands, including the municipal road allowance. Please refer to City of Brockville Drainage By-law 113-91 for specific requirements relating to drainage.

Where overland flow from adjacent property is tributary to the development site, it must be accommodated in the design (i.e. no damming of flow).

Storm runoff shall be collected and discharged to a suitable outlet, i.e. municipal ditch or storm sewer. For projects requiring Site Plan Control Approval, a Manhole may be required to be provided at the property line.

Discharge must be controlled to prevent hydraulic overloading of the receiving sewer system and/or to prevent flooding of receiving waterbodies. Usually the outflow rate is equivalent to the pro-rated sewer capacity. This is determined on a site specific basis and as needed by the Environmental Services Department and/or the Cataraqui Region Conservation Authority (CRCA).

The development shall utilize a piped storm system where a municipal storm/combined sewer is available, or where a municipal storm sewer can be extended to service the property.

Commercial and residential developments in the rural area (where no storm sewer exists in the ROW) should utilize a piped storm system to control out-letting to the roadside ditch providing it has sufficient depth. Should the roadside ditch be too shallow, an on-site ditch conveyance system shall be utilized.

Where ditch conveyance is used, ditch side slopes should be grassed to prevent erosion. They should be no steeper than 3:1 to enable grass cutting.

Where storm flow is discharged to a ditch, appropriate erosion and outflow control at the sewer outlet or ditch junction shall be required.

The development should comply with the Master Drainage Plan or be consistent with standard practices for the particular watershed in which the development occurs where no Master Drainage Plan exists. Although storm water practices vary depending on the watershed, some type of storm Water control will be required for most development proposals. Storm Water requirement may be generalized as falling into one of two categories:

- The minor system shall be designed and analyzed for 1:2 and 1:5 year storm frequency. Any storage requirements due to insufficient outlet capacity of receiving sewer or ditch shall be determined to provide protection level and shall be contained within the development site. Less frequent events overflow to the major system.
- Zero runoff increase - dependency upon site characteristics the calculations area required for the 1:2 through the 1:100 year storm to determine on-site storage requirements. Should there be suitable overland runoff present for a major storm event (1:100 year storm), on-site storage is required for the minor storm event.
- All sites must be analyzed for the 1:100 year storm for overland flow.
- On site storm water storage requirements are site specific and site recommendations shall be made by the City and the CRCA.
- Flow calculations shall be calculated using the values in **Appendix "K"**, attached.

Depending on the area of land being developed and the complexity of storm water management, the City may require a storm water brief or a storm water management report prepared by a qualified Consulting Engineer. This report would identify storm water elements including pre/post-development flows, allowable discharge rate, storm water storage requirements, location and physical design of storage facility, type of flow control and maintenance and inspection requirements. Design information to assist in preparation of this report is available from the Environmental Service Department.

For storm sewer connections, indicate catch basin position and grate elevation, manhole position, proposed pipe location and diameter, and

slope with lengths and invert elevations, location and diameter of any culverts; indicate drainage outlet.

Storm water quality control may be required on larger developments dependant on potential contaminant contribution and impact. Urban environments affected will require sediment and contaminant (e.g. hydrocarbon) interception with appropriate quality control methods (e.g. Stormceptor, or equivalent) to the minimum level of 70% total suspended sediments removal. Enhanced quality control (i.e. 80% TSS removal) may be required in some circumstances where receiving waterbodies is particularly sensitive to impacts (e.g. wetlands), in accordance with MOECC guidelines. Rural environments affected will be permitted storm water quality swales and/or ponds with equivalent removal levels. Maintenance provisions will be required on all storm water quality facilities.

Works required on City lands - when servicing a site requires extending or upgrading the existing services or building new services on City owned land or Right of Ways, an Excavation Permit will be required and a Service Extension Agreement may be required for these works. All work to be performed within the City ROW is to meet City of Brockville specifications and standards and all costs to complete the work shall be the responsibility of the developer.

Applicable Standards:

City of Brockville; Detail 3, Detail 4.

OPSD; 219.110, 219.180, 400.010, 401.040, 405.010, 610.010, 701.010, 701.030, 704.010, 705.010, 708.010, 708.020, 708.030, 806.040, 808.010, 1006.010, 1109.030

2. Sanitary Sewer and Water Service **(See attached Appendix "J" for Details)**

For sanitary sewers, indicate any manhole or clean out location, pipe location and diameter and slope with length and invert elevations; show discharge point. For properties requiring Site Plan Control Approval, a Manhole shall be required to be provided at the property line.

For water service connection, indicate diameter, location, type and pipe to be used, location of meter and appurtenances and design flow (if required); show the diameter and location of watermain to be connected to and location and size of tap desired. Projects must also provide a water shut-off valve (Curb stop) at the property line. Curb stops shall not be located within a driveway or parking lot.

Works required on City lands - when servicing a site requires extending or upgrading the existing services or building new services on City owned land or Right of Ways, an Excavation Permit will be required and a Service Extension Agreement may be required for these works. All work to be performed within the City ROW is to meet City of Brockville specifications and standards and all costs to complete the work shall be the responsibility of the developer.

Applicable Standards:

City of Brockville; Detail 2, Detail 3, Detail 4, Detail 5, Detail 6

OPSD; 401.040, 405.010, 701.010, 701.021, 701.030, 704.010, 806.040, 806.060, 808.010, 1003.010, 1003.020, 1006.010, 1104.010, 1104.020, 1109.011, 1109.012, 1109.030

3. Utilities

All new development must provide underground electrical service including Bell, and Cable (even if accessed from overhead on street).

Relocation of utilities necessitated by the proposed site plan is the responsibility of the owner.

4. Traffic

Depending on the type and nature of the proposed development, the City may require a Traffic Impact Assessment (TIA) be prepared by a qualified engineer. Results of an independent or City initiated Traffic Impact Assessment may result in the developer being required to incorporate improvements on the City infrastructure.

All sites subject to Site Plan Control Approval should have one driveway entrance up to 9.0 metres in width with proper tapers and radiuses as to accommodate the largest expected vehicle. Additional Driveways and Access Lanes shall be permitted subject to regulations contained within Zoning By-law 050-2014, as amended.

Existing and adjacent entrance locations and design will also be reviewed and must be provided on a drawing with the Site Plan submission.

Driveways (on municipal right-of-way) are to be paved in all cases to the property line and preferably to the front of the proposed building by the owner. This is to prevent the tracking of gravel and mud onto the municipal right-of-way.

Entrances will not be permitted within 10.0 metres of an intersection and no closer than 15.0 metres to another entranceway on the same lot.

Sidewalks and curbs on City streets must be continuous through all entrances and exits. New sidewalk placed across entrances shall be a minimum 150mm in depth. All concrete poured within the City ROW shall be 30 MPa, and meet City standards.

In high volume parking lots open to the public, such as shopping malls, an internal roadway and pedestrian path system must be established to allow safe and efficient internal vehicular and pedestrian traffic. Such internal roadways must be well defined with barrier curbs and signed appropriately. Use of speed bumps, humps and line painting is encouraged at pedestrian crossings.

The driveway grade will be compatible with the existing or future sidewalk and a curb depression will be provided for each entrance.

On the Site Plan, indicate traffic flow, all pavement widths, all curve radii, width and length of drive-through and pick-up lanes.

In a controlled access parking lot the control booth shall be located as to provide a minimum on-site storage as not to interfere with traffic flow on adjacent streets.

The existing road allowance i.e. the total width of the municipal right-of-way should be clearly shown and dimensioned on the site plan. Within this right-of-way, indicate the existing roadway including curbs, shoulders, and public sidewalks. Locate all municipal services and utilities. Arterial roadways having a right-of-way less than 30.0 m and collector roads having a right-of-way less than 25.0 m may be subject to a road widening dedication as a condition of Site Plan Approval at no cost to the Municipality.

All Pavement, Hazard and Delineation Markings within the site are to be consistent with the latest version of Ontario Traffic Manual – Book 11. All costs of pavement markings added within the City right-of-way as a result of the development shall be the responsibility of the developer.

All permanent traffic signage within the site are to be consistent with the latest version of Ontario Traffic Manual – Books 5 & 6. All temporary traffic signage within the site are to be consistent with the latest version of Ontario Traffic Manual – Book 7. All costs of traffic

signage added within the City right-of-way as a result of the development shall be the responsibility of the developer.

All Drive-through portions of the site will be fully reviewed for stacking, radius, safety, refuse containers, etc.

Appendix A – Site Plan Control Requirements

CITY OF BROCKVILLE - SITE PLAN CONTROL APPLICATION REQUIREMENTS FOR A COMPLETE APPLICATION

The following items are/may be required with every Site Plan Control submission:

ITEM	MATERIALS/SPECIFICATIONS	COPIES REQUIRED
1.	SITE PLAN CONTROL APPLICATION FORM Complete the entire form as directed	1
2.	SITE PLAN CONTROL APPLICATION FEES As per City of Brockville's current User Fee By-law	
3.	PROPERTY - LEGAL DESCRIPTION & REGISTRATION INFORMATION Legal description of the property in the form required by the Land Registry Office, including the most recent registered instrument number applicable to the property (the most recent deed for the subject property showing the instrument number) and the date of registration.	1
4.	PLAN OF SURVEY (LEGAL DESCRIPTION OF SUBJECT PROPERTY) A plan of survey prepared by an Ontario Land Surveyor, and submitted in a form acceptable to the Registrar of Deeds for registration purposes. The survey and description should include lot and concession numbers, or registered plan number, and block and lot numbers of the subject and adjacent properties.	1
5.	EXISTING CONDITIONS PLANS - to be submitted in metric measurement To include the following information: <ul style="list-style-type: none"> • Title, location and date of project. • Name of adjacent property owners, and municipal address of adjacent properties. • Surrounding land uses. • Legal lines, such as boundaries, easements and constraints, and setback lines. • Location and dimensions of all driveways, roads (radii of turns), walks, buildings, walls, utilities (surface, sub-surface and overhead). • Contours of every 0.5 metres for slopes or less than 5%, and every 1.0 metre for slopes of more than 5%. An indication of off-site grades and major topographic features. • Spot elevations at key points such as lot corners. • Presence of swamps, streams, water bodies, and drainage ditches and swales. • General vegetative cover of the site and its surroundings, the location, elevation and size of prominent trees and shrubs on the development site. • Location of rock outcrops and other geological features on the site. • Elevations of the land around the development site and information concerning any stormwater run-off shedding onto the site from 	8 full size sets (24 x 36) and 1 (11 x 17) set.

	adjacent properties. • Bearings and lengths of property lines. • North arrow, scale, legend. • Bench marks (lists of City bench marks are available by contacting the City Environmental Services Department).	
6.	<p>SITE PLAN – Proposed Development Plan – to be in metric measurement and to include all of the following information:</p> <ul style="list-style-type: none"> • Zoning: Existing zoning and use of subject and adjacent lands. • Buildings: Overall dimensions (in metres or millimetres) of all proposed buildings and structures on site, including distances from buildings to site boundaries (setbacks). Indicate type of buildings and number of floors. • For residential development that is subject to Site Plan Control, elevation and cross-section plans are required. • Parking Areas: Labeled as to type (open, underground, carport, garage, etc.). Give total number of parking spaces with dimensions, and include all access routes, loading bays, overhead clearances, identification of handicapped spaces, etc. Most parking areas require curbing. Please refer to the City of Brockville Zoning By-law for regulations. Should curbing be required, details must be provided. • Driveway and Ramps: Give dimensions, and indicate location of ramps, circulation routes, all access locations, traffic directions, curbs, overhead clearances, etc. Show all turning radii. • Site Services: The plan must indicate: <ul style="list-style-type: none"> ▶ Location and size, in metric measurement, of all existing and proposed stormwater and sanitary sewers, hydrants, water, gas and electrical services, both subsurface and overhead; ▶ Size and slopes of proposed utility systems; ▶ Invert elevations of storm and sanitary sewer systems; ▶ Anticipated sanitary and storm water sewer generation in litres per second (l/s); ▶ Proposed surface drainage pattern with location and size of proposed culverts. ▶ Standards to which all services and curbing are to be constructed (see City Standards (attached as Schedule "B-2" to "B-6" and current OPSD standards.) • Location of all steps, terraces, gardens, fences, walls, monuments, fountains, signs, bank retention, etc. • Existing features to be retained (natural and/or manmade). • Proposed vegetation (including existing vegetation to be retained) such as trees, shrubs and ground covers. Label using common botanical names, show areas to be sodded, seeded, hedged or treated with other materials (i.e. brick, stone, concrete). Existing vegetation; show species, protection measures, depth of proposed overburden, aeration measures, etc. • Basement and first floor elevations. • For garbage and storage areas, show: locations and major access, proposed screening such as fencing and/or hedging, collection method. • Design features for disabled persons access – all projects <u>shall</u> provide for such access (i.e. depressed curbing, signage, on-site markings, dimensions, etc.) • Area labeled by function or type (i.e. parking areas, landscape areas, amenity areas, work areas). • Lands dedicated to parks, open space, playgrounds and other 	<p>8 full size sets (24 x 36) and 1 (11 x 17) set.</p>

	<p>recreation areas</p> <ul style="list-style-type: none"> • Existing contours every 0.5 m for slopes of less than 5% and at every 1.0 m for slopes greater than 5%. • Spot elevations at key points such as building corners, lot corners, tops and bottom of slopes, walls, curbs and steps, tops of proposed grate elevations, and invert elevations for all sewers. In addition, spot elevations 1.0 m outward from site corners (adjacent properties) are to be shown. • Lot numbers and all lot lines. • Stamp of Professional Engineer licensed in Ontario. • Title, location, date of project, name and address of developer(s) and agent(s). • North arrow, scale, legend, Key Plan. • Proposed grading slopes for asphalt and soft areas with arrows indicating direction and % of slope. • Parking lot surface(s) are to be constructed of a material acceptable to the City of Brockville as per the City of Brockville Zoning By-law. • Fire Access Route and Fire Protection Requirements (see Appendix E) 	
7.	<p>LANDSCAPE PLAN</p> <p>The location and type of all trees, shrubs, plantings, flowerbeds, earth mounds, gardens, etc. is required. Vegetation must be labeled using common botanical names (refer to Appendix G of this manual).</p>	<p>8 full size sets (24 x 36) and 1 (11 x 17) set.</p>
8.	<p>SERVICING PLAN – DESIGN CRITERIA FOR MUNICIPAL SERVICES</p> <p><u>Sanitary Sewers</u></p> <ul style="list-style-type: none"> • Design flow: <ul style="list-style-type: none"> ▶ use minimum design flow 1125 (450 x peaking factor) litres per capita per day (0.013 l/s per person) plus an infiltration allowance of 0.28 l/s per gross hectare; ▶ for residential row dwellings and apartments, use 2.5 persons per unit; ▶ for light commercial areas, use the minimum equivalent of 50 persons per hectare (or actual population density if known) plus infiltration allowance of 0.28 l/s per gross hectare. • Flow Velocities: <ul style="list-style-type: none"> ▶ maximum 3.0 m/s, pipe flowing full; ▶ minimum 0.6 m/s at actual flow. • Connections from Sewer to Streetline: <ul style="list-style-type: none"> ▶ for multiple family residential blocks and light commercial areas the minimum size shall be 150 mm diameter or as required, P.V.C. DR 28 C.S.A.B182.1; ▶ minimum depth at streeline shall be 1.80 cover; ▶ minimum grade shall be 1%. 2% is desirable. ▶ a 1200.0 mm diameter sampling manhole, complete with benching (701.010) frame and closed cover (401.040 'A') shall be installed at streetline. • Sanitary Sewage Characteristics: please contact the Engineering Division of the Environmental Services Department (613-342-8772) regarding City of Brockville Sewer Use By-law. 	<p>8 full size sets (24 x 36) and 1 (11 x 17) set.</p>

	<p>Storm Sewers</p> <ul style="list-style-type: none"> • Design Flows: <ul style="list-style-type: none"> ▶ Run-off Q = 2.78 AIR ▶ Where Q = Peak flow in l/s ▶ A = Area in hectares ▶ I = Average rainfall intensity in millimetres per hour ▶ R = Run-off coefficient <p>I and R to be determined from City of Brockville Short Duration Rainfall Intensity – Duration Frequency Data (see Appendix K).</p> <p>Use Time and Concentration of 15 minutes where end of storm sewer is taking in one full lot, 20 minutes where external lands are being taken in.</p> <p>The five (5) year curve must be used for storm sewer design as depicted on rainfall intensity curve entitled "Short Duration Rainfall Intensity – Frequency Data for Brockville PCC" (see Appendix K), which is dated 2014-12-21.</p> <ul style="list-style-type: none"> ▶ Show 2, 5, 100 year ponding limits on the plan with calculated volumes. ▶ Show 100 year overland flow. <ul style="list-style-type: none"> • Flow Velocities: <ul style="list-style-type: none"> ▶ maximum 4.5 m/s, pipe flowing full ▶ minimum 0.60 m/s. • Connections from Sewer to Streetline: <ul style="list-style-type: none"> ▶ for multiple residential blocks and light commercial areas, the minimum size shall be 200.0 mm diameter or as required, P.V.C. DR 35, C.S.A. B-182.2 or concrete pipe C.S.A. approved; ▶ minimum depth at streetline shall be 1.8 m cover; ▶ minimum grade shall be 1.0%, 2% is desirable; ▶ a 1200.0 mm diameter sampling manhole, unbenched with 300 mm sump (701.010), frame and open cover (401.040 'B') shall be installed at streetline. • Storm Flow Characteristics: <p>Contact the Engineering Division of the Environmental Services Department (613-342-8772) regarding City of Brockville Sewer Use By-law.</p> • Manholes and Catchbasins: <ul style="list-style-type: none"> ▶ precast units shall be used as per City of Brockville standards; ▶ storm manholes shall be built with 300.0 mm sump; ▶ catchbasins shall be built with a 600.0 mm sump; ▶ manhole and catchbasin spacing shall not exceed 91.4 m; ▶ catchbasins shall be located on roadways, parking lots and at any low point to serve a maximum area of 1858.0 square metres each of paving and 4645.0 square metres of sodded area. ▶ Maximum distance between manholes shall be 90.0 metres. <p>Fire Hydrant / Fire Connections:</p> <ul style="list-style-type: none"> • All fire hydrants and fire connections, on-site and within 90.0 metres of the property line limits, must be identified. 	
9.	<p>ARCHTECTURAL ELEVATIONS:</p> <p>Plans must show four (4) point buildings and site elevations, and two-way cross sections of all buildings on site.</p>	<p>5 full size sets (24 x 36) and 1 (11 x 17) set.</p>

10.	STORMWATER MANAGEMENT: By-law 86-92, Stormwater Management Guidelines for Urban Development, applies to all developments where the property involved is greater than 0.8 ha in extent. Copies of the Guidelines are available from the Planning Department and the Environmental Services Department – Engineering Division. Consultation with the Engineering Division and the Cataraqui Region Conservation Authority (CRCA) is recommended to discuss the requirements of the Guideline with respect to each development proposal.	
11.	SEWER USE BY-LAW: Sewer Use By-law, applies to all development within the City of Brockville. Consultation with the Environmental Services Department - Engineering Division is recommended to discuss the requirements of this by-law with respect to each development proposal.	
12.	CARE AND USE OF STREETS: Care and Use of Streets By-law, applies to all development within the City of Brockville. Consultation with the Operations Department – Transportation Division is recommended to discuss the requirements of this by-law with respect to each development proposal.	
13.	TRAFFIC: A Site Impact Analysis on the potential impact of a development on traffic characteristics <u>may</u> be required. Such analysis is at the discretion of the Director of Operations for the City of Brockville.	1 (if required)
14.	ADDITIONAL INFORMATION: The Applicant is invited to submit any other supporting materials such as photographs, perspective plans, soil condition reports, etc. It should be noted that in special cases this type of material and information may be required from the Applicant if considered necessary. (All Plans, except the Plan of Survey, may be combined as one or more plans if they are not confusing to read. However, if the plans are unreadable, they will be refused.) Drawings must be folded and provided together in sets. Unless otherwise indicated, all plans and drawings must be at a usable scale (i.e. 1:100, 1:200, 1:300). Plans must be submitted only in metric measurement. Applicants should contact the Engineering Division to review a list of all City and area elevation benchmarks.	

Appendix B – Letter of Credit Example

CITY OF BROCKVILLE

APPROVED FORM OF IRREVOCABLE STANDBY LETTER OF CREDIT

Agreement Type: _____

Letter of Credit No.: _____ Amount: _____

Initial Expiry Date: _____

To: The Corporation of the City of Brockville

Address: c/o The Planning Department
One King Street West, P.O. Box 5000
Brockville, ON K6V 7A5

We hereby authorize you to draw on the (Name of Bank and Branch)

For the account of (Name of Customer) _____

Up to an aggregate amount of _____ Dollars

(\$ _____) available on demand.

Pursuant to the request of our customer (Name of Customer):

We/the (Name of Bank) _____
hereby establish and give to you an Irrevocable Standby Letter of Credit in your favour in the above amount which may be drawn on by you, at any time and from time to time, upon written demand for payment made upon us by you, which demand we shall honour without enquiring whether you have the right as between yourself and the said customer to make such demand, and without recognizing any claim of our said customer, or objection by our said customer to payment by us.

The Irrevocable Standby Letter of Credit we understand relates to the obligations, financial and otherwise, imposed by Agreement between the Corporation of the City of Brockville and (Name of Customer)

The amount of this Irrevocable Standby Letter of Credit may be reduced from time to time as advised by notice, in writing to the undersigned, from time to time, by the Corporation of the City of Brockville.

This Irrevocable Standby Letter of Credit will continue in force for a period of one (1) year, but shall be subjected to the condition hereinafter set forth.

It is a condition of this Irrevocable Standby Letter of Credit that it shall be deemed to be automatically extended, without amendment from year to year, from the present or any future expiration date hereof, unless at least 30 days prior to the present or any such future expiration date, we notify you in writing by registered mail, that we elect not to consider this Irrevocable Standby Letter of Credit to be renewable for any additional period.

This Irrevocable Standby Letter of Credit is subject to the Uniform Customs and Practices for Documentary Credits (International Chamber of Commerce, Paris, France, Publication No. 500).

Dated at _____, Ontario, this the _____ day of _____, 20____

Countersigned by (Name of Bank): _____

Per: _____

Appendix C – Solid Waste, Refuse and Recycling

Solid Waste, Refuse, and Recycling

- a) Single family dwelling units or multi-unit residential buildings with five (5) units or less.
 - Residential buildings with five (5) units or less will receive collection curbside as stipulated in By-Law 093-2012 or any amendments thereto if street is assumed by the City.
 - Refuse and recycling will be the financial responsibility of the owner if it is located on any street not assumed by the City.
 - The owner and/or person in charge of every multiple unit building from which municipal solid waste, refuse, and/or source separated recyclables is to be collected shall be responsible for providing adequate weather resistant indoor or outdoor storage facilities for all municipal solid waste and/or source separated recyclables generated within the building between curbside collection dates, in accordance with all City by-laws, and shall be responsible for the placement curbside of garbage and recycling containers for collection in accordance with By-Law 093-2012.

- b) Multi-unit residential buildings with six (6) or more units where individual residential units in the building have separate entrances to the roadway and the street is assumed by the City.
 - Refuse and recycling collection will be curbside as stipulated in By-Law 093-2012 and any amendments thereto.
 - The owner and/or person in charge of every multiple unit building from which municipal solid waste and/or source separated recyclables is to be collected shall be responsible for providing adequate weather resistant indoor or outdoor storage facilities for all municipal solid waste, refuse, and/or source separated recyclables generated within the building between curbside collection dates, in accordance with all City by-laws, and shall be responsible for the placement curbside of garbage and recycling containers for collection in accordance with By-Law 093-2012.

- c) Multi-unit residential buildings with six (6) or more units without separate entrances for each unit and/or the street is not assumed by the City.

- Refuse and recycling collection is the financial responsibility of the owner.
- The owner or person in charge of every multiple unit building from which waste and recyclables are generated shall provide container for the use of all units therein.
- Facilities shall be sufficient for the collection, handling, and storage of the anticipated quantities of refuse and recyclables.
- The collection containers should be appropriate for the generator's site and activity. That is, they should be located conveniently, be properly sized, and made from materials that can adequately contain the waste.
- Storage areas and equipment must be provided for the materials. The method of storage must prevent damage to the materials and control litter. Requirements for preparation and shipping will usually be in accordance with a hauler, user or processor specification.

d) Industrial, Commercial and Institutional

- Refuse and recycling collection is the financial responsibility of the owner.
- Facilities shall be sufficient for the collection, handling, and storage of the anticipated quantities of refuse and recyclables.
- The collection containers should be appropriate for the generator's site and activity. That is, they should be located conveniently, be properly sized, and made from materials that can adequately contain the waste.
- Storage areas and equipment must be provided for the materials. The method of storage must prevent damage to the materials and control litter. Requirements for preparation and shipping will usually be in accordance with a hauler, user or processor specification.

All facilities are responsible to comply with all rules and regulations stipulated in Regulations 101 and 103 of the Environmental Protection Act and any amendments thereto and all other municipal, provincial, and federal regulations.

Bicycle Parking Requirements

If a lot is located within the area delineated as the Downtown and Central Waterfront Area, as shown on Schedule "B", or is zoned any Residential, Mixed Use, Commercial, Employment or Institutional Zone, bicycle parking shall be provided for the uses specified in Table 3.9 and in accordance with the provisions of Subsection 3.9.

- a) Bicycle parking and non-motorized vehicle sharing parking spaces shall be permitted as an accessory use in all zones.
- b) The minimum number of bicycle parking spaces shall be in accordance with **Table 3.9**:

Type of Use	Minimum Required Bicycle Parking
Institutional Residence	0.25 spaces per room or suite.
Retirement Home, Apartment Dwelling, Maisonnette Dwelling	0.25 spaces per dwelling unit.
School	1.0 space per 100.0 square metres of gross floor area.
Retail, Office or Restaurant Use with less than 3,000.0 square metres of gross floor area	1.0 space per 250.0 square metres of gross floor area.
Retail, Office or Restaurant Use with over 3,000.0 square metres of gross floor area	1.0 spaces per 250.0 square metres of gross floor area for the first 3,000.0 square metres of gross floor area, and 1.0 space per 500.0 square metres of gross floor area thereafter.
Hotel or Motel	1.0 space per 1,000.0 square metres of gross floor area.
Any other Non- Residential Use	1.0 space per 1,000.0 square metres of gross floor area.

Appendix E – Fire Safety Standards

Fire Safety Standards – Site Plan Applications

With the exception of fire route designations set out in By-law 119-89, all existing fire safety standards applicable to site plan applications are drawn from provincial regulations as follows:

- The Ontario Fire Code (particularly Parts 2, 3 and 6)
- The Ontario Building Code (Parts 2, 3, 9 and 11)
- The gasoline Handling Act
- The Ontario Propane Storage and Utilization Code

Final Fire suppression and access requirements may be subject to revisions as determined by construction plans in accordance with the listed Standards.

Each site plan application should include a drawing or statement denoting the proposed building major occupancy(s), building area and building height to facilitate review of fire safety requirements. In large projects the applicant should indicate the number of streets or access routes the building is intended to face in compliance with Subsection 3.2.2 of the Ontario Building Code. It should also be indicated if the building has a sprinkler system.

Drawing Requirements

The following additional information should be included with the site plan drawing where applicable.

- 1) Fire Access Routes should be surfaced with asphalt, concrete or suitable alternatives and designed to support the weight of firefighting equipment.

Access routes should have the following dimensions:

- Minimum 6.0 metre width.
- Maximum 15.0 metres from buildings principal entrance(s).
- Maximum 90.0 metres dead end length.
- Minimum 12.0 metre centre line turning radius.
- Minimum 5.0 metre overhead clearance height.

- 2) Water Supply

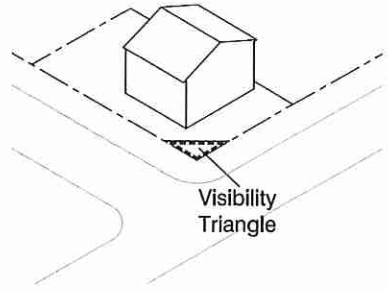
- Indicate location of all existing/new fire hydrants adjacent to the building and property.
- Indicate size of watermain serving hydrants.
- For buildings with sprinkler and/or standpipe systems, indicate water service size to building, available pressure and flow, and proximity of Siamese connection(s) to access routes and hydrants. Hydrants and watermain design standards may be obtained from the Environmental Services Department.

- 3) Location of municipal fire hydrants, underground mains, standpipe/ sprinkler Siamese connections, fire routes, signs.

- 4) Location of all outdoor storage of bulk combustibles or flammable material including fuel storage, tires, lumber piles and automobile salvage areas.

Appendix F – Visibility Triangle Policies

Visibility Triangles

- a) Notwithstanding any other provision of this By-law, within any visibility triangle as defined and required by this By-law, no person shall:
- i) erect any building, structure, opaque fence or use land within a visibility triangle for the purpose of planting or growing of trees, or the planting or growing of hedges or shrubs to a height exceeding 1.0 metre measured from the grade at the centreline of the street;
 - ii) use land in any visibility triangle on a lot for the parking or storage of a vehicle; and
 - iii) for clarity, and without limiting the generality of the foregoing, no person shall use a visibility triangle for any driveway, access, stacking lane, parking area or outdoor storage use.
- 
- The diagram shows a street intersection with a building on a corner lot. A dashed line forms a triangle at the intersection, labeled 'Visibility Triangle'. The building is situated within this triangle.
- b) Notwithstanding any other provision of this By-law, a visibility triangle shall be required on a corner lot at any at-grade intersection of two (2) or more streets or of a street and a rail line right-of-way that is measured according to that set out in **Table 3.49** below.

Classification of Street (1)	Classification of Intersecting Street	Size of Visibility Triangle
i) Local Road	Local Road	6.0 m
	Collector Road	6.0 m
	Arterial Road	10.0 m
ii) Collector Road	Local Road	6.0 m
	Collector Road	10.0 m
	Arterial Road	10.0 m
iii) Arterial Road	Local Road	10.0 m
	Collector Road	10.0 m
	Arterial Road	10.0 m
iv) Railway	Any type of street	15.0 m

(1) The street classifications shall be as indicated in the City of Brockville's Official Plan.

CITY OF BROCKVILLE SELECTED LANDSCAPING STANDARDS

SECTION I - TREES

1. GENERAL GUIDELINES AND SPECIFICATIONS

- 1.1** A permit must be obtained from the Parks Supervisor before any person, firm or organization either, for himself or another, plants, prunes, removes or destroys any tree in or upon the public right-of-way of any street, alley, sidewalk or other public place.
- 1.2** No permit shall be required of any Public Electrical Utility, their agents and contractors engaged in line clearance maintenance or City employees doing such work in the pursuit of their public endeavors.
- 1.3** All utilities and City employees must however, receive a permit from the Parks Supervisor for the removal of any tree from public property.
- 1.4** All Public Utilities, their agents, contractors and City employees must follow acceptable arboricultural standards and specifications for maintenance, as outlined in this document.
- 1.5** All personnel utilized for work on or with trees and shrubs on public property shall be trained to perform the work properly and safely in accordance with the requirements of the Occupation Health and Safety Act and amendments hereto.
- 1.6** Any work to City trees near or around electrical wires shall require that all personnel utilized for such work will have completed the required E.U.S.A. (Electrical Utilities Safety Association) training.
- 1.7** Qualified supervisors shall be present at all times when work is being performed.
- 1.8** All such work shall be conducted in a manner so as to cause the least possible interference with on annoyance to others.

- 1.9** Any injury to persons, or damages to any improvement, vehicle, tree, shrub or structure while working with public trees shall be promptly reported to Parks Supervisor.
- 1.10** Any use of tools or equipment in unsafe condition or any application of techniques or methods deemed unsafe to life, limb or property is forbidden.
- 1.11** Pedestrians and vehicular traffic shall be allowed to pass through the work areas only under conditions of safety and with as little inconvenience and delay as possible.
- 1.12** Adequate barricades and warning devices must be placed and flagmen shall be stationed as necessary for the safety of persons and vehicles.
- 1.13** Proper street and sidewalk warning devices shall be in position as required at all times while work on public trees is being performed.
- 1.14** No person shall dig any hole or trench without first obtaining locations of the buried services in the area, from the proper local Public Utilities.
- 1.15** Whenever electric or telephone lines, gas lines, water lines or other improvements, public or private, on a public area will be implicated or jeopardized by any authorized tree activity, the proper authorities of the utilities involved shall be consulted prior to performing any work activity and all requested precautions by any such authority shall be complied with.

2 DEFINITIONS

- 2.1** STREET TREES: Street trees are herein defined as trees on the public right-of-way between the curb or road surface and property line along the side of streets or in medians of all streets, avenues, boulevards or roadways within the city.
- 2.2** PARK TREES: Park trees are herein defined as trees in public parks, green belts and all other areas owned by the City, or any area to which the public has free access as a park.

3 PLANTING STANDARDS

- 3.1** Public projects and areas including parks, streets, medians, boulevards, sub-stations, treatment plants and public buildings shall provide for street and park tree planting as a part of the development process. The landscape plan for such projects shall be approved by the Parks Supervisor and adhere to the standards and specification as outline herein.
- 3.2** Private projects shall provide for street tree planting as part of the development process. Street trees shall be located on the public right-of-way and adhere to the design objectives and spacing and location requirements of this document i.e.: large shade trees every 10.0m, medium tree every 8.0m and smaller trees every 6.0m. species selection shall be from the accompanying suggested tree species list. All tree planting on the public right-of-way shall be approved by the Parks Supervisor.
- 3.3** Existing public properties shall receive new infill planting on an ongoing basis. All removed public trees, either from parks, public buildings or street shall be replaced with two or more new trees.
- 3.4** Site criteria to be evaluated in determining tree planting locations shall be:
- i. Visibility of site.
 - ii. Probability of long term tree survival.
 - iii. Likelihood of private participation and financing.
 - iv. Overall benefit to the community.
- 3.5** Public tree planting must be accomplished by the balled and burlaped, tree spade or container method. Bare root plantings are not permitted without written approval of the Parks Supervisor.
- 3.6** The following are the minimum sizes for plant material. Larger sizes may be required to ensure survival or provide a landscape effect.

Shade Trees	70mm caliper
Ornamental Trees	70mm caliper
Evergreen Trees	1.8m height
Shrubs	14 litre container

- 3.7** No single species shall make up more than 15% of the total City tree population. This is to prevent uniform disease susceptibility and eventually uniform senescence. Therefore, the following represents the minimum tree species variation for a given site.

# of Trees at Site	Max. % of any one species at site
10 – 19	50% of one species
20 – 39	33% of one species
40 – 59	25% of one species
60 or more	15% of one species

- 3.8** The following trees are not permissible as street tree plantings in the City of Brockville; however, they may be used in larger open space parks.

- Acer Saccharinum – Silver Maple
- Populus species – Poplars
- Salix species – Willows

4 ACCEPTABLE PLANT SPECIES FOR BOULEVARD PLANTING

NOTE: Unless otherwise noted, cultivars or accepted species may be used.
 (s) = demonstrates good tolerance to road salt
 (w) = tolerant of poorly drained soil conditions (clay)

- 4.1** **Large Street Trees** – Spacing approximately 10.0 m apart (over 18.0 m in height)

Scientific Name	Common Name
Acer platanoides	Norway Maple (s) (w)
Acer rubrum	Red Maple (w)
Acer saccharum	Sugar Maple
Fraxinus pennsylvanica	Green Ash (s) (w)
Gleditsia triacanthos	Honey Locust (s)
Quercus rubra	Red Oak (s) (w)
Tilia cordata	Little-leaf Linden
Ulmus Davidiana japonica "Jacan"	Jacan Japanese Elm (s)

- 4.2** **Medium Street Trees** – Spacing approximately 8.0 m apart (9.0 m to 18.0 m height)

Scientific Name	Common Name
Celtis occidentalis	Hackberry (w)
Ostrya virginiana	Ironwood
Pyrus calleryana "Capital"	Capital Pear (s)
Pyrus calleryana "Redspire"	Redspire Pear (s)

4.3 Small Street Trees – Spacing approximately 6.0 m apart (under 9.0 m height) – for use in restricted spaces (overhead wires)

Scientific Name	Common Name
<i>Acer ginnala</i>	Amur Maple (s)
<i>Crataegus mordenensis</i> "Toba"	Toba Hawthorne
<i>Crataegus mordenensis</i> "Snowbird"	Snowbird Hawthorne
<i>Malus baccata</i>	Siberian Crabapple
<i>Malus</i> spp.	Crabapple
Acceptable cultivars include:	Dolgo, Hopa, Makamik, Royalty
<i>Syringa amurensis japonica</i>	Japanese Tree Lilac (s)

4.4 Buffer Planting Behind Sidewalks/Adjacent to Fencing

Any of the above material in addition to the following list, which is not exhaustive, but serves as a guide for urban plant material for this area:

CONIFEROUS MATERIAL	
Scientific Name	Common Name
<i>Juniperus horizontalis</i> and cultivars such as: "Bar Harbour, Blue Aces, Pulmosa Compacta, Prince of Wales, Wiltonil"	Creeping Juniper (s)
<i>Juniperus Sabina</i> and cultivars such as: "Arcadia, Blue Danube, Calgary Carpet, Skandla, Tamariscifolia"	Savin Juniper(s)
<i>Larix decidua</i>	European Larch (s)
<i>Picea abies</i>	Norway Spruce
<i>Picea glauca</i>	White Spruce
<i>Picea omorika</i>	Serbian Spruce
<i>Picea pungens</i>	Colorado Spruce (s)
<i>Pinus mugho</i>	Mugo Pine (s)
<i>Pinus nigra</i>	Austrian Pine (s)
<i>Pinus sylvestris</i>	Scot's Pine

DECIDUOUS MATERIAL	
Scientific Name	Common Name
<i>Amelanchier Canadensis</i>	Serviceberry (w)
<i>Caragana arborescens</i>	Siberian Pea Shrub (s)
<i>Cornus alba</i> "Ellegantissima"	Silver Leaf Dogwood (w)
<i>Cornus sericea</i>	Red Osier Dogwood (w)
<i>Cotoneaster acutifolius</i>	Peking Cotoneaster
<i>Elaeagnus angustifolia</i>	Russian Olive (s)
<i>Euonymus alatus</i>	Winged Euonymus (s)
<i>Hydrangea arborescens</i> "Annabelle"	Annabelle Hydrangea
<i>Lonicera morrowii</i>	Morrow Honeysuckle (s)

Lonicera tatarica	Tatarian Honeysuckle (s)
Lonicera exyosteam	Clavey's Dwarf
	Honeysuckle (s)
Physocarpus opulifolius	Ninebark
Potentilla fruticose Bush	
Cinquefoil(s) and cultivars such as: "Coronation Triumph, Farreri, Golfinger, Mt. Everest"	
Pyrnus virginiana	Chokecherry (s)
Rhus typhian	Staghorn Sumac (s)
Riber alpinum	Alpine Currant (s)
Rosa rugosa	Rugosa Roase (s)
Salix purpurea "Gracilis"	Artic Willow (w)
Sambucus Canadensis	American Elder (w)
Sorbaria sorbifolia	Falsepirea
Spiraea x bumalda and cultivars such as: "Anthony Waterer, Froebellii, Goldframe"	Bumalda Spirea
Syringa vulgaris (French Hybrids)	French Hybrid Lilac (s)
Syringa prestoniae	Preston Lilac (s)
Thuja occidentalis	Eastern White Cedar (w)
Viburnum dentatum	Arrowwood Viburnum (w)
Viburnum lantana	Wayfaring Tree
Viburnum lentago	Nannyberry
Viburnum Opulus and cultivars such as: "Nanum, Roseuni"	European Cranberry (w)
Viburnum trilobum	American Cranberry (w)

5 SPACING AND LOCATION REQUIREMENTS

5.1 Standard Planting Setbacks, All Species

Minimum distances between trees/large shrubs and the following typical roadway elements:

Street intersections	10.0 metres
Light standards	3.0 metres
Traffic signs (stop, yield, etc.)	3.5 metres
Private approaches (driveways)	1.5 metres
Fire hydrants/transformers	3.0 metres
Hydro poles	3.0 metres
Bus stops	3.0 metres
Manholes	3.0 metres
Sidewalks	0.75 metres
Underground utilities	1.0 metres
Buildings	1.5 metres

- 5.2** At the intersection of roadways or vehicular access points, no plant material with a mature height greater than 1.0 metre shall be planted within the visibility, measuring as per the classification of street (see Appendix "F" to this document), except where engineering standards indicate and permit otherwise.
- 5.3** No tree planting is permitted where the distance between a curb and a detached sidewalk is less than 1.2 metres. In addition, a planting area defined by two curbs, a curb and a fence or sidewalk and fence must be 1.2 metres wide if street trees are to be planted.
- 5.4** All tree plantings in new subdivisions and along collector and arterial streets will be in accordance with the locations as outlined in the Engineering Department's road allowance cross sectional drawings. In existing subdivisions, where utilities allow, trees shall be centred in the planting strip when the distance between the curb and attached sidewalk is 3.4 metres or less.
- 5.5** No street tree planting is to be made closer to the street than 750mm behind the face of the curb. The face of the curb is the street side of the curb.
- 5.6** Larger measuring trees should be spaced approximately 10.0 metres apart, medium trees spaces approx.. 8.0 metres apart and smaller maturing trees spaces 6.0 metres apart. The Park Supervisor may require wider spacing if it is necessary for development of the tree or for safe use of the street or sidewalk. When spacing is limited or to achieve certain design effects, closer spacing may be considered.
- 5.7** No tree shall be planted closer than 1.5 metres from any driveway or alley nor shall a tree or shrub be planted in such a manner that its eventual growth cannot be reasonably controlled so as to avoid interference with or obstruction to any improvements installed for public benefit.
- 5.8** Tree plantings made in the sidewalk must have a minimum of 3.0 square metres of cut out area.
- 5.9** The cut out area required in 5.8 (above) may be granted or otherwise surfaced with a material which allows uninhibited

infiltration and exfiltration. The surfacing material must be approved for use by the Parks Supervisor prior to installation.

5.10 No tree planting is to be made within 1.5 metres of any building or structure.

5.11 No street trees other than those low growing species that do not attain a mature height greater than 6.0 metres shall be planted under or within 3.0 metres of any overhead power lines inclusive of street light or service lines.

6 PLANTING SPECIFICATIONS

6.1 Plant Material

- a) Plant material shall conform to the guide specifications for Nursery Stock of Canadian Nursery Trades. Material shall be of standard quality, true to name and type and a first class representative of their species or variety.
- b) Plants shall have normal, well developed branches and vigorous root systems. They shall be healthy, vigorous plants free from defects, decay, scald injuries, abrasions of the bark, insects, pests and all forms of infestation or objectionable disfigurements.
- c) Balled and burlaped plants shall be dug with solid balls of adequate size. The balls shall be securely wrapped with burlap or canvas, tightly bound with rope twine or wire basket. Allow 400mm diameter root ball for every 25mm of trunk diameter.
- d) The minimum sizes of plants are as specified under planting standards. Variances must be authorized by the Parks Supervisor.
- e) The Parks Supervisor may request to inspect any trees or shrubs before they are planted.

6.2 Planting Methods and Techniques

- a) The planting methods as identified on the "Planting Detail Drawings shall be adhered to, for all planting on public property.

- b) Circular pits with sloping sides shall be excavated for all balled and burlaped container pots. All pits should be at least 2 times wider than the ball and at least the depth of the soil ball.
- c) For all balled and burlaped container plantings, the backfill shall be 25% peat and 75% soil of a desirable structure, texture and PH for plant growth. The Parks Supervisor will decide if the existing soil at each location is adequate for use in the backfill or if soil will have to be brought in. Backfill shall be added and tamped firmly around the ball or root system at 150mm increments until the pit is 2/3 full. The remaining open space in the pit should be soaked with water and let soak in twice before final backfilling. The top layer of soil should be thoroughly soaked with water.
- d) For all plants moved with a tree spade, all holes and cavities between the ball and surrounding soil should be filled. The ball should be thoroughly soaked with water after planting.
- e) All plants should be centred in the pit set at the depth of the ball or slightly higher than they were when growing at the nursery.
- f) All evergreen trees in excess of 1.8 metres in height and any deciduous tree insecure in the ground shall be guyed. The method shall be approved by the Parks Supervisor.
- g) Prior to digging any planting pit, it is necessary to check with the Utility Companies for underground electric or telephone lines, gas lines, water lines or any other improvements, public or private.
- h) All tree and shrub plantings should be mulched over the root system with 100mm of wood chips or equivalent.
- i) A 200mm watering dike will be constructed around all new tree and shrub plantings when determined by the Parks Supervisor to be necessary to ensure adequate irrigation.
- j) When planting a tree that will be surrounded by a hard surface, there should be a minimum of 3.0 square metres of porous surface for trees up to 100mm in trunk diameter and 1.0 metre for each additional 50mm of trunk diameter.

6.3 Planting Standards of Workmanship

- a) Trees and shrubs should not be dug, balled or burlaped or moved with a tree spade during the active growth period, unless the ball is large enough to ensure survival.
- b) Plant material shall be handled in a manner so as to cause the least amount of damage during the planting process.
- c) Evergreen trees with an excessively bushy form of growth shall have the boughs tied up with rope or twine during transporting and planting to avoid damage to the foliage and branches. After planting the boughs should be released.
- d) Balled and burlaped and container plants shall always be handled by the soil ball. Under no circumstances should they be dragged, lifted or pulled by the trunk or foliage parts in a manner that will loosen the roots in the ball.
- e) In cases where trees or shrubs are loose in a soil ball, the ball shall be secured with twine or burlap before transporting to the planting site.
- f) On the jobsite, plants shall be handled, secured or covered so as to prevent damage from wind or vibration. Plants should never be thrown or bounced off a truck or loader to the ground.
- g) Plant materials shall be planted the day it is taken to the planting site or it should be watered and covered and placed in a shade area to prevent dehydration.
- h) Any abrasions of the bark or broken limbs or branches caused in the planting operation the trunk should be protected with wrap or padding.
- i) In cases where trees are apt to have their trunks scarred during the planting operation the trunk should be protected with wrap or padding.
- j) Excavated plant pits that will be left open when work is not in progress or pose an immediate and considerable hazard

to traffic shall be adequately barricaded with qualified warning devices.

- k) All twine, rope or wire and plant labels secured around the trunk shall be removed after planting is complete.
- l) Trees or shrubs that have their soil ball secured in a wire basket shall have the wire bent back and down around the ball and the top 1/3 cut off after the plant is placed and centred in the pit and before backfilling occurs.
- m) Cleanup of any soil, branches or other debris resulting from any tree or shrub planting shall be promptly accomplished. The work area shall be kept safe at all times until the cleanup operation is completed. Under no conditions shall the accumulation of soil, branches or other debris be allowed upon the public property in such a manner as to result in a public hazard.

7 DEVELOPMENT CONSTRAINTS

- 7.1** Development proposals for public open space, plans or subdivision and private lot development, shall be required to include a complete landscape plan showing all existing trees. Trees to be saved and removed shall be indicated on the landscape plan.
- 7.2** No tree clearing or tree removal within the plan shall be undertaken unless such clearing or tree removal is a consequence of road, service construction, or the construction of a noise barrier.
- 7.3** Prior to the issuance of any building permit for any dwelling or commercial building within the plan, an individual tree saving plan identifying trees to be saved and the location and extent of protective barriers to be used to protect the said trees during construction shall be prepared and presented to the City for its approval.
- 7.4** Any field work or inspections required by City Staff as a consequence of this requirement shall be paid for by the property developer/owner.

- 7.5** Any building, pool or other construction required on any lot after the construction of the main building on the lot shall be constructed in such a manner so that trees identified for saving in the tree saving plan for that lot shall not be removed or destroyed as a result of the construction.
- 7.6** the developer/owner shall be required to plant a minimum of one (1) tree on each lot created, in accordance with the planting standards as defined in Section III of the Arboricultural Guidelines and Specifications Manual which outlines tree species, minimum tree caliper, tree spacing and locations.

8 BARRIERS FOR TREE AND WOOD LOT PROTECTION

- 8.1** Barriers for tree protection shall be erected prior to commencement of any development or construction activities so as to provide a continuous barricade between trees and the work area. The barricade shall be maintained erect and in good repair throughout the duration of construction operations, and shall be removed upon completion of the work and disposed of outside the right-of-way.
- 8.2** The barrier shall be placed at the drip line of trees or wood lot edges unless this is inadequate to provide a 1.5 metre buffer zone between the barrier and the limit of grading. The barrier may be placed within the drip line if necessary to provide a buffer zone of up to 1.5 metres. Under no circumstances shall it be placed less than 0.5 metres from the circumference of a tree trunk. When the trunks are less than 4.5 metres apart, the tree shall be considered a group, and the barrier shall be placed to form a continuous barricade.
- 8.3** The barrier shall consist of a good substantial fence, not less than 1.2 metres high and all material, dirt and other debris. Construction equipment or vehicles shall be kept outside of the barricaded area.

SECTION II – GROUND COVER

1. GENERAL GUIDELINES AND SPECIFICATIONS

1.1 Materials

- Number one Kentucky Bluegrass sod: grown from minimum mixture of 3 Kentucky Bluegrass cultivates complying with standards set out by Landscape Canada C.N.T.A. Nursery Guide.
- Topsoil: minimum 100mm (4 in.) underlay.
- Wooden pegs: 17 x 17 x 200mm (0.6 in. x 0.6 in. x 8 in.)
- Fertilizer: complete synthetic slow release fertilizer with maximum 35% water soluble nitrogen.

1.2 Execution

- a) Laying Sod:
 - Prior to sodding obtain approval from Consultant or City Staff that finished grade and topsoil are satisfactory.
 - Laying sod during excessively wet conditions, at freezing temperatures or over frozen soil is not acceptable.
 - Lay sod perpendicular to slope, stagger joints. Butt sections closely without overlapping or leaving gaps.
 - Roll sodded area to provide contact between sod and soil. Rolling to correct irregularities in grade is not permitted.
 - Water sod immediately after laying, ensure moisture penetration to a minimum depth of 100mm (4 in.).
- b) Laying Sod on a Slope:
 - Place mesh on top of topsoil of slopes steeper than 3:1. Secure mesh in place with wooden pegs at intervals of 1000mm (0.97 metres). Cover mesh lightly with topsoil.
 - Lay sod perpendicular to slope and secure with pegs. Place three (3) pegs per metre square (3/sq. yd.) pegs should be flush with sod.
 - Protect sodded area with the necessary barriers required.

1.3 **Maintenance**

Maintain sodded areas from start of installation until final acceptance as follows:

- Water sodded area at frequency required to maintain continuous growth. Minimum soil moisture depth 100mm (4. In.).
- Cut grass to 40mm (1.5 in.) when it reached height of 60mm (2.3 in.).
- Fertilize sodded areas one month after sodding with 2:1 ratio fertilizer.

1.4 **Acceptance**

Sodded area will be accepted at final inspection provided that:

- Sodded area is established.
- No surface soil is visible when grass has been cut to a height of 40mm (1.5 in.).
- Sodded areas have been cut twice.
- Lawns sodded in fall will be accepted the following Spring or month after growing seasons starts provided that they are found to be satisfactory.

2. SEEDING

2.1 **Materials**

Canada Certified No. 1 Grade seed in accordance with Government of Canada Seed Act and Regulations with 97% purity and 75% germination.

Seed Mixes:

Sportsfield	Parkland	Sloped Areas
60% Tall Fescue	30% Canada Bluegrass	5% Canadian Bluegrass
20% Kentucky Bluegrass	20% Kentucky Bluegrass	25% Tall Fescue
20% Perennial Rye	30% Tall Fescue	30% Hard Fescue
190.5 kg/ha	20% Perennial Rye	15% Perennial Rye
	190.5 kg/ha	25% Birdfoot Trefoil
		135.0 kg/ha

2.2 Execution

- a) Workmanship:
 - Do not perform work under adverse field conditions.
- b) Seeding:
 - Provide a minimum 150mm (6 in.) of topsoil underlay.
 - Prior to seeding obtain approval from Consultant or City Staff that finished grade and topsoil are satisfactory.
 - Sow seed uniform. Blend application into adjacent areas to form uniform surfaces.
 - Sow half of required amount of seed in one direction and remainder at right angles.
 - Embed seed into soil to depth of 5mm (0.19 in.) within 1 hour of sowing. Roll area prior to watering.
 - Water with fine spray to prevent washout of seed.
 - Protect seeded area against damage.

2.3 Establishment

Provide maintenance from the time of application until final acceptance as follows:

- Water seeded area to ensure germination and continued growth.
- Repair and reseed dead or bare spots.
- Cut grass to 40mm (1.5 in.) whenever it reaches height of 60mm (2.3 in.).
- Fertilize seeded area after cutting. Postpone fertilizing until following spring if application falls within four (4) week period to expected end of local growing season.
- Eliminate weeds.

2.4 Acceptance

Seeded area will be accepted by Consultant or City Staff provided that:

- Areas are uniformly established and turf is free of eroded, bare or dead spots.
- Areas have been cut at least twice.
- Areas have been fertilized.

3. SEEDING

3.1 Materials

- a) Grass seed (Common No. 1) in accordance with Government of Canada Seed Act & Regulations.
- b) Mulch:
 - Fibres: 40% organic content (may vary depending on soil conditions).
 - Free of growth inhibiting ingredients.
 - 60% potential water uptake (may vary depending on soil conditions).
 - Capable of dispersing in water to form homogeneous slurry.
 - Capable of forming an absorptive mat ground cover, allowing water to penetrate mulch larger.
- c) Tackifier: water dutiable liquid dispersion containing polyvinyl acetate terpolymer emulsion.
- d) Hydro Seed Mixture:
 - Chosen seed mixture.
 - Tackifier: organic, Gnar Gum mixture
 - Hay/Straw or fibre mulch.
 - Water.

Note: In accordance with Albion Seed, Bolton, Ontario, recommended rate of metric 20 lb. per acre of the slurry above. Rates may differ greatly depending on manufacturer and severity of the potential erosion problem.

- e) Erosion control blanket, blanket anchors, staples.

3.2 Execution

- a) Workmanship
 - Take care to prevent spraying items, i.e. fencing, plant material, etc.
 - Do not perform work under adverse field conditions, i.e. winds over 10km/h (6 miles/hr).

- b) Site Preparation
 - Cultivate area to be seeded to a depth on 25mm (1 in.).
 - Ensure that moisture depth exceeds 150mm (6 in.).
- c) Slurry Application
 - Slurry application applied per hectare in accordance with manufacturer's recommendations.
 - Apply seed slurry uniformly.
 - Blend applications into adjacent areas to form uniform surfaces.
 - Reshoot areas where application is not uniform.

3.3 Establishment

Perform the following maintenance from time of seed application until final acceptance by Consultant or City Staff:

- Water seeded area to ensure germination and continued growth.
- Control washout areas.
- Cut grass to 40mm (1.5 in.) whenever it reaches height of 60mm (2.3 in.).
- Fertilize area one (1) month after seeding. Fertilizer rotation 2:1:1.
- Repair dead or bare spots.
- Eliminate weeds.

3.4 Acceptance

Areas will be accepted by Consultants or City Staff provided that:

- Seeded areas are uniformly established and free of rutted, eroded, bare or dead spots.
- Seeded areas have been cut at least twice.
- Areas seeded in the fall will be accepted the following spring, one (1) month after the start of the growing season, provided area meets approval.

4. SEEDING

4.1 Materials

- Minimum depth of mulch 100mm (4 in.).
- Mulching types: shredded pine bark (preferred) wood strips, pea gravel, brick chips, synthetic mulch, husks (vegetation).

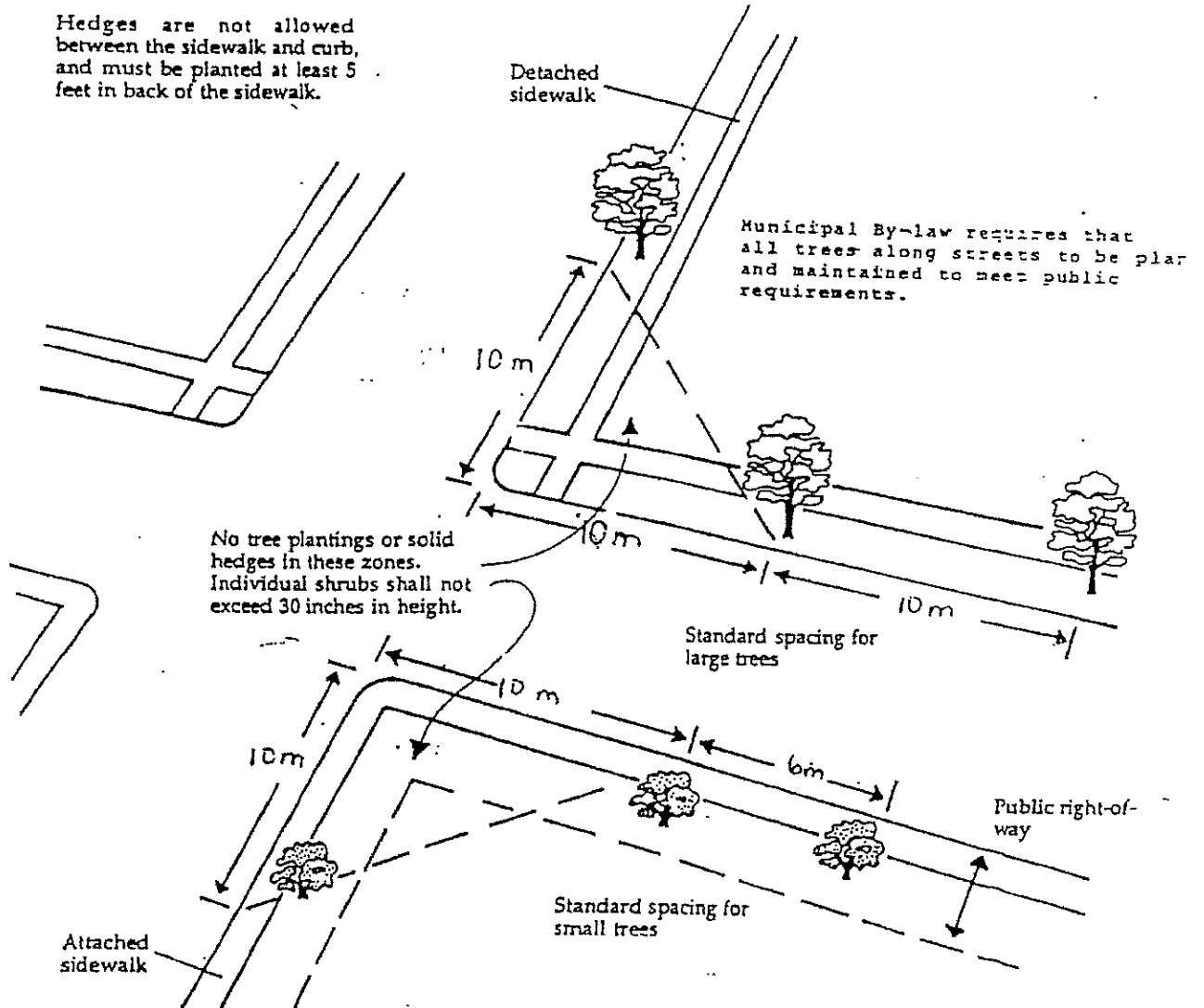
4.2 Execution

- Ensure soil settlement has been corrected prior to mulching.
- Mulch all plant beds and tree saucers.
- Mulch should be spread uniformly throughout the bed.
- Mulch insulates soil and delays spring thawing or frozen soil in root zone increasing mortality of plants. For fall planting in localities with deep frost, specify placing of mulch the following spring after soil thaws and soil temperature rises.

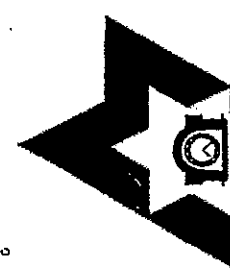
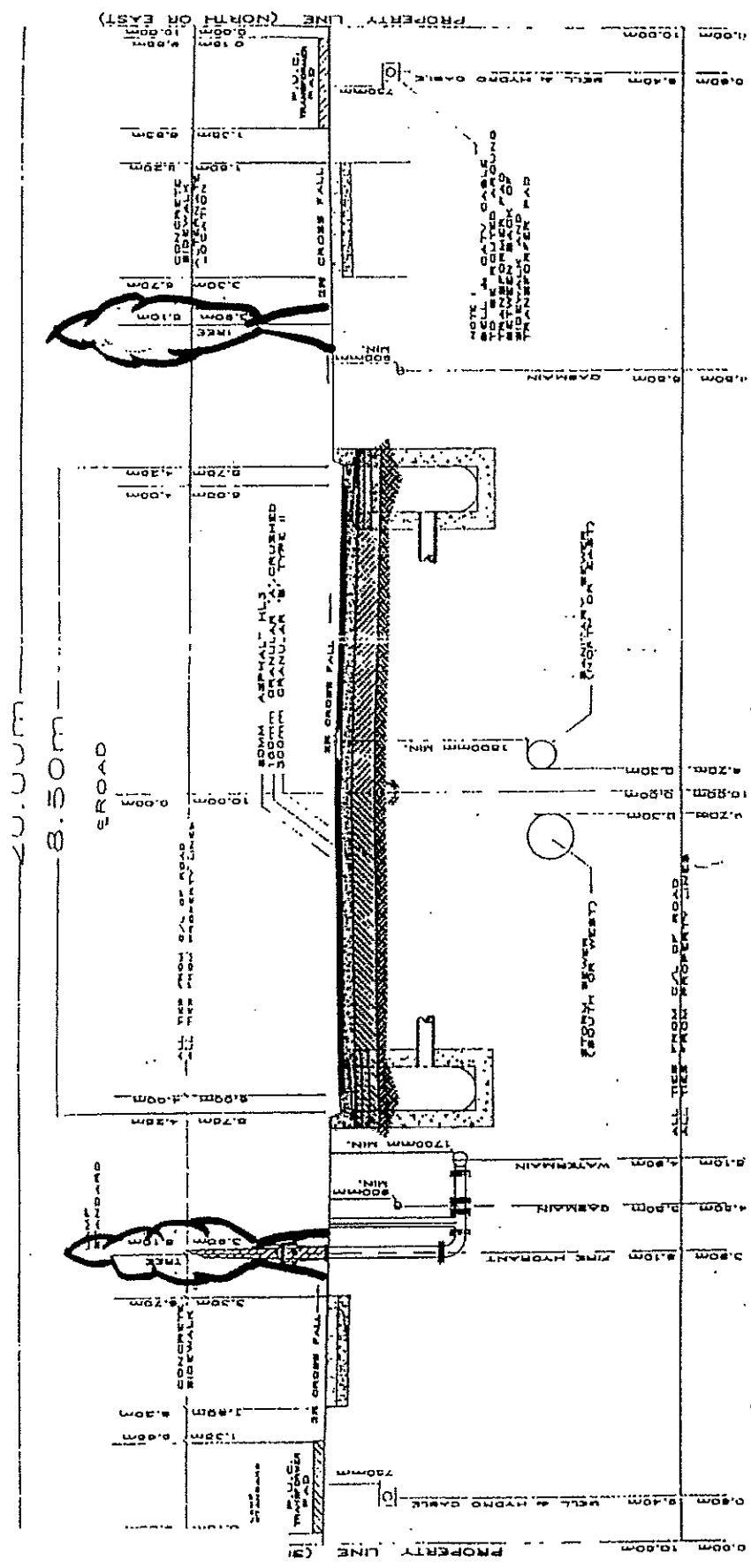
4.3 Maintenance

- Replace or re-spread damaged, missing or disturbed mulch.
- Where mulch is in place, remove prior to freeze-up and replace in the spring after soil thaws and soil temperature rises.

STREET TREE SPACING AND LOCATION REQUIREMENTS



Almost all streets within the city have rights-of way or boulevards that extend back of the curb line. This area is public property and is generally used for utilities, walks and landscaping. The width of this right-of-way area varies considerably in different sections of town. Approval from the Parks Supervisor is required prior to planting, trimming, removing or otherwise treating trees or shrubs upon public areas.



BROCKVILLE
CITY OF THE 1000 ISLANDS

J.M. McINTOSH P. ENG.

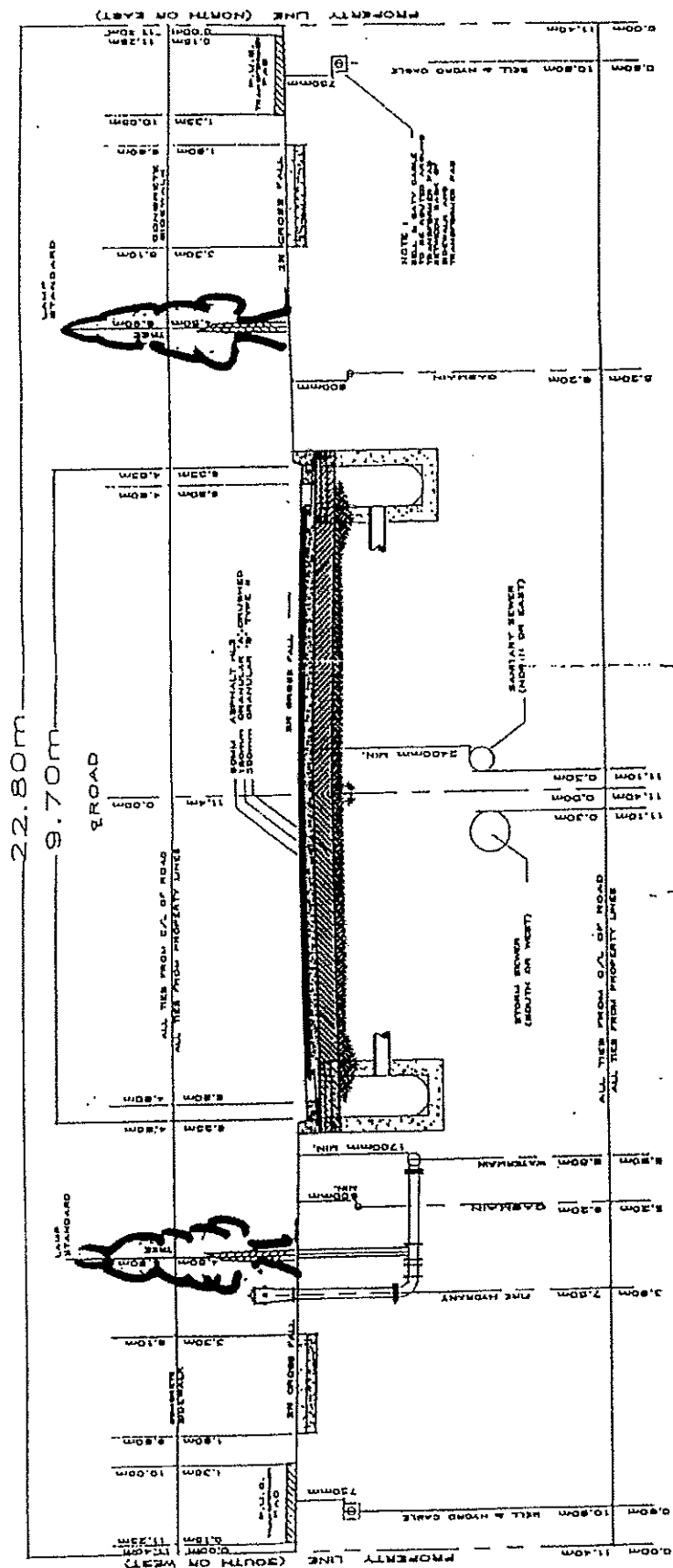
DEPARTMENT OF ENGINEERING

DATE: FEBRUARY, 1992

8.500m SIDEWALK ALLOWANCE
20.000m ROAD ALLOWANCE

(13)

SRD-1A



COLLECTOR ROAD

ROAD ALLOWANCE

S.R.D - 2

(13B)



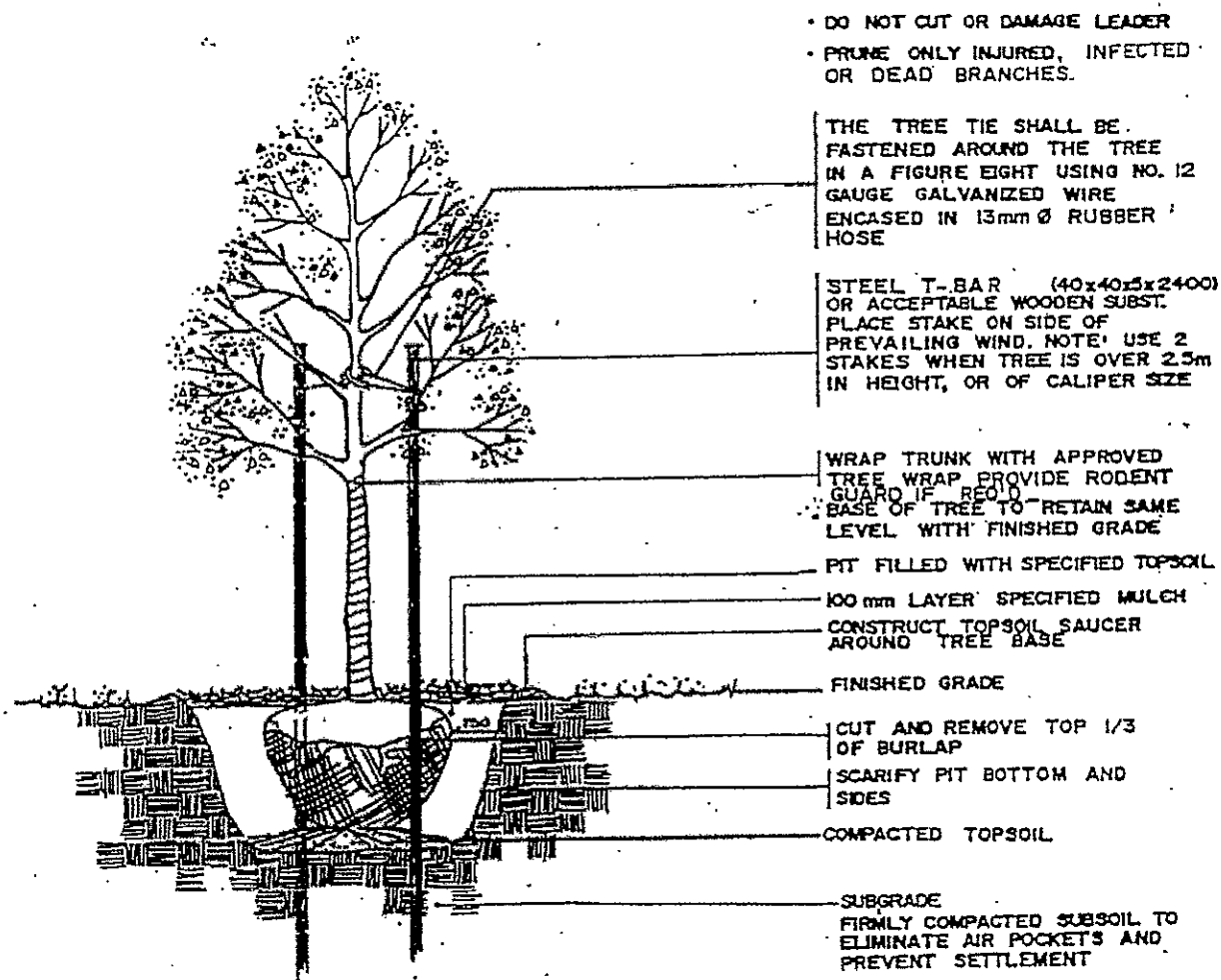
REVISION No. 1 DATE: FEBRUARY, 1992

J.M. McINTOSH P. ENG. DIRECTOR OF ENGINEERING

Planting

DECIDUOUS TREE DETAIL

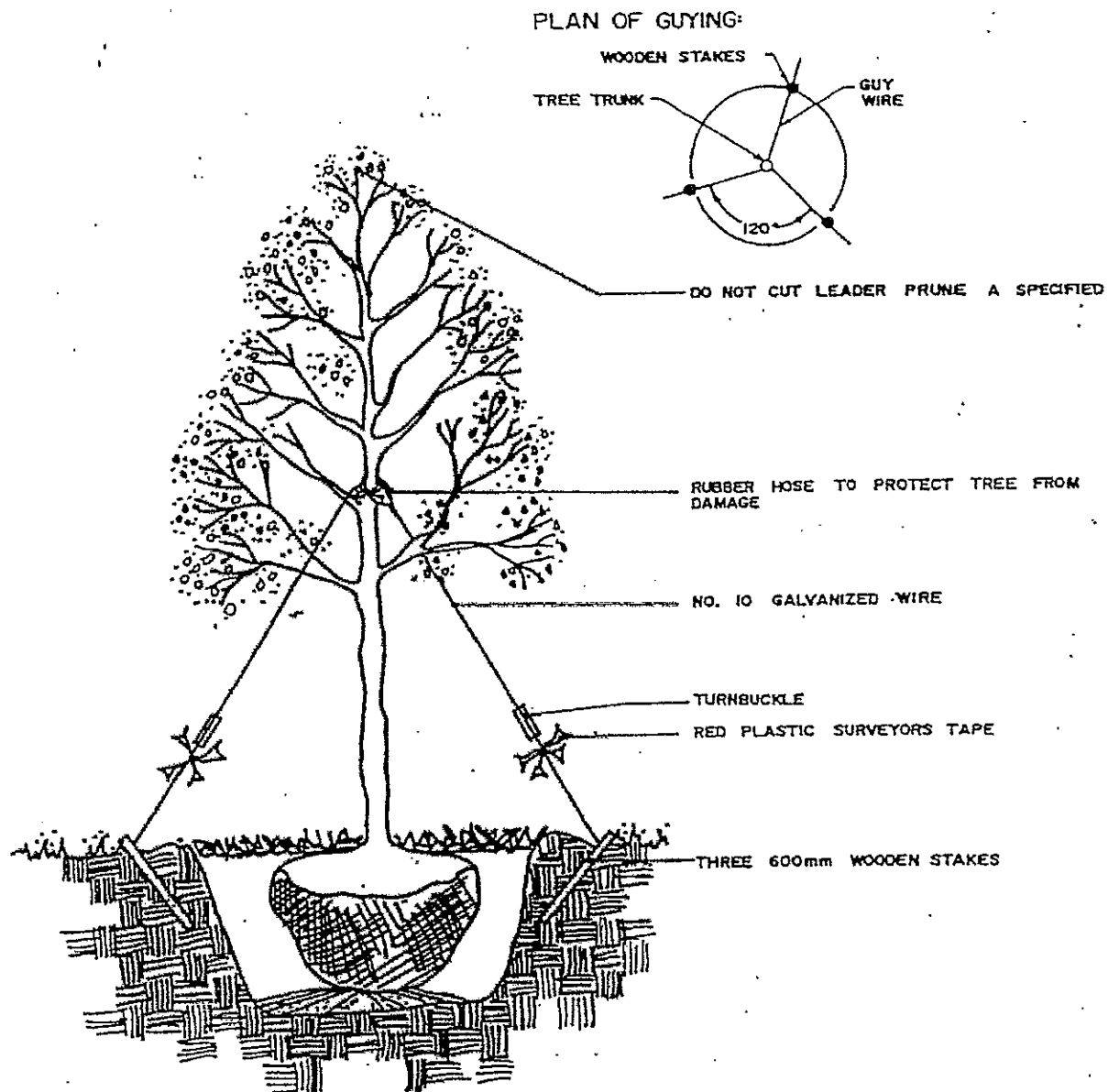
300 cm ht (45mm CALIPER) TO 90mm CALIPER



NOTES: TOP OF ROOT BALL SHALL BE POSITIONED 50 mm ABOVE GRADE
SET TREE 50mm HIGHER THAN SURROUNDING GRADE TO ALLOW FOR SETTLEMENT
TREES UNDER 70mm CALIPER REQUIRE 2 STAKES. TREES 70mm CALIPER AND OVER REQUIRE 3 STAKES. UNDER 300cm HT USE ONE STAKE
THE ABOVE DETAIL DOES NOT REPRESENT ANY PARTICULAR SPECIES
WHEN PLANT MATERIAL IS SUPPLIED IN A WIRE BASKET THE TOP 1/3 OF THE BASKET SHALL BE CUT AND REMOVED FROM THE PIT
WATER THOROUGHLY AFTER PLANTING
DRAWING DIMENSIONS IN MILLIMETRES
SCALE NTS.

Planting

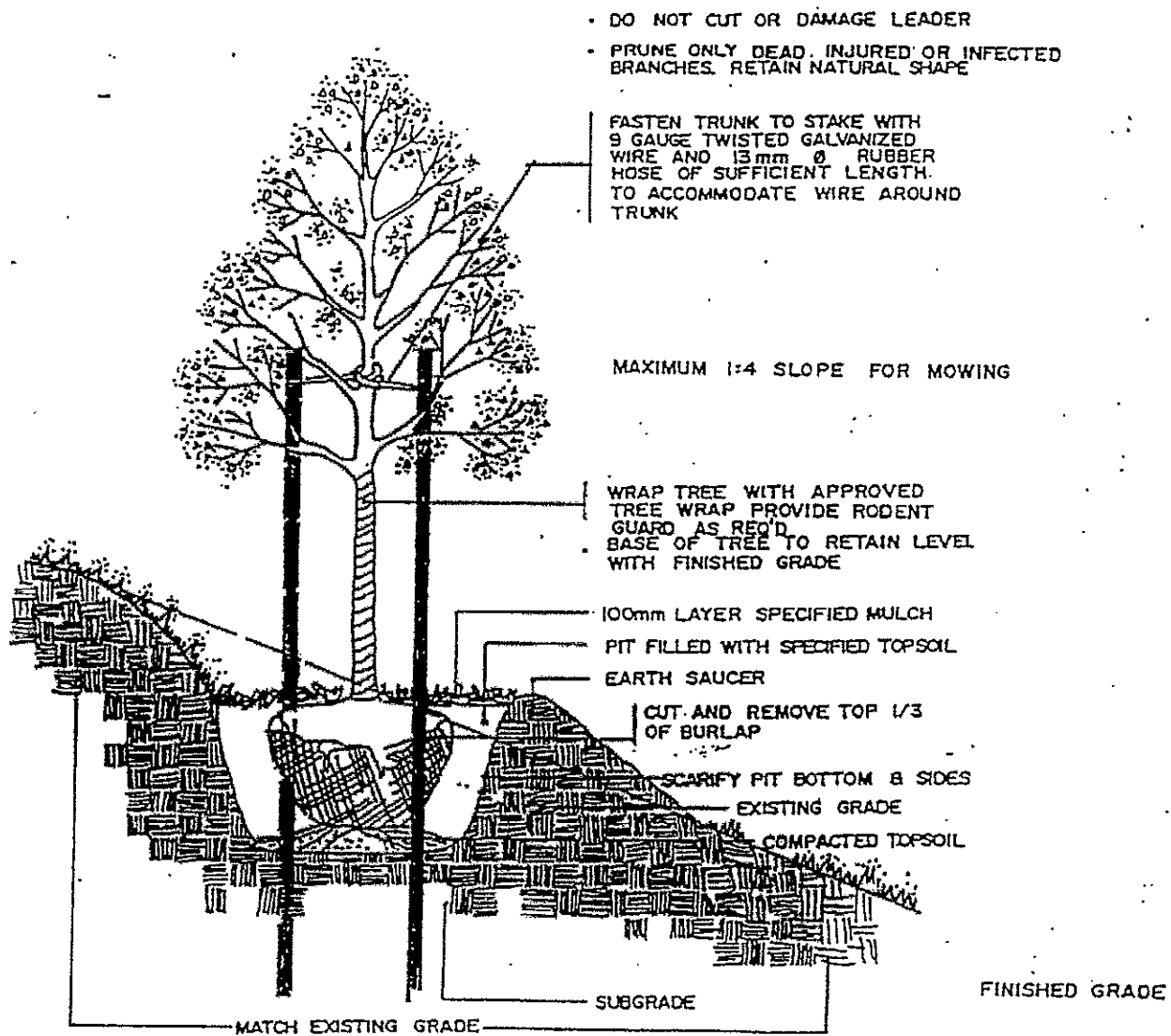
DECIDUOUS TREE DETAIL LARGER THAN 200mm CALIPER



NOTE: SIMILAR GUYING USED FOR CONIFEROUS TREES GREATER THAN 2m IN HEIGHT
FOR ADDITIONAL NOTES REFER TO TYPICAL DECIDUOUS TREE DETAIL

Planting

DECIDUOUS TREE PLANTING ON A SLOPE



NOTE: WATER THOROUGHLY AFTER PLANTING -
REFER TO DECIDUOUS TREE DETAIL FOR ADDITIONAL NOTES.

Planting

TYPICAL CONIFEROUS TREE DETAIL

TREES GREATER THAN 200 cm HEIGHT

- DO NOT CUT OR DAMAGE LEADER
- PRUNE ONLY DEAD INJURED OR INFECTED BRANCHES. RETAIN NATURAL SHAPE.

TREE GUY WIRES, ONE LOOP.
EACH OF 13mm Ø GALVANIZED WIRE
ENCASED IN 1 lb. RUBBER HOSE

- BASE OF TREE TO RETAIN SAME
• LEVEL WITH FINISHED GRADE.

APPLY APPROVED RODENT
REPELLENT AS REQ'D

PIT FILLED WITH SPECIFIED TOPSOIL

100mm LAYER SPECIFIED MULCH

GALVANIZED TURNBUCKLE (ONE PER WIRE)

EARTH SAUCER
EXISTING TOPSOIL

'T' BAR STAKE 760mm LONG
FINISHED GRADE

CUT AND REMOVE TOP 1/3
OF BURLAP

SCARIFY PIT BOTTOM AND
SIDES

COMPACTED TOPSOIL

SUBGRADE, IF DISTURBED
FIRMLY COMPACT SUBSOIL TO
ELIMINATE AIR POCKETS AND
PREVENT SETTLEMENT

NOTES: WATER THOROUGHLY AFTER PLANTING

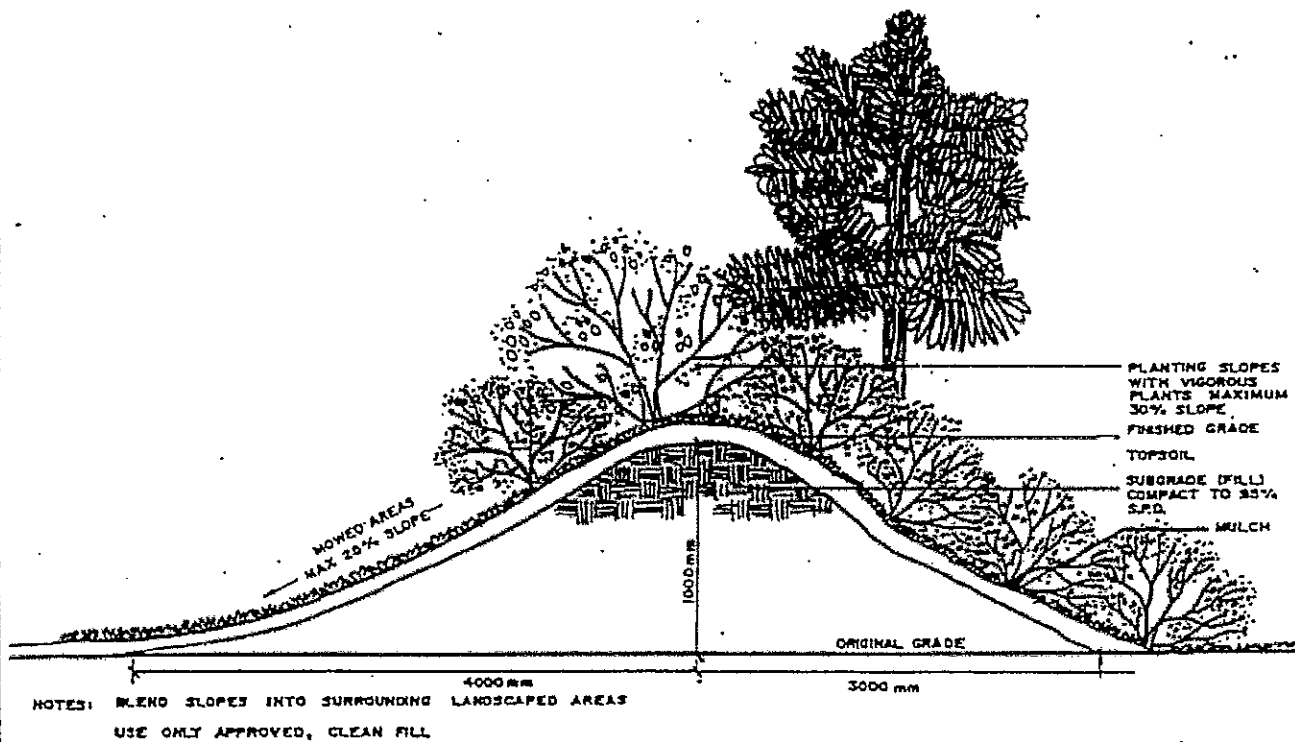
DRAWING DIMENSIONS IN MILLIMETRES

TOP OF ROOT BALL SHALL BE POSITIONED 50 mm ABOVE GRADE

ALL CONIFEROUS TREES 1.8 m IN HEIGHT AND OVER TO BE TRIPLE GUYED
CONIFERS 120 cm TO 200 cm ht. SHALL BE DOUBLE STAKED (STEEL T-BARS)
CONIFERS 420 cm ht. REQUIRE ONLY ONE STAKE (STEEL T-BAR)

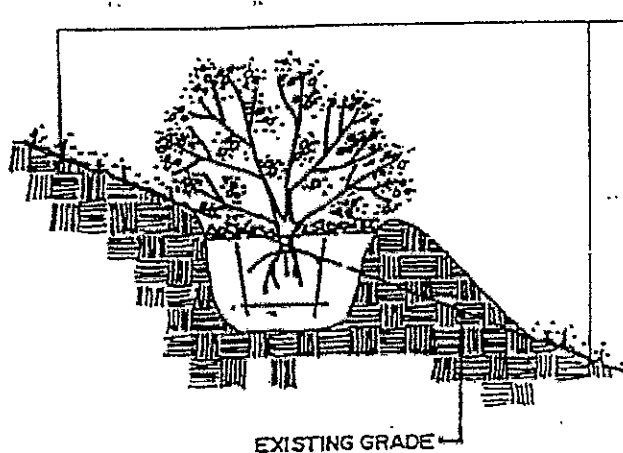
Planting

TYPICAL BERM PLANTING



Planting

SHRUB PLANTING DETAIL



SHRUB PLANTING ON A SLOPE

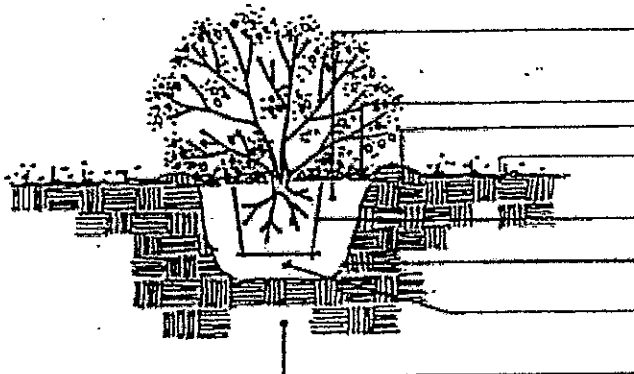
MATCH TO EXISTING GRADE

MAXIMUM
1:4 SLOPE FOR MOWING

NOTE: OTHER DETAILS AS BELOW

PRUNE ONLY DEAD, INJURED, OR INFECTED BRANCHES. RETAIN NATURAL SHAPE.

BASE OF SHRUB TO RETAIN SAME LEVEL WITH FINISHED GRADE.



SHRUB PLANTING ON LEVEL GROUND

NOTE: WATER THOROUGHLY AFTER PLANTING.
IN RODENT PRONE AREAS TREAT SHRUBS WITH APPROVED LIQUID RODENT SPRAY

PIT FILLED WITH SPECIFIED TOPSOIL

100mm LAYER SPECIFIED MULCH
EARTH SAUCER
FINISHED GRADE

CUT AND REMOVE CONTAINER
SCARIFY POT. SIDES.

SCARIFY PIT BOTTOM AND SIDES

ROOTS TO BE SET ON MINIMUM
150mm TOPSOIL

SUBGRADE IF DISTURBED
FIRMLY COMPACT BACKFILLED
SOIL TO ELIMINATE AIR POCKETS
AND SETTLEMENT

1. *Chlorophyll a* and *Chlorophyll b* were determined by the method of Arar and Collins (1971).

PLAN
N.E.S.
EYEBOLT LOCATION

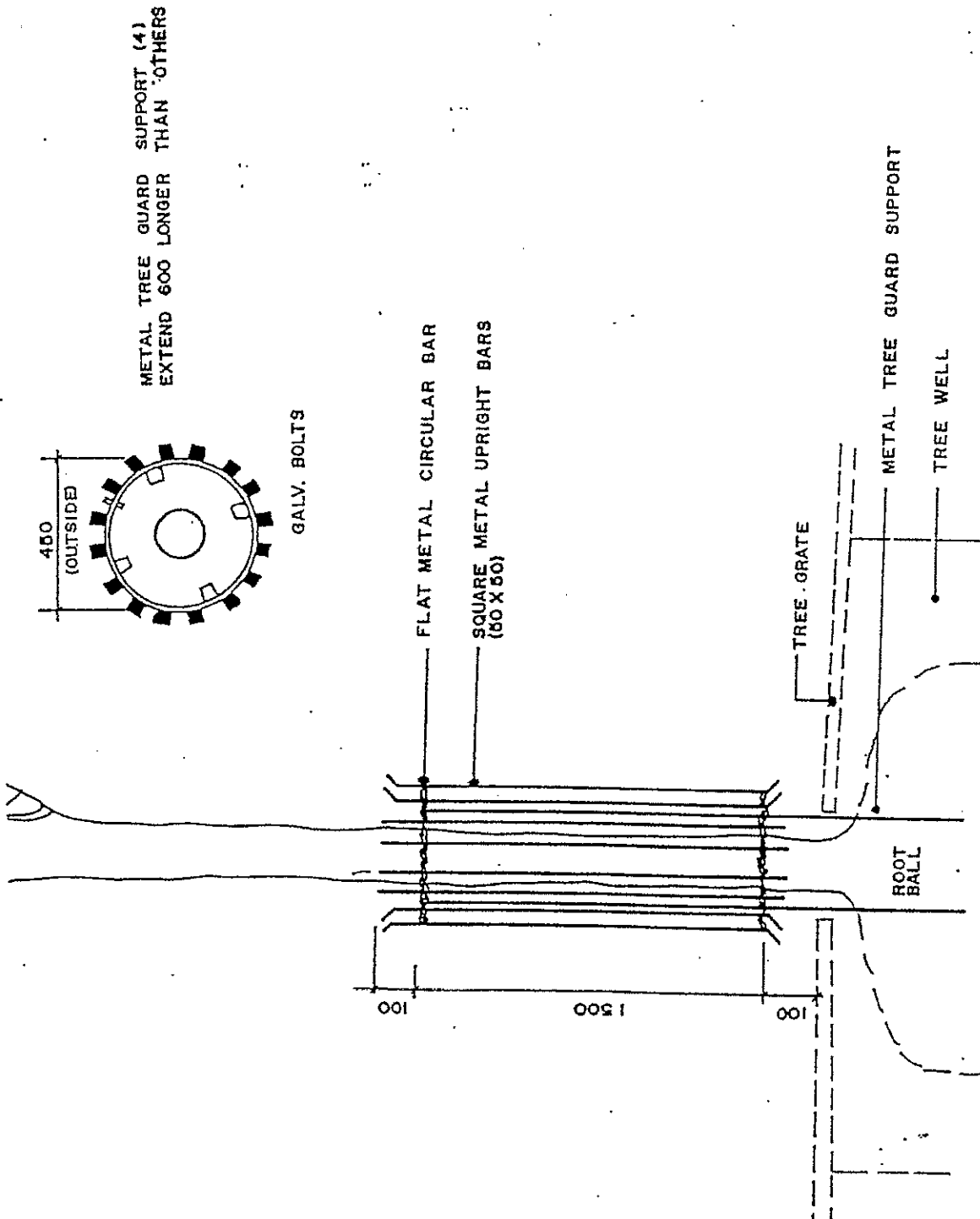
ROADWAY

TREE GUARD

EYEBOLTS TO BE LOCATED
AS SHOWN

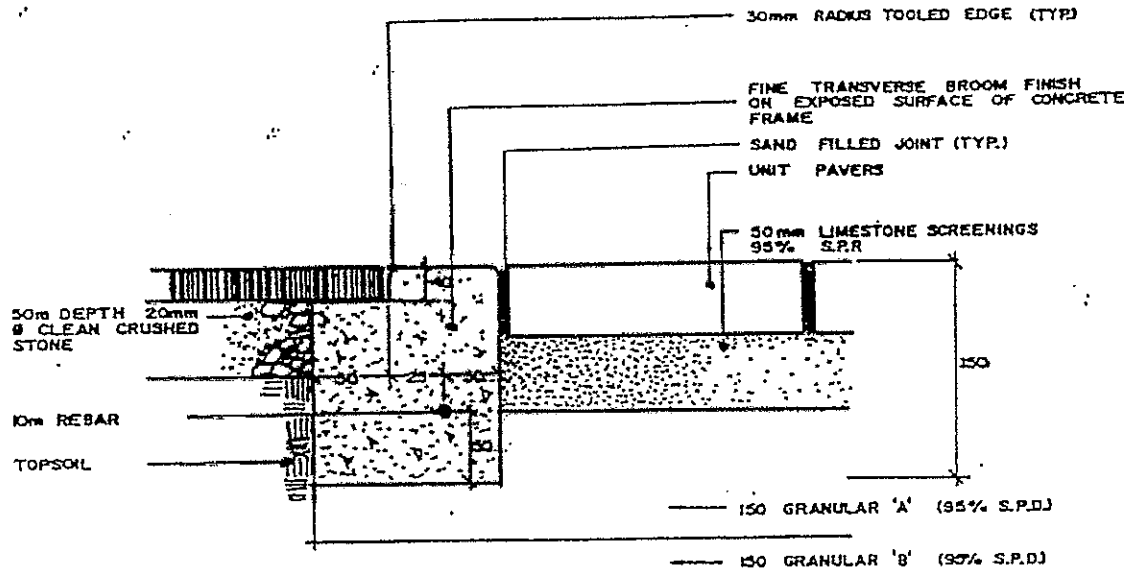
Tree Preservation_____

TREE GUARD DETAIL



NTS.

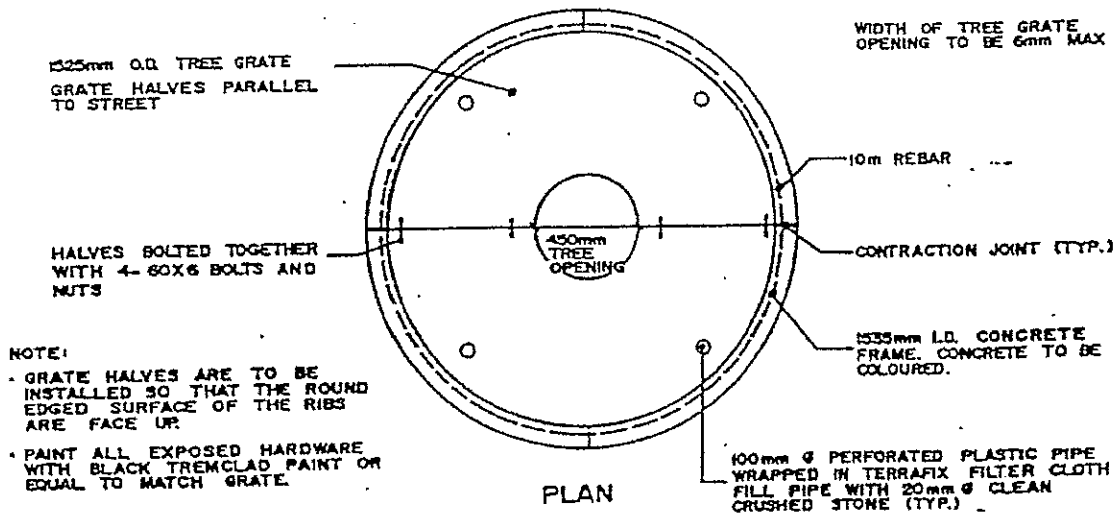
Tree Grate



SECTION

NOTE:

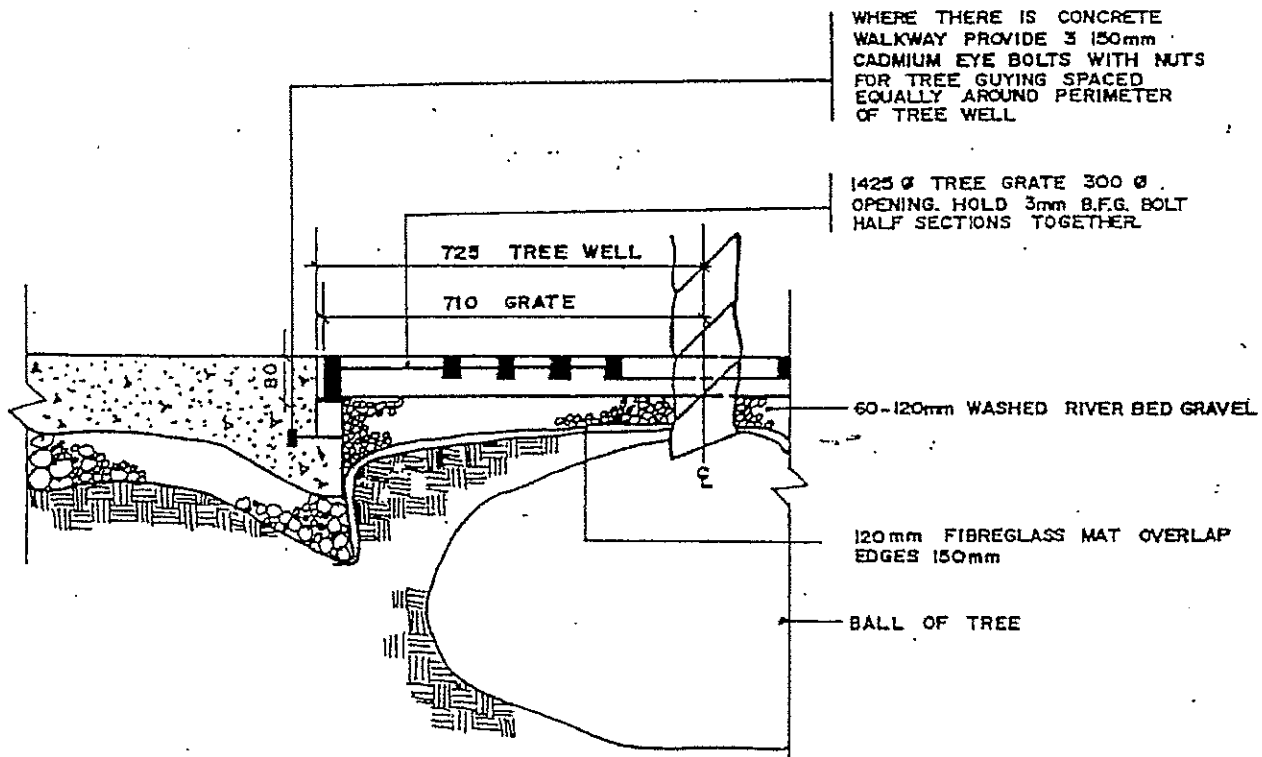
- ENSURE THAT THE TOP OF THE CONCRETE PAVERS MEET SMOOTH AND FLUSH WITH THE TOP OF THE CONCRETE FRAME AS SHOWN.
- REBARS TO HAVE 50mm MIN. CONCRETE COVER
- CONCRETE SHALL BE 30MPa WITH 6% ± 1% AIR ENTRAINMENT



NOTE:

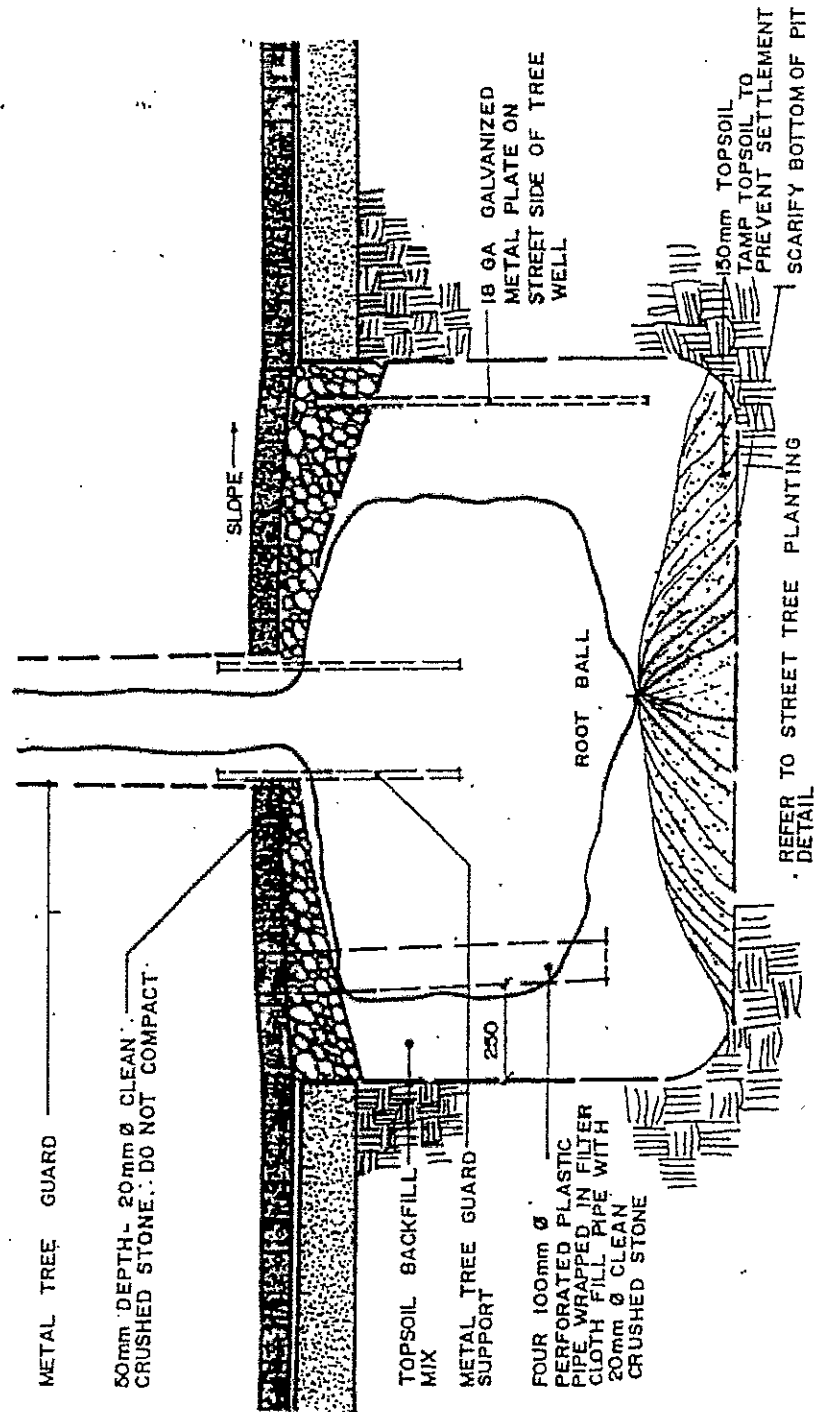
- GRATE HALVES ARE TO BE INSTALLED SO THAT THE ROUND EDGED SURFACE OF THE RIBS ARE FACE UP.
- PAINT ALL EXPOSED HARDWARE WITH BLACK TREMCLAD PAINT OR EQUAL TO MATCH GRATE.

Tree Grate



N.T.S.

Planting TREE WELL DETAIL - PAVER



NTS.

Appendix A: Planting Guidelines for the Cataraqi Region

1.0 PURPOSE

The purpose of this document is to assist people in the Cataraqi Region of southeastern Ontario with the planting and maintenance of healthy and vigorous trees, shrubs, vines and groundcovers that will serve various purposes. These guidelines outline considerations for plantings, and some appropriate species are recommended. The intended outcome is successful plantings that do not cause harm to native species in the surrounding natural environment.

Persons undertaking planting projects may wish to retain the expertise of an Ontario Landscape Architect, a Registered Professional Forester, and/or an ecologist consultant who can provide further guidance.

This document is Appendix A to the CRCA Environmental Planning Policies (2015). These guidelines will be updated from time to time.

Terms that are *italicized* throughout this document are either defined in the glossary or are the botanical (Latin) names of plant species.

2.0 BACKGROUND – OUR ROLE AND REGION

The Cataraqi Region Conservation Authority (CRCA) frequently reviews landscape plans that are prepared for urban and rural developments. Plans are most commonly prepared in support of site plan control and subdivision applications under the Planning Act. The CRCA normally reviews such plans for their general suitability and for anticipated effects on nearby natural areas. The Conservation Authority has a particular interest to prevent the introduction of *invasive species* (e.g. garlic mustard, phragmites reed) into forests, meadows and wetlands. Other aspects such as aesthetics, compatibility with underground infrastructure and crime prevention through environmental design fall outside of the Conservation Authority's mandate but are also important to consider.

A primary consideration for planting is our location in North America. The Cataraqi Region is located at the boundary between two *ecozones* – the Boreal forest of the Canadian Shield and the Mixedwood Plains of the Great Lakes – St. Lawrence River lowlands (OMNR, 2013a). The former is further classified by the Province of Ontario as Ecoregion 5E (Georgian Bay), while the latter is considered part of Ecoregion 6E (Lake Simcoe-Rideau) (see OMNR 2009 for a detailed

description). This location means that we have a high degree of biodiversity – many different species of flora and fauna call this region home.

The species appropriate for planting projects vary between the ecozones. It is important to recognize that the climate varies within the Cataraqui Region – from the relative warmth of Adolphustown along the Bay of Quinte to the cool highlands of Frontenac Park north of Sydenham. Southern portions of the Region fall into Plant Hardiness Zone 6a, while inland areas are located in Zones 5b and 5a (Natural Resources Canada, 2000).

3.0 SPECIFIC CONSIDERATIONS FOR PLANTINGS

The following considerations reflect the interests of the CRCA to promote healthy and appropriate plantings.

3.1 Existing Settings and Vegetation

Persons undertaking planting projects are encouraged to maintain as much of the existing setting and vegetation as possible – matching existing grades and carefully protecting trees, shrubs and their root systems during construction. This is best accomplished by fencing off areas at least 1.5 metres outside the dripline (canopy) of existing vegetation.

It should be noted that grading and filling activities associated with planting projects may be subject to restrictions and permissions. For example, work near water and wetlands may be subject to CRCA approvals per Ontario Regulation 148/06 under the Conservation Authorities Act, and municipal site alteration and/or tree-cutting by-laws enacted under the Municipal Act may also apply.

3.2 Erosion Protection and Shoreline Stabilization

Existing natural vegetation and soil mantles along shorelines should be retained for shoreline stabilization, and allowed to go “natural”. Woody trees, shrubs, and vines, with deep fibrous roots should be planted along the water’s edge (e.g., dogwoods, willows) to provide erosion protection and shoreline stabilization. Additional information can be found in Appendix F: Guidelines for Ecological Buffer Areas, and in Solutions for Shoreline Erosion: A Basic Guide to Bioengineering (RVCA, 2011).

3.3 Native, Non-cultivar Species

For many years the CRCA has encouraged the use of native, non-cultivar species of eastern Ontario stock. Native species are those known to have prospered in southeastern Ontario before the area was cleared for agriculture and settlement in the 1800s. With the exception of Boreal species that may not be suited to a changing climate, most native species will be the most appropriate for our disease, moisture, pollen, soil and temperature conditions. Non-cultivar species are the natural, non-hybridized, not genetically modified varieties of a given plant.

Eastern Ontario stock means seedlings and plants that have been grown using seeds from local plants. The plants that grow from this stock are also more likely to prosper in our setting. Maps published by the Ontario Ministry of Natural Resources show that the Cataraqui Region falls into Seed Zone 36 (OMNR, 2011).

3.4 Invasive Species

A primary concern of the Cataraqui Region Conservation Authority with respect to plantings is to avoid the introduction of *invasive species* into natural areas such as alvars, meadows, wetlands and woodlands. *Invasive species* are known to have negative ecological, economic and human health impacts (OMNR, 2012). Unfortunately they can be difficult or impossible to eradicate once introduced to an area.

Invasive species often escape from developments and ornamental gardens onto adjacent lands. The ability to spread is dependent on the competitive nature of the plant and the means through which it is able to spread (propagate). Plants that produce large quantities of seed, spread by rhizomes, and grow rapidly are difficult to control once they become established.

Some examples of problematic *invasive species* (which were planted originally as garden plants) include:

Common reed	<i>Phragmites australis</i>
Dog-strangling vine	<i>Vincetoxicum rossicum</i>
Garlic mustard	<i>Alliaria petiolata</i>
Giant hogweed	<i>Heracleum mantegazzianum</i>
Norway maple	<i>Acer platanoides</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Wild parsnip	<i>Pastinaca sativa</i>
European buckthorn	<i>Rhamnus cathartica</i>
Tartarian honeysuckle	<i>Lonicera tatarica</i>

The Ontario Invasive Species Awareness Program has established an Invading Species Hotline (1-800-563-7711).

3.5 Biodiversity

Ecosystems tend to thrive when they include many different types of flora and fauna. They prosper through their richness in genes and through complex relationships, for example, between trees and the fungi that grown on their roots and facilitate the transfer of water and nutrients. As noted above, the Cataraqui Region enjoys a high degree of biodiversity because of our location between southern and northern *ecozones*. People can protect and foster this biodiversity by protecting natural areas as part of landscaping, and by planting a variety of appropriate species.

3.6 Plant Association

Some circumstances require further investigation of existing plants within an existing site, before prescribing plants that you would like to introduce into the same site. For example, some fungus such as rust species, require two (2) hosts to complete its lifecycle. White pine blister rust (*Cronartium ribicola*) can be fatal to white pine trees and requires *Ribes spp.* (Currants or Gooseberries) as its alternate host to complete its lifecycle. Therefore, if Currants or Gooseberries exist within the proposed planting site, White pine should not be introduced.

Cedar-apple rust (*Gymnosporangium juniperi-virginianae*) also requires two (2) hosts to complete its lifecycle. Eastern red cedar and apple or crab apple trees. The rust can affect the health of apple trees and ruin the fruit crop.

3.7 Climate Change

The climate of southeastern Ontario is changing, and this has implications for plantings. Average temperatures are expected to rise by three to eight degrees Celsius over the next century (OMNR, 2013b).

Historically we have been located at the transition between Carolinian and Boreal zones. It is possible that the Boreal species such as white spruce (*Picea glauca*) will cease to grow in the Cataraqui Region over the longer-term (OFRI 1998, s.9). The climate may change more quickly than the species can adapt to that change. We encourage the use of native plants that are shown to be adaptable to climate change.

3.8 Food for Wildlife

Plantings can be designed to encourage and support wildlife – from songbirds to butterflies and bees. An example of a native shrub that serves this purpose is Nannyberry (*Viburnum lentago*). Native wildlife may not consume non-native (introduced) plant species, which can increase the plant species' opportunity to spread uncontrolled.

3.9 Drought Resistance

Low water conditions are experienced in the Cataraqui Region from time to time, and may become longer and more prevalent as our climate changes in the future. An approach called *xeriscaping* is used to minimize the water needs of plantings by avoiding lawn cover and instead using drought resistant species such as groundcovers and wildflowers (see Utilities Kingston, 2014 and City of Toronto, 2013).

3.10 Salt Tolerance

The salt applied every winter season to our roads, parking areas and walkways can harm plantings. It can also cause hard surfaces such as concrete to degrade more rapidly. Some species are more susceptible to die-back than others. For example, while the Red-osier Dogwood (*Cornus stolonifera*) has a low salt tolerance, the Pussy Willow (*Salix discolor*) has a

high salt tolerance (City of Ottawa, 2013). Also, while White Pine (*Pinus strobus*) has a low salt tolerance, Eastern Larch (*Larix laricina*) has a high salt tolerance.

3.11 Persuasive Planting

Shrubs can be used to discourage pedestrian traffic through a technique called *persuasive planting*. This is a common practice around stormwater management facilities (ponds and swales) that look inviting but may have hazards such as steep slopes and variable water levels. Wild rose (*Rosa acicularis*) and Hawthorn (*Crataegus chrysocarpa*) are two species commonly used in persuasive plantings.

4.0 RECOMMENDED SPECIES

The following species are native, non-cultivars that are likely to thrive throughout the Cataraqui Region and for which eastern Ontario stock (Seed Zone 36) may be available from nurseries and suppliers.

Planters may also wish to refer to other resources, such as the following:

- City of Ottawa Forests and Greenspace Advisory Committee website (City of Ottawa, 2013); it has an on-line database of native tree and shrub species that lists their moisture and light requirements, salt tolerance and height at maturity.
Visit <http://www.ofnc.ca/ofgac/displaytreelisten.php?orderby=NameEn>
- Grow Me Instead: A Guide For Southern Ontario: Beautiful Non-Invasive Plants for Your Garden (Ontario Invasive Plant Council, 2011); it has a list of invasive species to avoid and alternatives to consider, with a focus on groundcovers and shrubs.
Visit <http://www.ontarioinvasiveplants.ca/files/GMI2012web.pdf>

4.1 Trees

Eastern white pine	<i>Pinus strobus</i>
Eastern white cedar	<i>Thuja occidentalis</i>
Red oak	<i>Quercus rubra</i>
Red pine	<i>Pinus resinosa</i>
Sugar maple	<i>Acer saccharum</i>

4.2 Shrubs

Eastern white cedar	<i>Thuja occidentalis</i>
Gray dogwood	<i>Cornus racemosa</i>
Nannyberry	<i>Viburnum lentago</i>
Red cedar	<i>Juniperus virginiana</i>
Serviceberry	<i>Amelanchier</i>

4.3 Vines

Virginia creeper	<i>Parthenocissus vitacea</i>
Climbing hydrangea	<i>Hydrangea anomala</i>
American wisteria	<i>Wisteria frutescens</i>

4.4 Grasses and Groundcovers

Big bluestem	<i>Andropogon gerardii</i>
Indian grass	<i>Sorghastrum nutans</i>
Wild geranium	<i>Geranium maculatum</i>

DEFINITIONS

Ecozone means a large area of land and water that is characterized by bedrock and climate that differs from the areas next to it (after OMNR, 2013a).

Invasive species means harmful alien species whose introduction or spread threatens the environment, the economy, or society, including human health. Once established, invasive species are extremely difficult and costly to control and eradicate, and their ecological effects are often irreversible (OMNR, 2012).

Persuasive plantings means groups of shrubs or similar vegetation that due to their density or physical characteristics tend to encourage pedestrians to move to other areas.

Xeriscaping means designing landscapes that match local conditions with xeric (or waterwise) plants, trees and shrubs that will thrive (City of Toronto, 2013).

REFERENCES

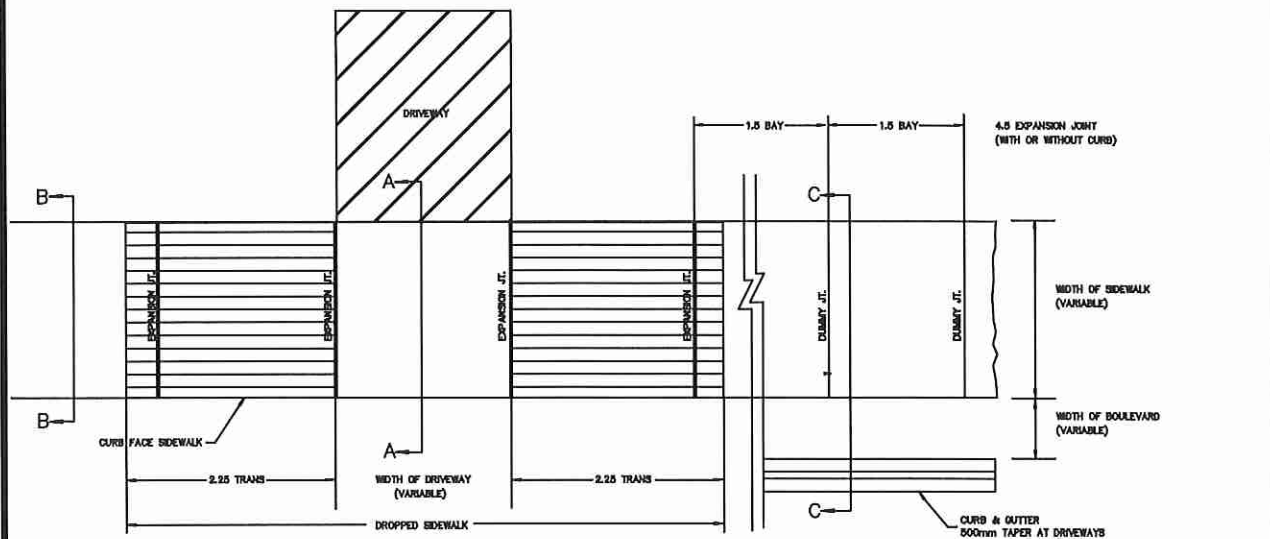
- Crowder, A., et al. 1996. Plants of the Kingston Region. Kingston, Ontario: Queen's University Department of Biology.
- Natural Resources Canada. 2000. <http://sis.agr.gc.ca/cansis/nsdb/climate/hardiness/intro.html> (accessed March 5, 2013).
- Ontario Ministry of Agriculture, Food and Rural Affairs. 2013. <http://www.omafra.gov.on.ca/english/crops/facts/climzoneveg.htm> (accessed March 5, 2013).
- Ontario Forest Research Institute. 1998. The Impacts of Climate Change on Ontario's Forests. Ontario Forest Research Paper # 143. Sault St. Marie, Ontario: the Institute.
- Ontario Invasive Plant Council. 2011. Grow Me Instead: A Guide For Southern Ontario: Beautiful Non-Invasive Plants for Your Garden. <http://www.ontarioinvasiveplants.ca/files/GMI2012web.pdf> (accessed May 28, 2013).

- Ontario Ministry of Natural Resources. 2013a. http://www.mnr.gov.on.ca/en/Business/Biodiversity/2ColumnSubPage/STEL02_166891.html (accessed March 5, 2013).
- Ontario Ministry of Natural Resources. 2013b. <http://www.mnr.gov.on.ca/en/Business/ClimateChange/> (accessed March 5, 2013).
- Ontario Ministry of Natural Resources. 2012. Ontario Invasive Species Strategic Plan 2012. http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@biodiversity/documents/document/stdprod_097634.pdf (accessed May 28, 2013).
- Ontario Ministry of Natural Resources. 2011. Southern Ontario Tree Seed Zone Atlas. http://www.mnr.gov.on.ca/en/Business/Species/Publication/STDPROD_086738.html (accessed March 5, 2013).
- Ontario Ministry of Natural Resources. 2009. The Ecosystems of Ontario, Part 1: Ecozones and Ecoregions. (Technical Report SIB TER IMA TR-01). Queen's Printer for Ontario.
- Ottawa, City of. 2013. website Forests and Greenspace Advisory Committee <http://www.ofnc.ca/ofgac/displaytreelisten.php?orderby=NameEn> (accessed May 22, 2013).
- Rideau Valley Conservation Authority. 2011. Solutions for Shoreline Erosion: A Basic Guide to Bioengineering. http://www.rvca.ca/PDF/SolutionsforShorelineErosion_PDF_EN1.pdf (accessed May 28, 2014).
- Toronto, City of. 2013. website <http://www.toronto.ca/watereff/tips/xeriscaping.htm> (accessed May 22, 2013).
- Tree Canada. 2013. website: <http://treecanada.ca/en/resources/tree-killers/plants/norway-maple/> (accessed March 5, 2013).
- Utilities Kingston. 2014a. website: <https://www.utilitieskingston.com/Water/Conservation/MakeEveryRainDropCount.aspx> (accessed June 24, 2014).
- Utilities Kingston. 2014b. website: http://www.utilitieskingston.com/pdf_downloads/120229%20-%20Reducing%20Treated%20Water%20Use%20in%20the%20Garden.pdf (accessed June 24, 2014)

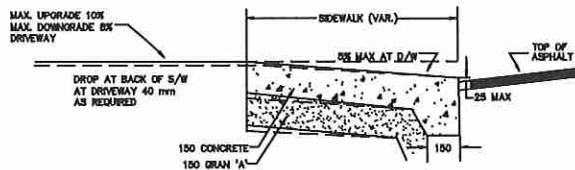
FOR MORE INFORMATION

Please contact the CRCA at 613-546-4228 or info@crca.ca, or visit our website at www.crc.ca.

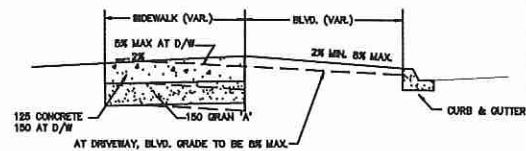
Appendix H – Sidewalk & Curbing Details



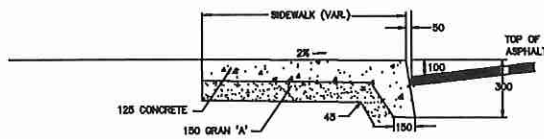
PLAN – TYPICAL NEW ENTRANCE



SECTION A – A



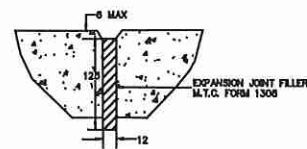
SECTION C – C



SECTION B – B

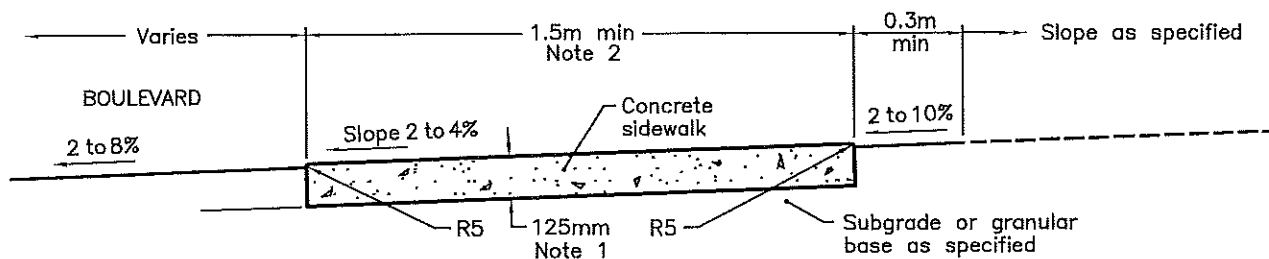


DUMMY JOINT
DETAIL

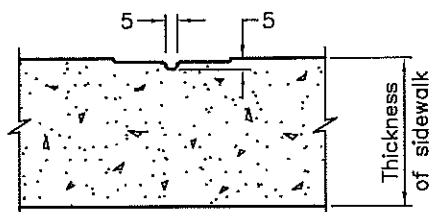


EXPANSION JOINT
DETAIL

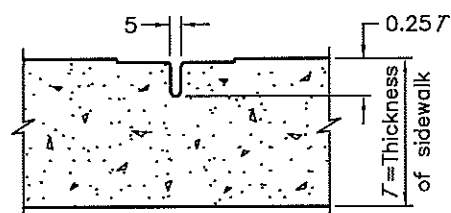
1. FULL DEPTH EXPANSION JOINTS ARE REQUIRED IN SIDEWALK AT INTERVALS OF 4.5m AND
 - A. BETWEEN SIDEWALK AND ABUTTING CURB
 - B. AT BOTH ENDS OF DROPPED SIDEWALK SECTION AND AT MID SPAN WHEN LENGTH IS GREATER THAN 4.5; THESE JOINTS ARE TO BE CARRIED THROUGH ABUTTING CURB.
 - C. TO ISOLATE OBSTRUCTIONS FROM SIDEWALK E.G. HYDRANTS, LIGHT STANDARDS, BUILDINGS, ETC.
2. DUMMY JOINTS SHALL HAVE STANDARD SPACING OF 1.5m.
3. ALL CONCRETE EDGES OF BAYS TO BE FINISHED WITH EDGER, 6mm RADIUS.
4. CONCRETE SHALL BE 30 MPa, WITH 7% (+/- 1.5%) AIR ENTRAINMENT, MAX. SLUMP 70 +/- 20mm, OR AS SPECIFIED IN CONTRACT.
5. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES UNLESS OTHERWISE SPECIFIED.
6. ALL WORK TO CONFORM TO O.P.S.S. 351.
6. SIDEWALK PANEL SPACING IS TO BE EVEN 1.5m PANELS LONGITUDINALLY ON NEW SIDEWALK CONSTRUCTION.



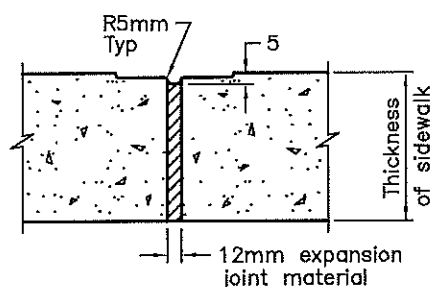
TYPICAL SECTION



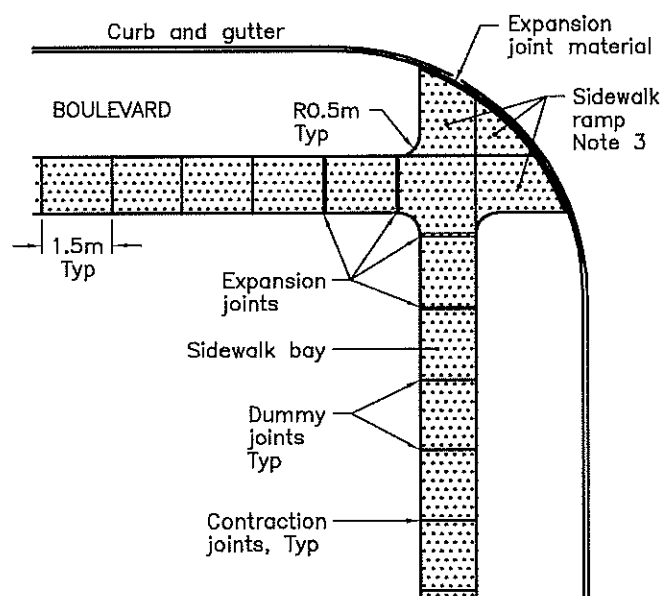
DUMMY JOINT (OPTIONAL)



CONTRACTION JOINT



EXPANSION JOINT



JOINT LAYOUT

NOTES:

- 1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
- 2 Sidewalk width shall be wider when specified.
- 3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

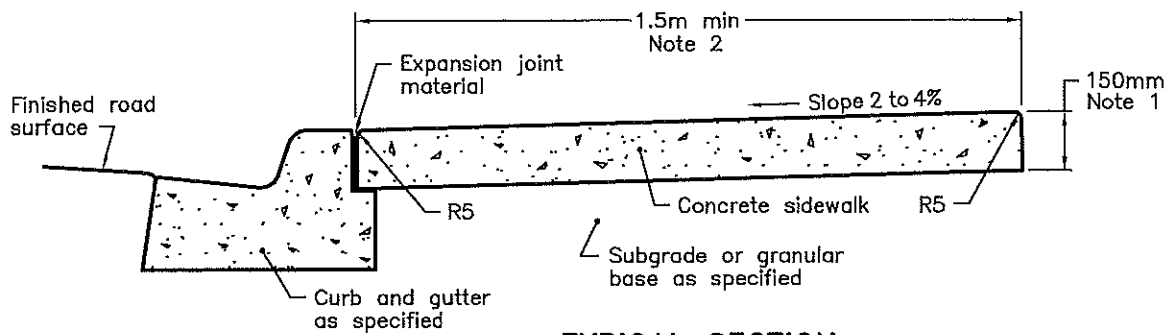
Nov 2015

Rev 2

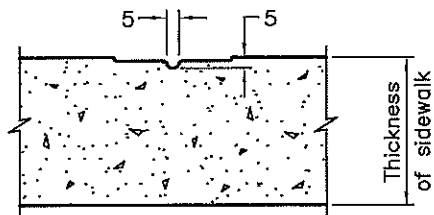
CONCRETE SIDEWALK

OPSD 310.010

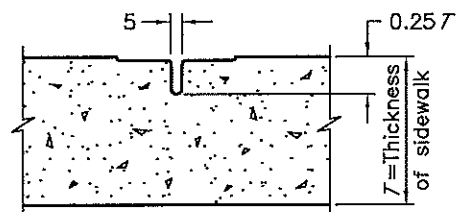




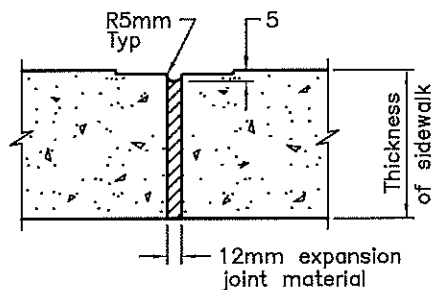
TYPICAL SECTION



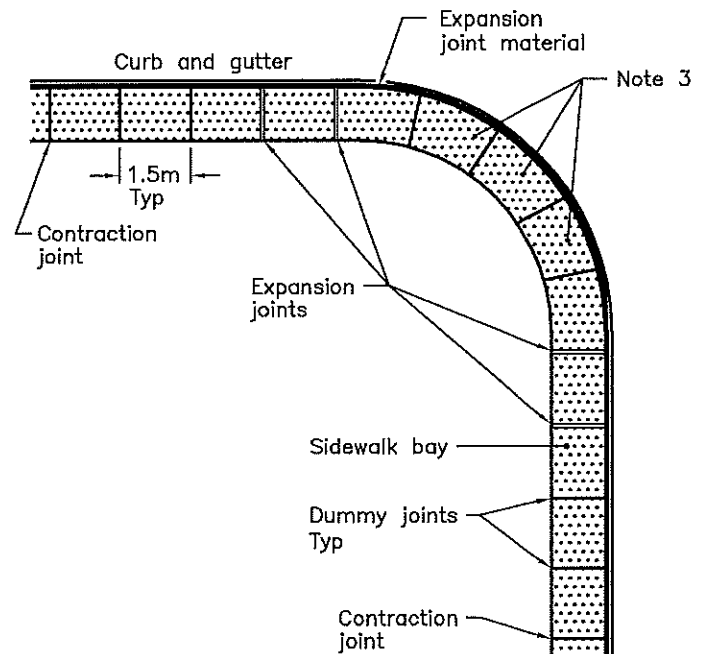
DUMMY JOINT



CONTRACTION JOINT



EXPANSION JOINT



JOINT LAYOUT

NOTES:

- 1 At commercial and industrial driveways, the thickness shall be 200mm.
- 2 Sidewalk width shall be wider when specified.
- 3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.
- A All dimensions are in millimetres unless otherwise shown.

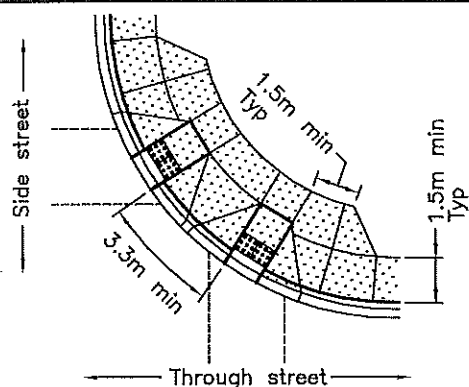
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 2

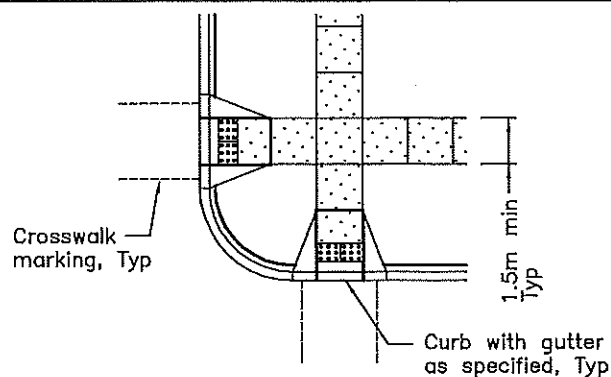
**CONCRETE SIDEWALK
ADJACENT TO CURB AND GUTTER**

OPSD 310.020

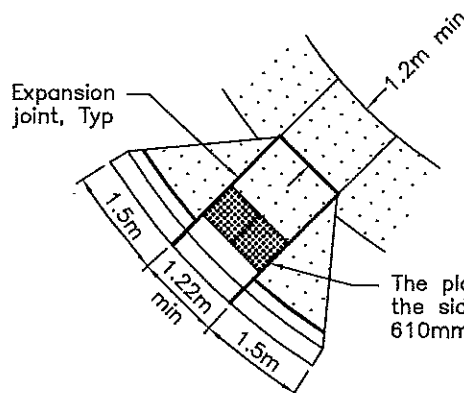




DOUBLE RAMP WITHOUT BOULEVARD

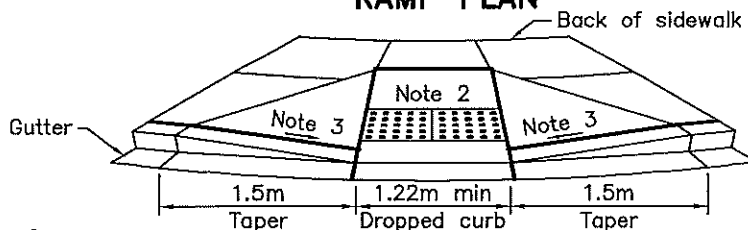


RAMPS WITH BOULEVARD

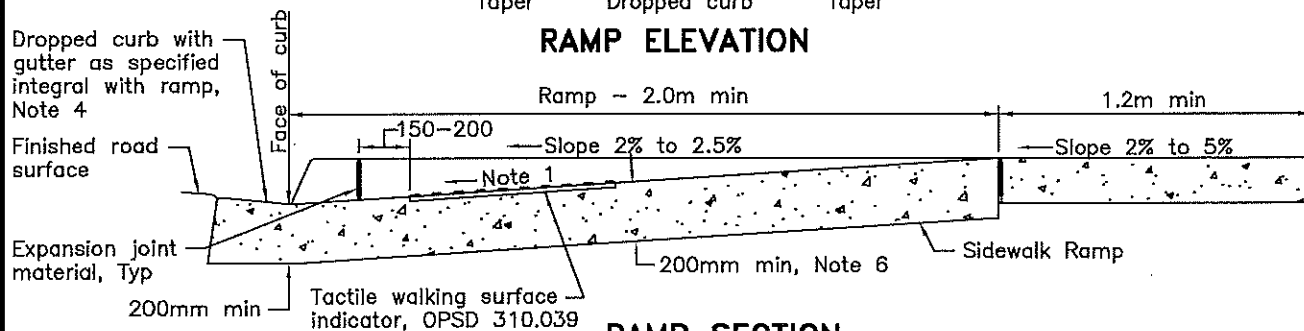


The plates shall extend the entire width of the sidewalk ramp at a minimum length of 610mm, in accordance with OPSD 310.039

RAMP PLAN



RAMP ELEVATION



RAMP SECTION

NOTES:

- 1 Slope of ramp shall not exceed 8%.
- 2 Cross slope of ramp shall not exceed 2% in either direction.
- 3 Cross slope of flared side of ramp shall not exceed 8%.
- 4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
- 5 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.
- A All dimensions are in millimetres unless otherwise shown.

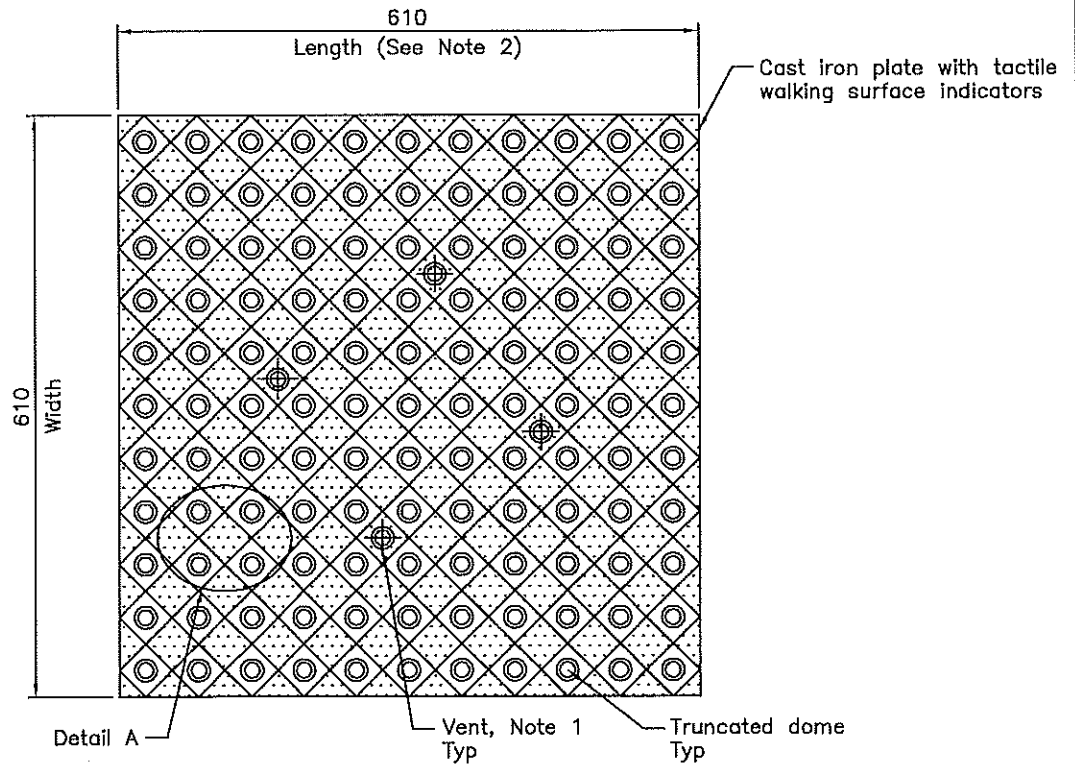
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 0

**CONCRETE SIDEWALK RAMPS AT
UNSIGNALIZED INTERSECTIONS**

OPSD 310.033

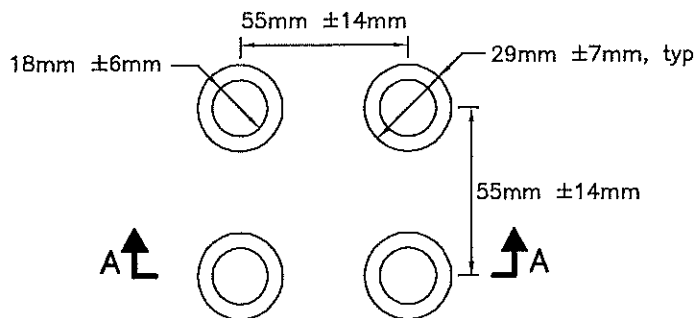




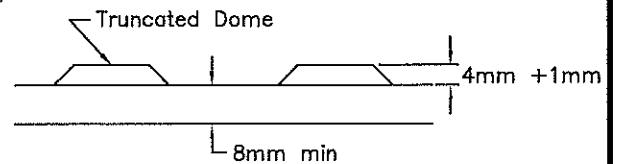
PLAN



ELEVATION




**DETAIL A
TRUNCATED DOMES PLAN**

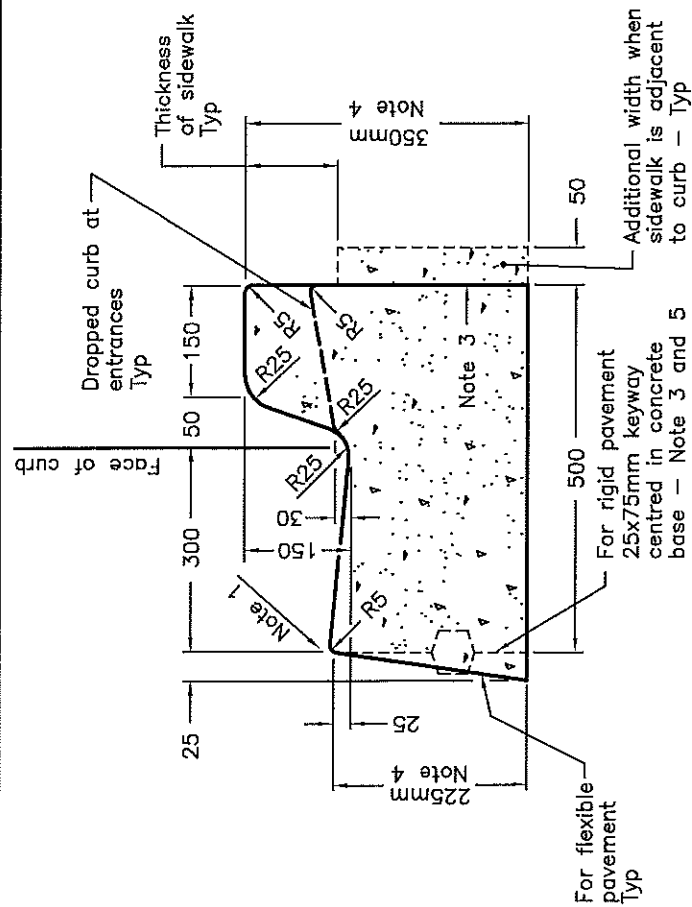


SECTION A-A

NOTES:

- 1 Vents shall be as specified by the manufacturer.
- 2 Length of plate may be increased to suit the curb depression width.
- A Adjacent cast iron plates shall be permanently connected using a locking mechanism and any hardware shall be hot dipped galvanized.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0	
CONCRETE SIDEWALK RAMPS TACTILE WALKING SURFACE INDICATORS COMPONENT				
	OPSD 310.039			



TANGENT

LEGEND:

S — Rate of pavement superelevation in percent, %.

NOTES:

- 1 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
- 2 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
- 3 For slipforming procedure a 5% batter is acceptable.
- 4 For composite pavement the depth of concrete curb shall be adjusted to depth of concrete pavement.
- 5 When tie bars are specified, refer to OPSD 552.010 and 552.020 for details.

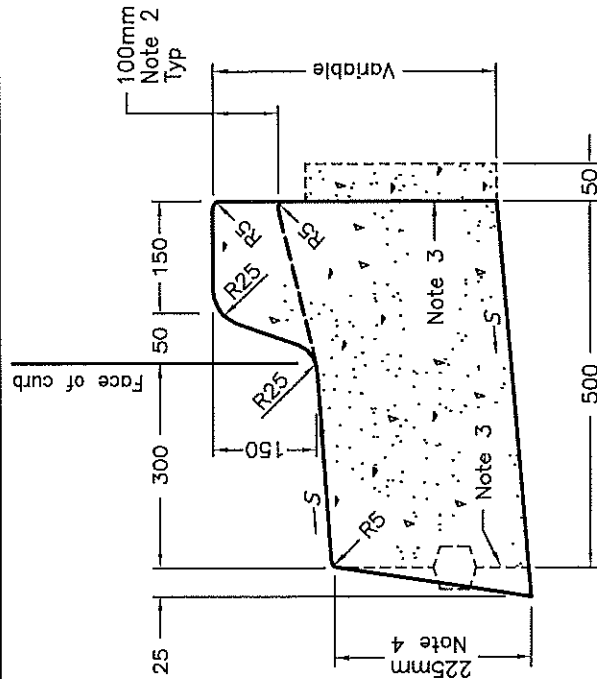
A Treatment at entrances shall be according to OPSD 351.010.

B Outlet treatment shall be according to the OPSD 610 Series.

C The transition from one curb type to another shall be a minimum length of 3.0m,

except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

D All dimensions are in millimetres unless otherwise shown.



SUPERELEVATED




ONTARIO PROVINCIAL STANDARD DRAWING

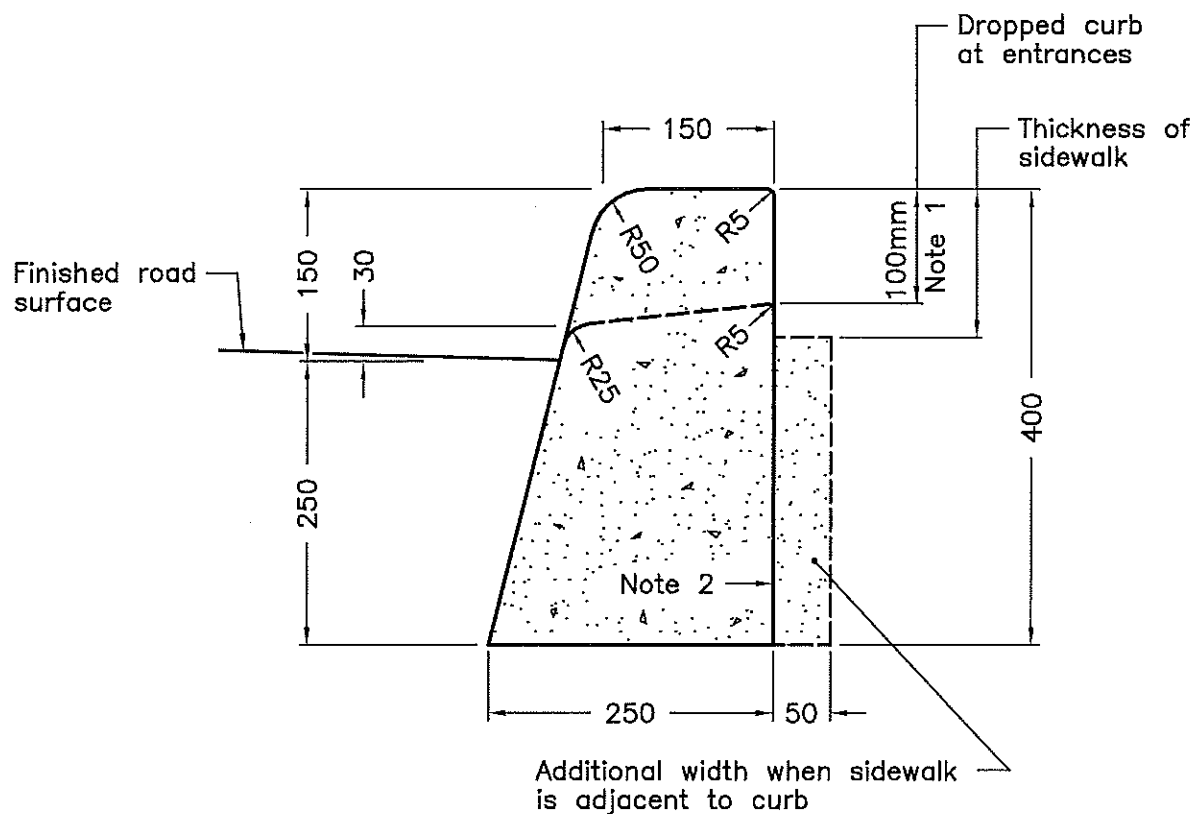
Nov 2012 Rev 2

CONCRETE BARRIER CURB WITH STANDARD GUTTER

OPSD 600.040



ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2	
CONCRETE SEMI-MOUNTABLE CURB WITH STANDARD GUTTER	<div style="border-bottom: 1px dashed black; height: 1.2em; width: 100%;"></div> <div style="border-bottom: 1px dashed black; height: 1.2em; width: 100%;"></div>			
	OPSD 600.060			



NOTES:

- 1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
- 2 For slipforming procedure a 5% batter is acceptable.
- A Treatment at entrances shall be according to OPSD 351.010.
- B Outlet treatment shall be according to the OPSD 610 Series.
- C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

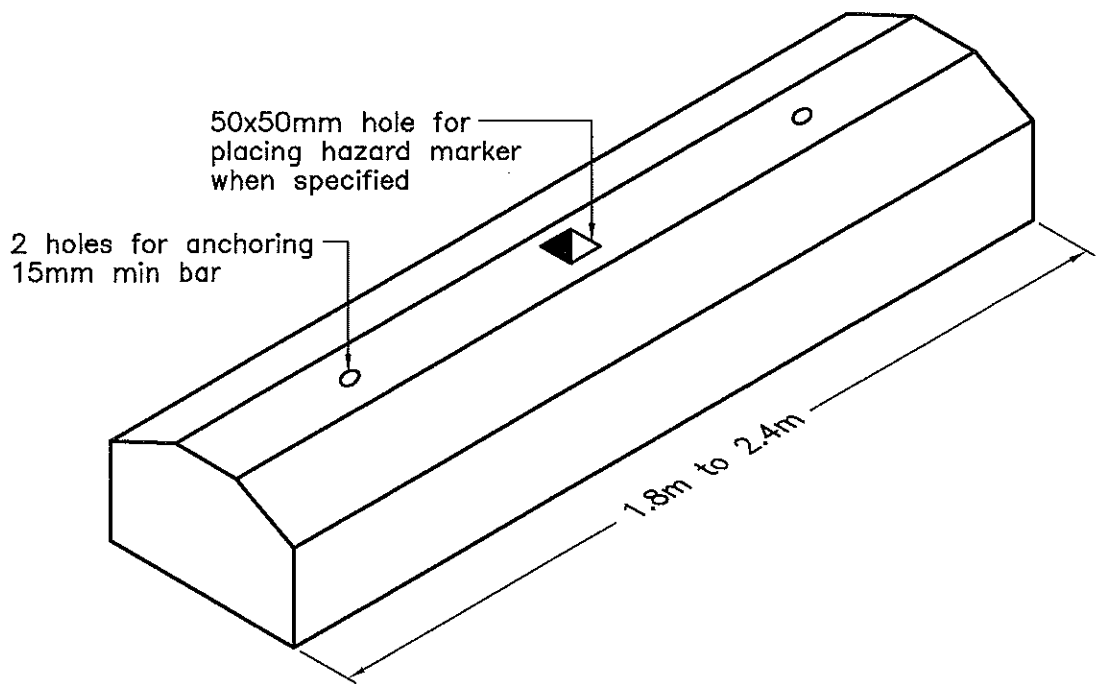
Nov 2012

Rev 2

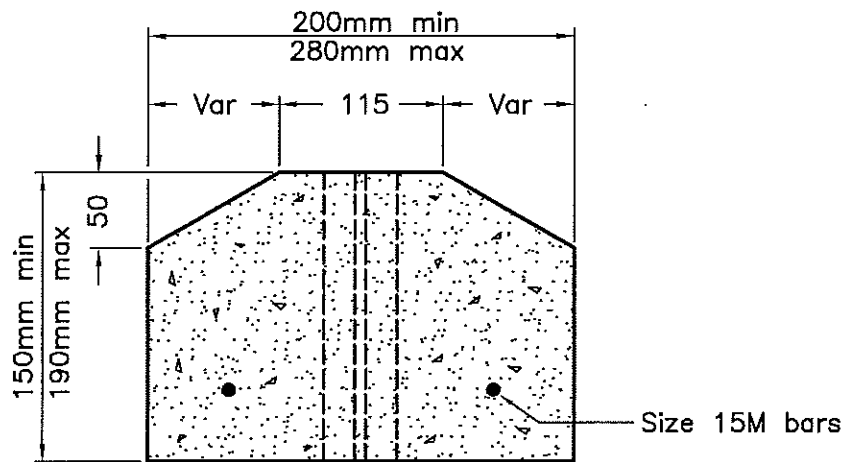
CONCRETE BARRIER CURB



OPSD 600.110




ISOMETRIC VIEW



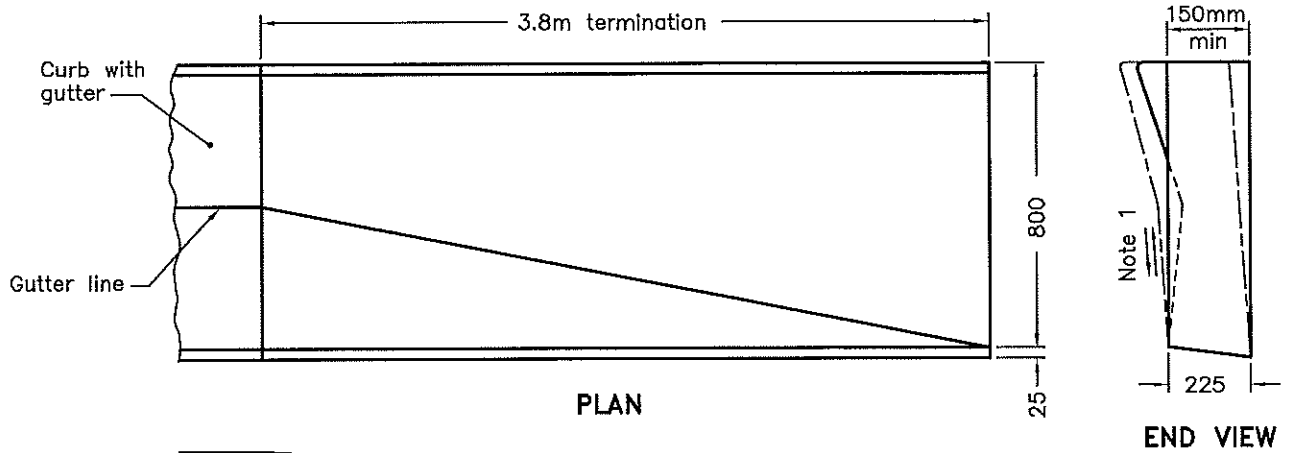
SECTION

NOTES:

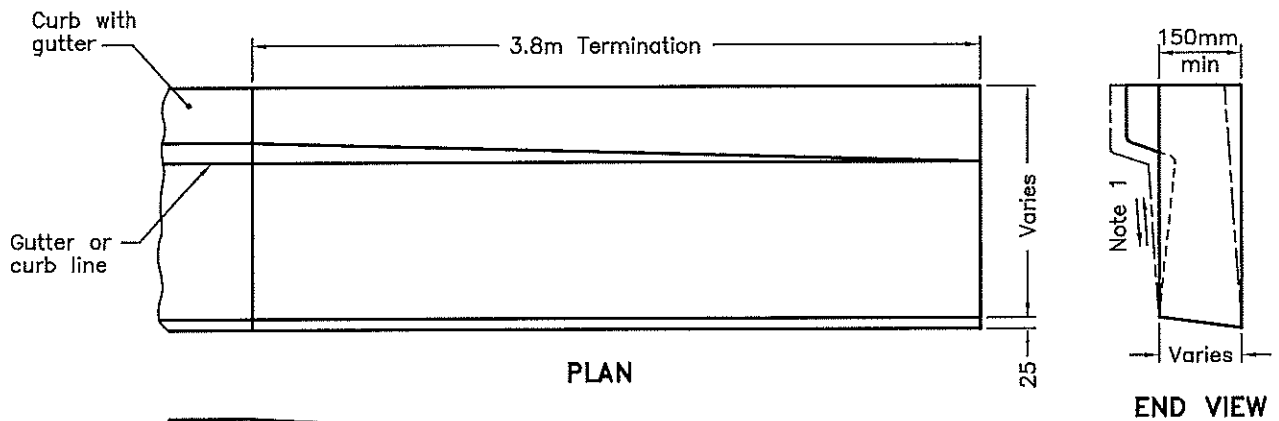
- A Class of concrete shall be C2 according to CSA A23.1.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2	
PRECAST CONCRETE CURB	-----			

OPSD 603.020				



ELEVATION
MOUNTABLE CURB WITH GUTTER



ELEVATION
BARRIER AND SEMI-MOUNTABLE CURB WITH GUTTER

NOTES:

- 1 Slope shall match existing shoulder.
- A This drawing shall be read in conjunction with OPSD 600 series curb with gutter drawings.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

METHOD OF TERMINATION
FOR CONCRETE CURB WITH GUTTER

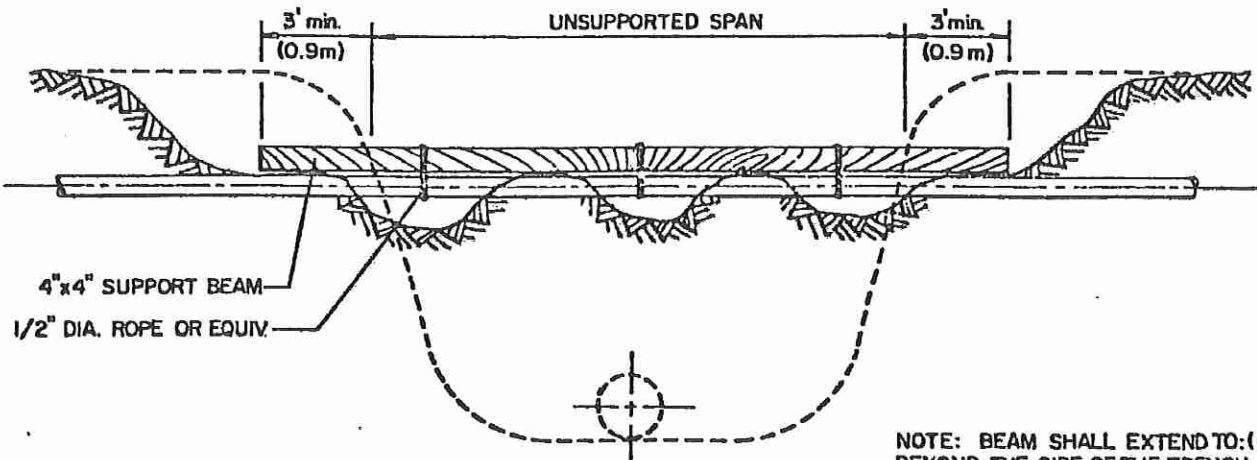
OPSD 608.010



Appendix I – Grading & Storm Drainage

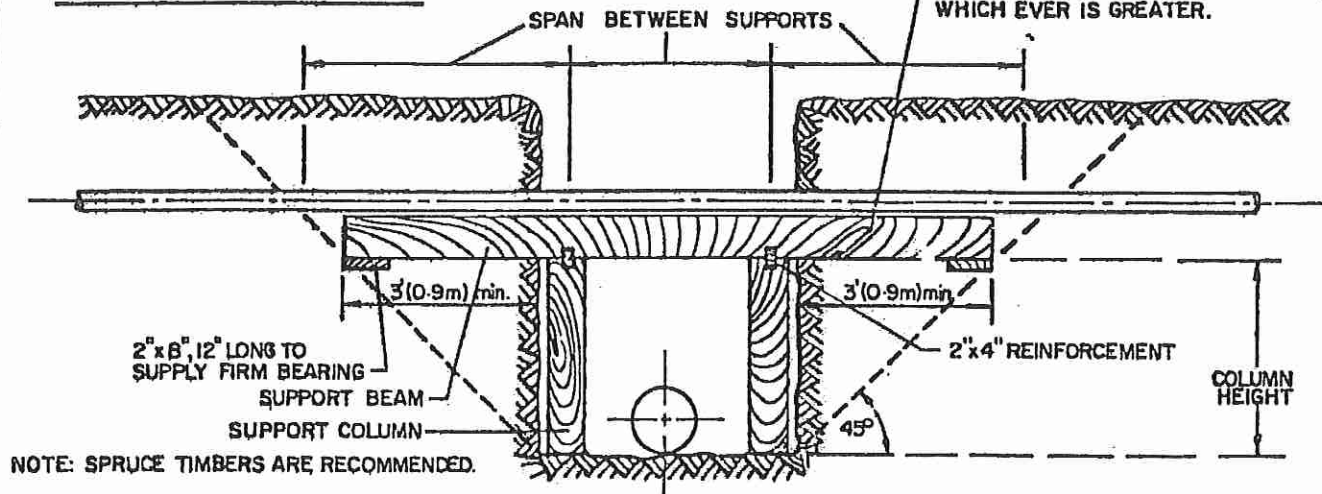
SUPPORT OF GAS PIPELINES CROSSING EXCAVATIONS

TEMPORARY SUPPORT

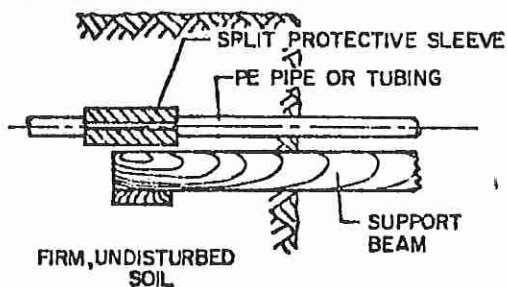


NOTE: BEAM SHALL EXTEND TO: (1) 3' BEYOND THE SIDE OF THE TRENCH, OR (2) A LINE EXTENDED 45° FROM THE BOTTOM OF THE TRENCH UPWARDS AND AWAY FROM THE TRENCH WALL, WHICHEVER IS GREATER.

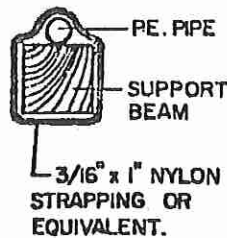
PERMANENT SUPPORT



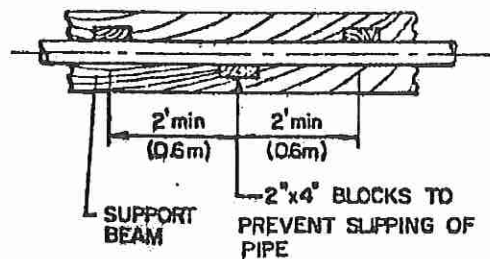
PROVISIONS FOR PE PIPE



DETAIL OF PIPE RESTRAINT (PE PIPE)



DETAIL OF PIPE RESTRAINT (STEEL PIPE)



SECTION:

SUPPORT OF GAS PIPELINES CROSSING EXCAVATIONS

DATE:

AUG. 1978

SUPERSEDES ISSUE DATED:

NEW ISSUE

DWG. NO:

25

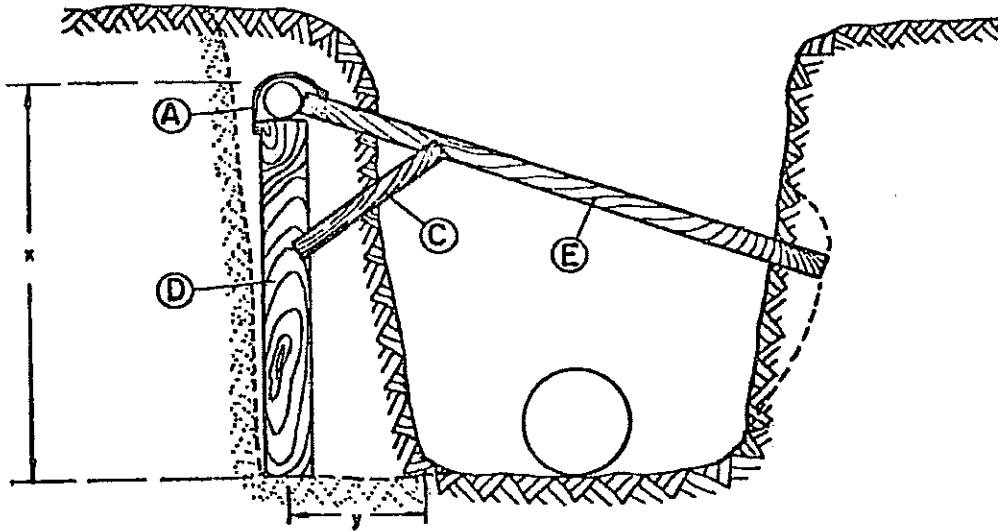
APPROVED

Chief Engineer: *R. P. Rinn*

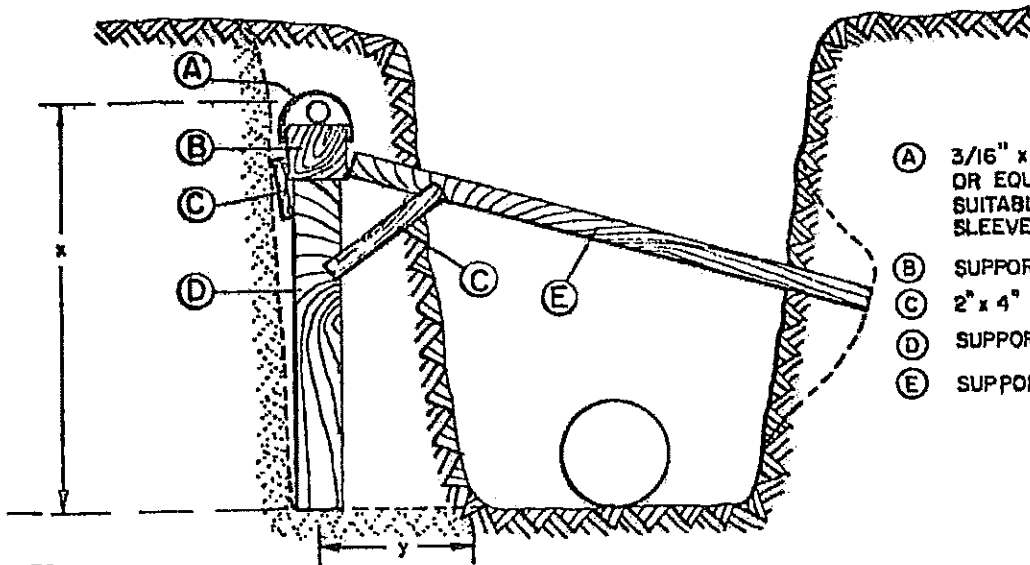
Mgr. Sys. Operations: *Chapman*

SUPPORT OF GAS PIPELINES PARALLEL TO UNSHORED TRENCH

STEEL PIPE, 3" NOMINAL SIZE & GREATER



ALL PE PIPE & TUBING, STEEL PIPE NOMINAL SIZE 2" & SMALLER



- (A) 3/16" x 1" NYLON STRAPPING OR EQUIVALENT WITH SUITABLE SPLIT PROTECTIVE SLEEVE FOR PE PIPE.
- (B) SUPPORT BEAM
- (C) 2" x 4" TIMBER TO SUIT
- (D) SUPPORT COLUMN
- (E) SUPPORT BRACE - 4" x 4"

NOTES:

- ① IF THE DISTANCE 'y' IS GREATER THAN 'x' NO SUPPORT IS NECESSARY.
- ② IF THE DISTANCE 'y' IS LESS THAN 'x' DITCH SHALL BE ENLARGED TO ACCOMMODATE SUPPORT. (SEE DOTTED DITCH LINE)
- ③ BEAMS AND COLUMNS ARE TO BE SIZED AND SPACED TO THE SPECIFICATIONS OF PIPELINES CROSSING A TRENCH.
- ④ SPECIAL CARE SHALL BE TAKEN TO AVOID CONDITIONS THAT WOULD KINK THE PLASTIC PIPE.
- ⑤ SPRUCE TIMBERS ARE RECOMMENDED.

SECTION:

SUPPORT OF GAS PIPELINES PARALLEL TO UNSHORED TRENCH

DATE:

AUG. 1978

SUPERSEDES ISSUE DATED:

DEC. 1973

DWG. NO:

26

APPROVED

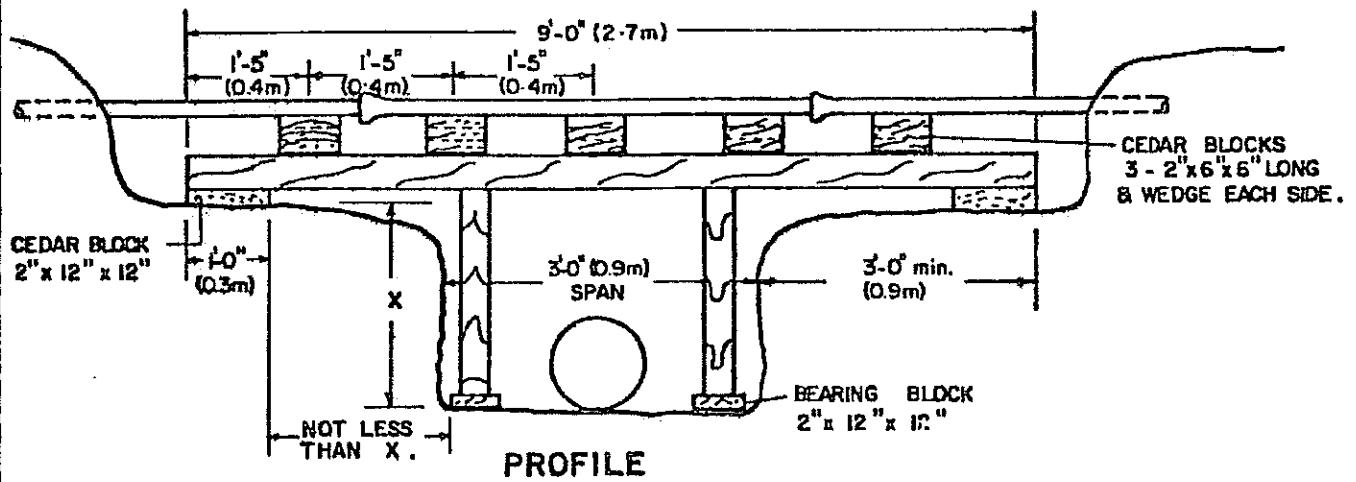
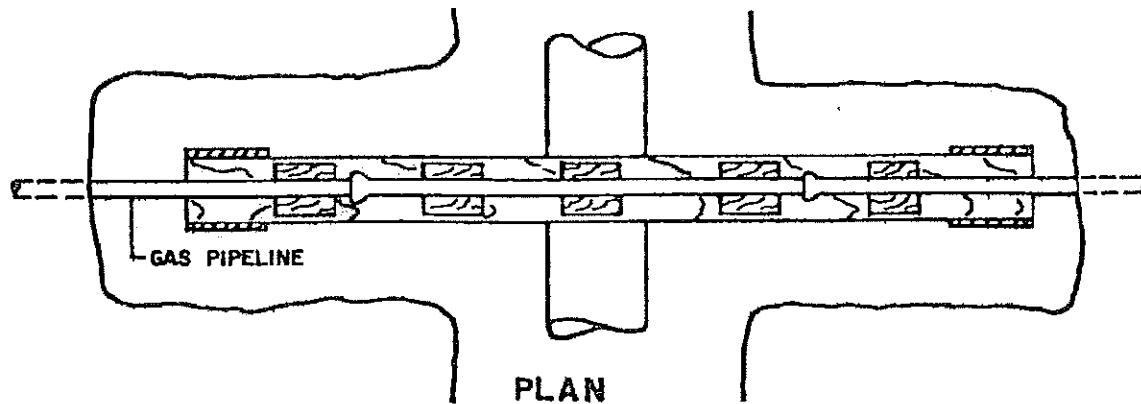
Chief Engineer:.....

Mgr. Sys. Operations:.....

[Signature]
[Signature]

094

PIPELINES CROSSING TRENCH



NOMINAL PIPE SIZE	TYPE OF BEAM	TYPE OF COLUMN
UP TO 4"	6" x 8"	6" x 6"
6"	8" x 8"	6" x 6"
8" & 10"	12" x 12"	8" x 8"
12"	12" x 12"	8" x 8"

NOTES :-

- FOR MAINS LARGER THAN 12", A SUPPORT SHALL BE CUSTOM DESIGNED BY THE COMPANY .
- WHERE SPAN EXCEEDS 3'-0" (0.9m) USE COLUMNS AS SHOWN, MINIMUM 4" x 4" .

SECTION: SUPPORT OF CAST IRON GAS
PIPE OVER EXCAVATIONS .

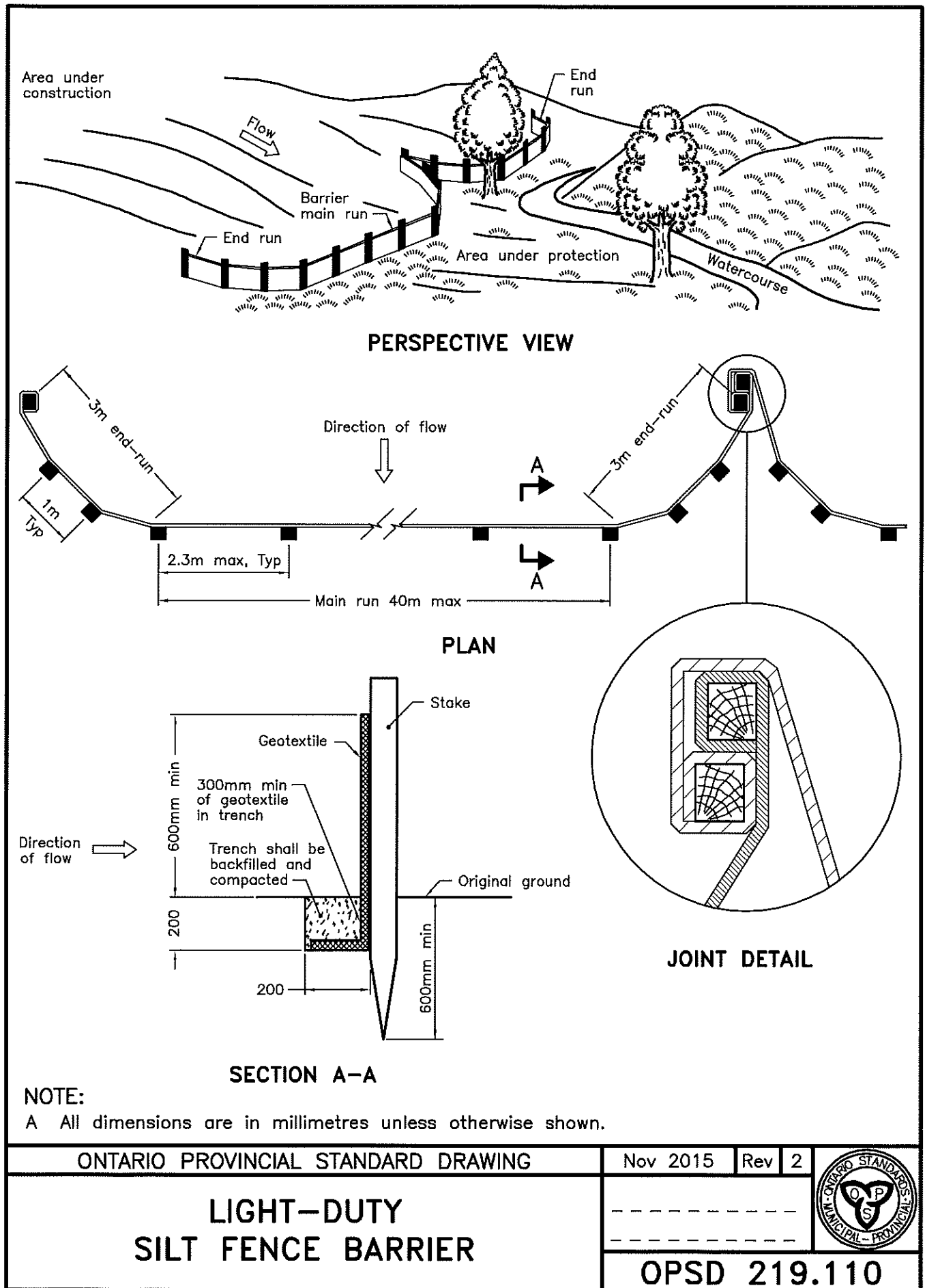
DATE: AUG. 1978

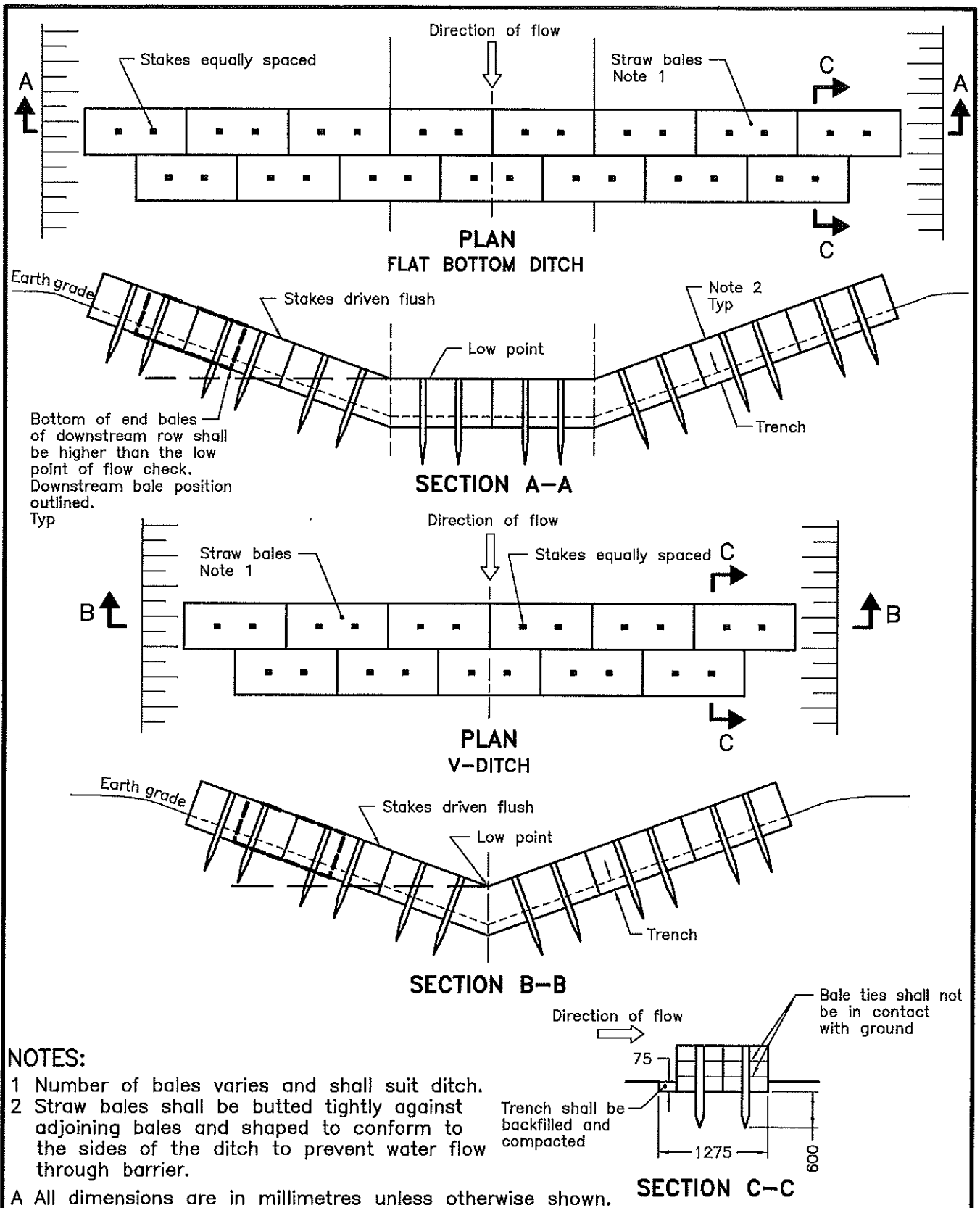
SUPERSEDES ISSUE DATED:
DEC 1973

DWG. No.
27

APPROVED

Chief Engineer: *P. R. R.*
Mgr. Sys. Operations: *Chapman*





ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015

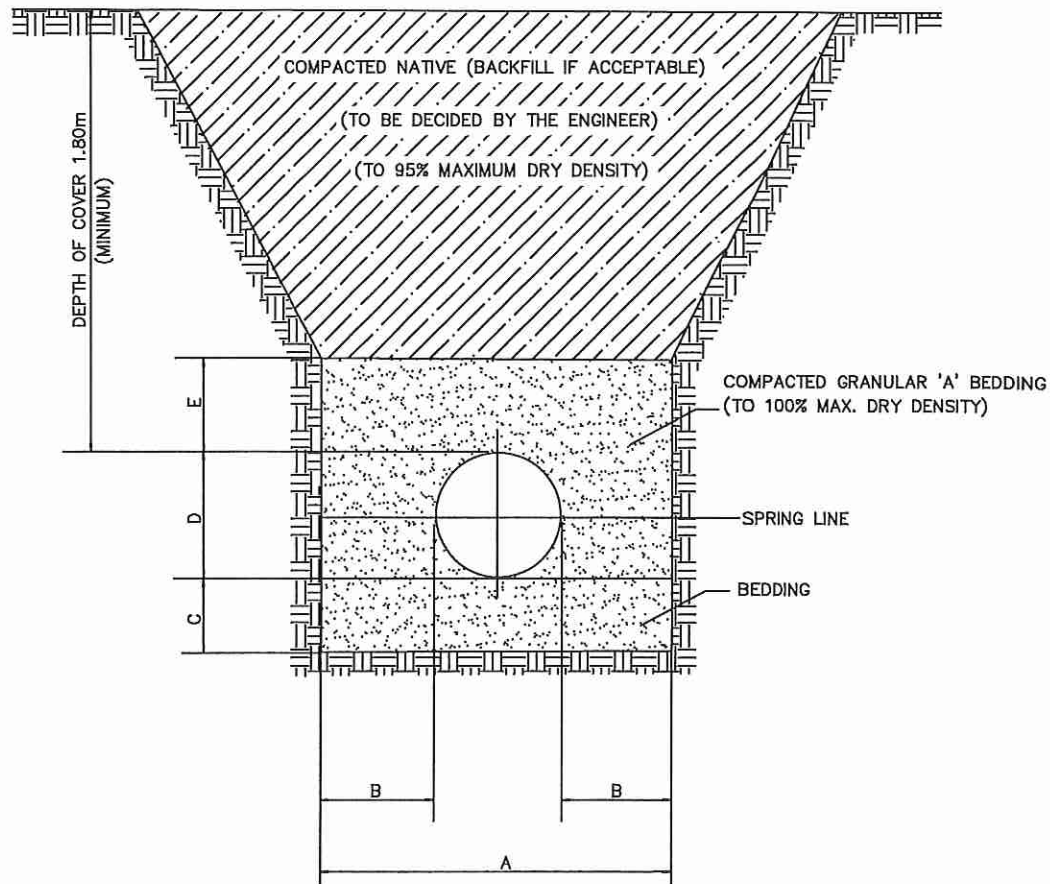
Rev 2

STRAW BALE FLOW CHECK DAM

OPSD 219.180



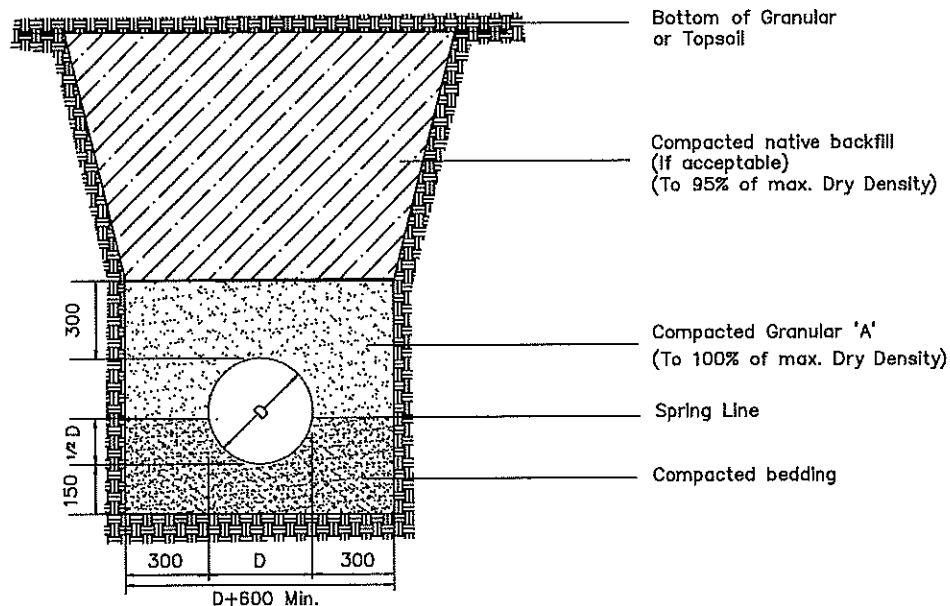
Appendix J – San. Sewer, Water Ser. & Stormwater



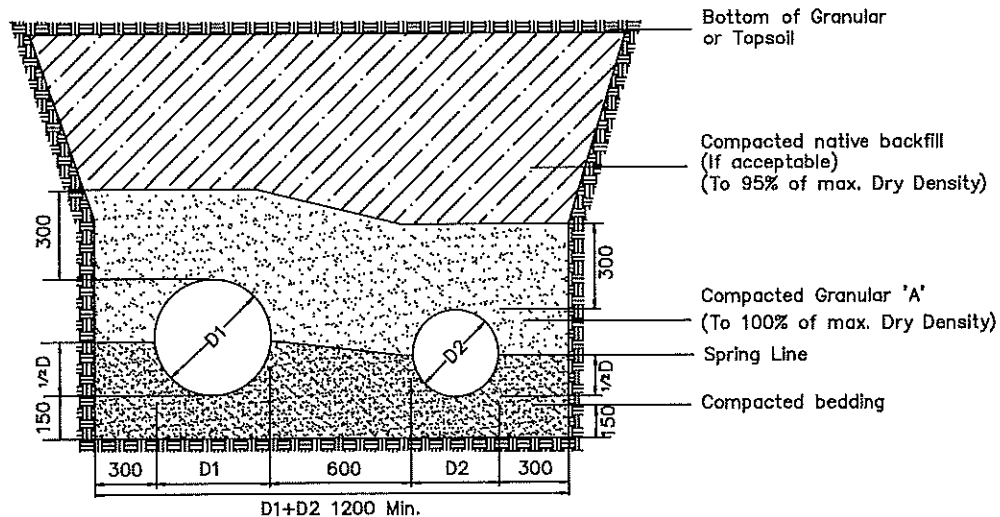
WATERMAINS			
SIZE OF PIPE	100 TO 300	GREATER THAN 300	ALL
A	"D1"+"D2"+1200	"D1"+"D2"+1200	600 MIN
B	300 MIN	300 MIN	150 MIN
C	150	150	150
D	O.D. OF PIPE	O.D. OF PIPE	O.D. OF PIPE
E	300 MIN	300 MIN	300 MIN

NOTES:

1. ALL EXCAVATIONS AND SLOPES ARE TO BE IN COMPLIANCE WITH THE HEALTH AND SAFETY ACT
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED
3. WHERE NATIVE BACKFILL IS NOT ACCEPTABLE, THE BACKFILL SHALL BE IMPORTED
4. COMPACT BEDDING, SPRING LINE AND COVER MATERIAL AS REQUIRED TO ACHIEVE 100% (MAX. DRY DENSITY)



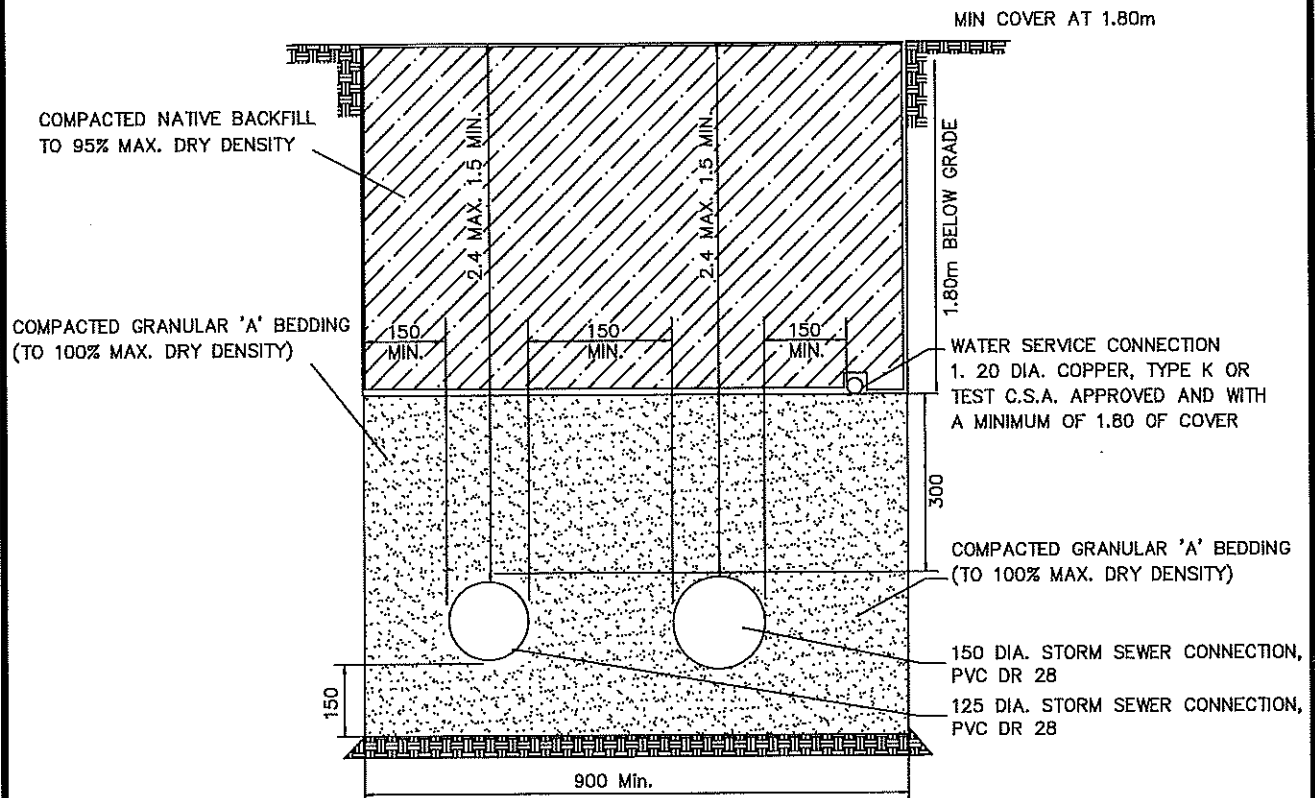
SINGLE PIPE SEWER



TWIN PIPE SEWER

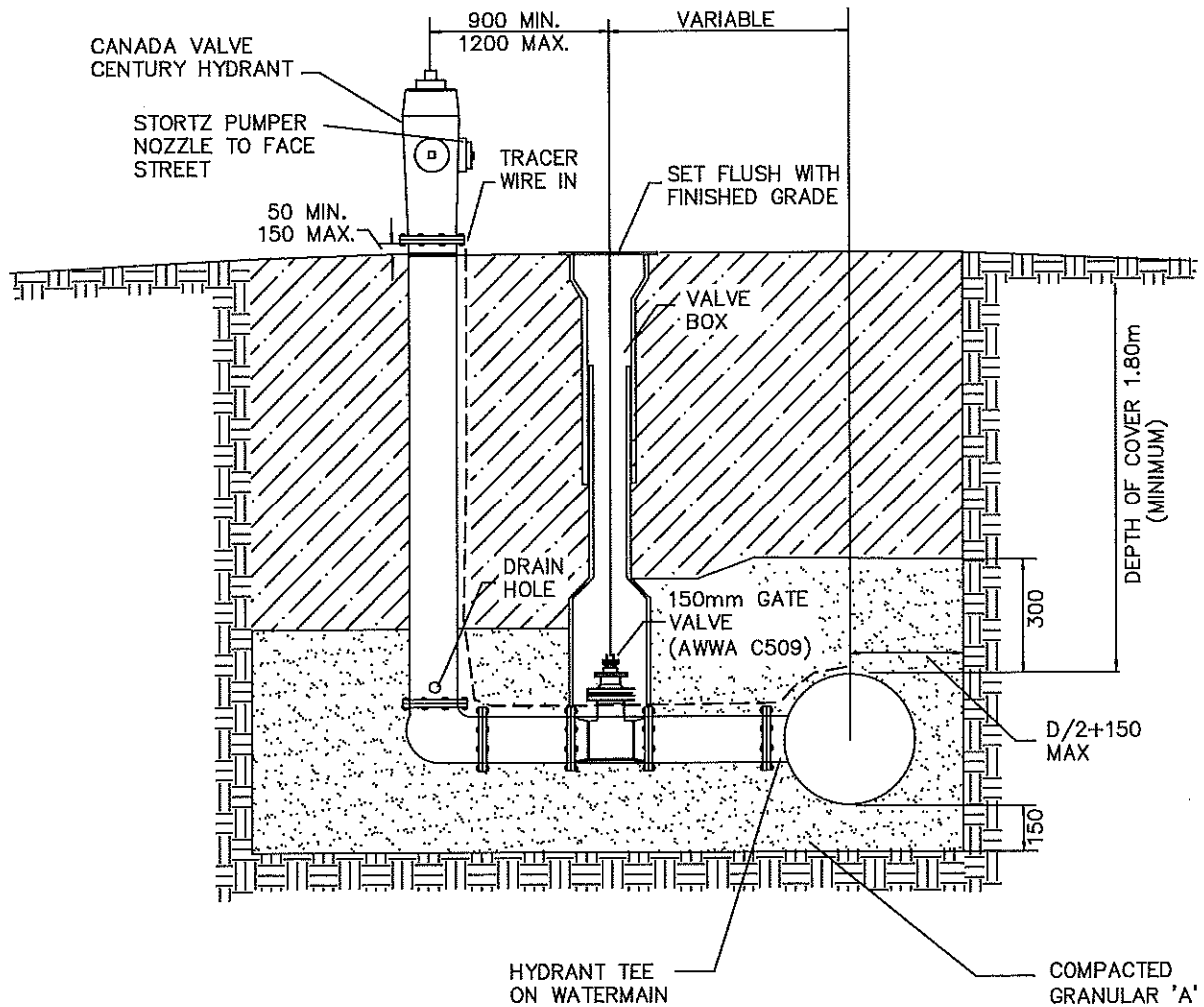
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES UNLESS OTHERWISE SPECIFIED
2. COMPACT GRANULARS TO SPRING LINE OF PIPE TO 100% MAX. DRY DENSITY.



NOTES:

1. ALL HOUSE CONNECTION TRENCHES TO HAVE 150 OF GRAN 'A' BEDDING PLACED BEFORE PIPES ARE LAID.
2. WHERE POSSIBLE, ALL PIPES TO BE LAID STRAIGHT TO HOUSE WITH NO KINKING OF PIPE ALLOWED, LONG RADIUS SWEEPS ONLY FOR JOINTS.
3. MINIMUM SLOPE FOR SEWER CONNECTION FROM PROPERTY LINE TO HOUSE TO BE 1% MIN., 2% DESIRABLE.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED
5. NO CURB STOPS SHALL BE LOCATED IN DRIVEWAYS

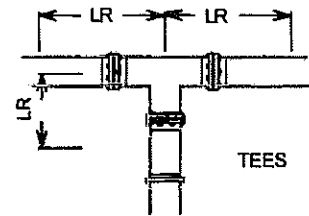


NOTES:

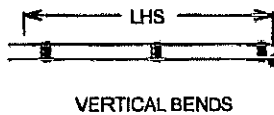
1. ALL HYDRANT LEADS ARE TO BE 150mmØ -PVC-CLASS 150-DR 18 BEDDING PLACED BEFORE PIPES ARE PLACED
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED
3. ALL MATERIALS ARE TO BE IN ACCORDANCE WITH THE CITY OF BROCKVILLE STANDARD MATERIAL SPECIFICATIONS FOR WATERMAIN CONSTRUCTION
4. ALL MECHANICAL JOINTS ARE TO BE RESTORED WITH ROMAC RESTRAINING GLANDS.



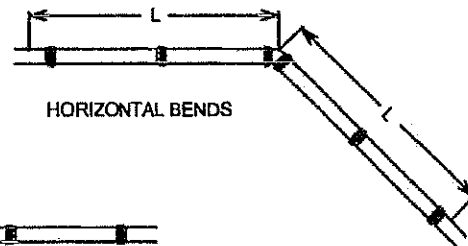
DEAD ENDS, CAPS, PLUGS, AND ISOLATION VALVES



TEES



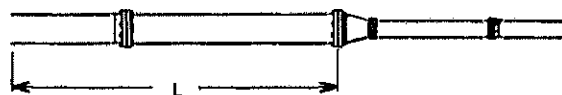
VERTICAL BENDS



HORIZONTAL BENDS

Definitions

L - Restrained Length
LR - joints of Apputenance only
LHS - Restrained Length (high side)
LLS - Restrained Length (low side)



REDUCERS

Table of Restrained Lengths (L)

Lengths are in Metres		Diameter PVC (DI) Watermain					
		100mm	150mm	200mm	250mm	300mm	400mm
DEAD ENDS, CAPS, PLUGS, VALVES		6.0	9.0	12.0	15.0	18.0	21.0
REDUCERS		LARGER DIAMETER (SIDE TO BE RESTRAINED)					
SMALLER DIAMETER		100mm	150mm	200mm	250mm	300mm	400mm
100mm		N/A	6.0	9.0	12.0	15.0	18.0
150mm			N/A	6.0	9.0	12.0	15.0
200mm				N/A	6.0	9.0	12.0
250mm					N/A	6.0	9.0
300mm						N/A	6.0
400mm							N/A

NOTES:

1. WHEN DETERMINING RESTRAINED LENGTHS THE FOLLOWING ASSUMPTION SHALL BE MADE: TEST PRESSURE 125 psi
2. FOR HORIZONTAL BENDS - 11.25° / 22.5° / 45°; ALL JOINTS WITHIN 3.0m OF BENDS SHALL BE RESTRAINED
3. FOR VERTICAL BENDS - 11.25° / 22.5° / 45°; ALL JOINTS WITHIN 6.0m OF BENDS SHALL BE RESTRAINED; APPLICABLE FOR VERTICAL SEPARATIONS OF UP TO 1.2m
4. FOR TEES ALL JOINTS WITHIN 3.0m OF TEE SHALL BE RESTRAINED; NOTE: LR MUST BE GREATER THAN 3.0m
5. ANY JOINT THAT FALLS WITHIN THE RECOMMENDED LENGTH (L) SHALL BE RESTRAINED. TO REDUCE THE NUMBER OF RESTRAINERS REQUIRED THE USE OF FULL PIPE LENGTHS IS RECOMMENDED IN THESE AREAS
6. IN SPECIAL SITUATIONS THE CITY ENGINEER MAY REQUIRE CONCRETE THRUST BLOCKING IN WHICH CASE THE CONCRETE THRUST BLOCKS MUST BE DESIGNED BY A PROFESSIONAL ENGINEER.



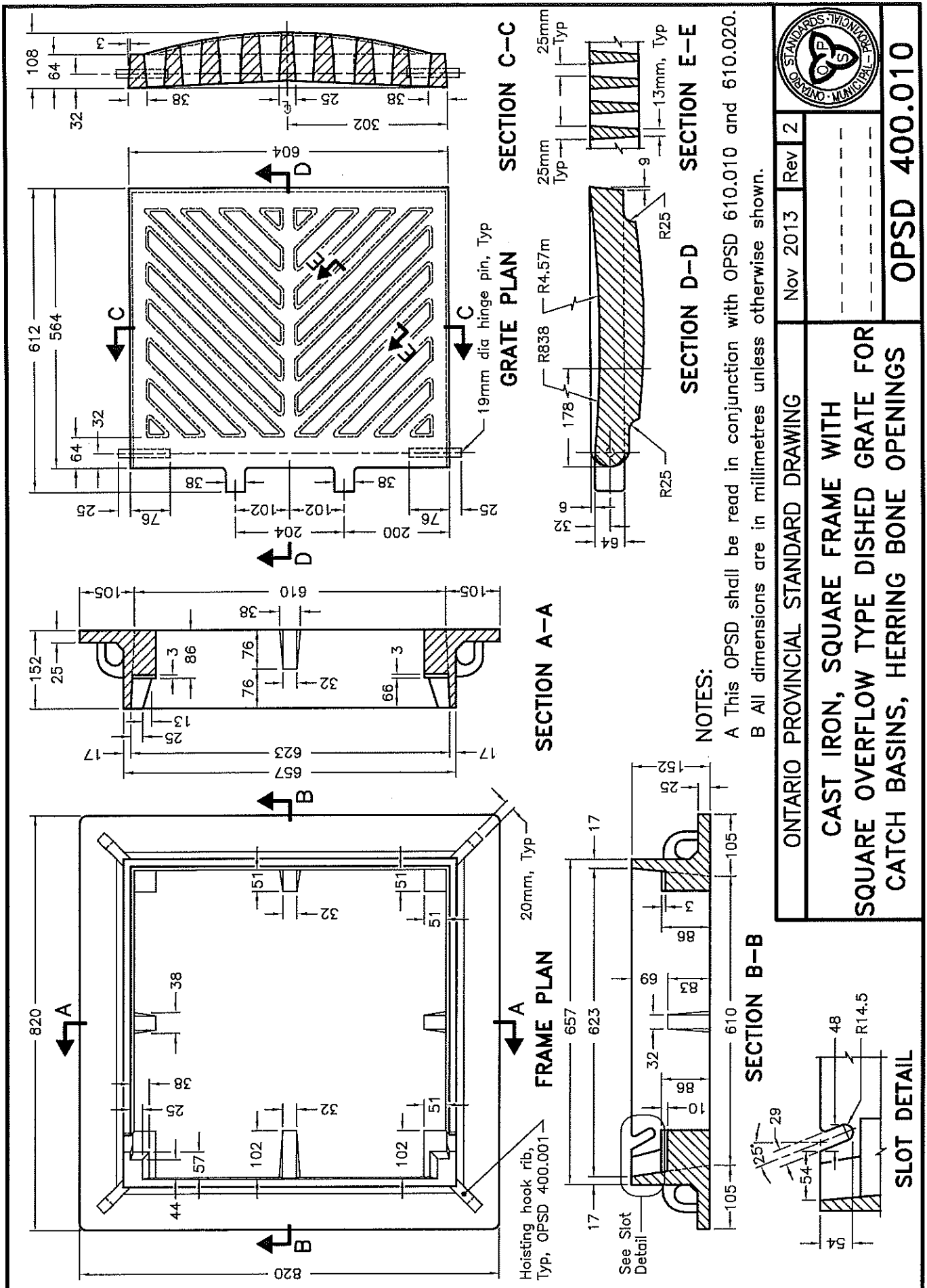
BROCKVILLE
CITY OF THE 1000 ISLANDS

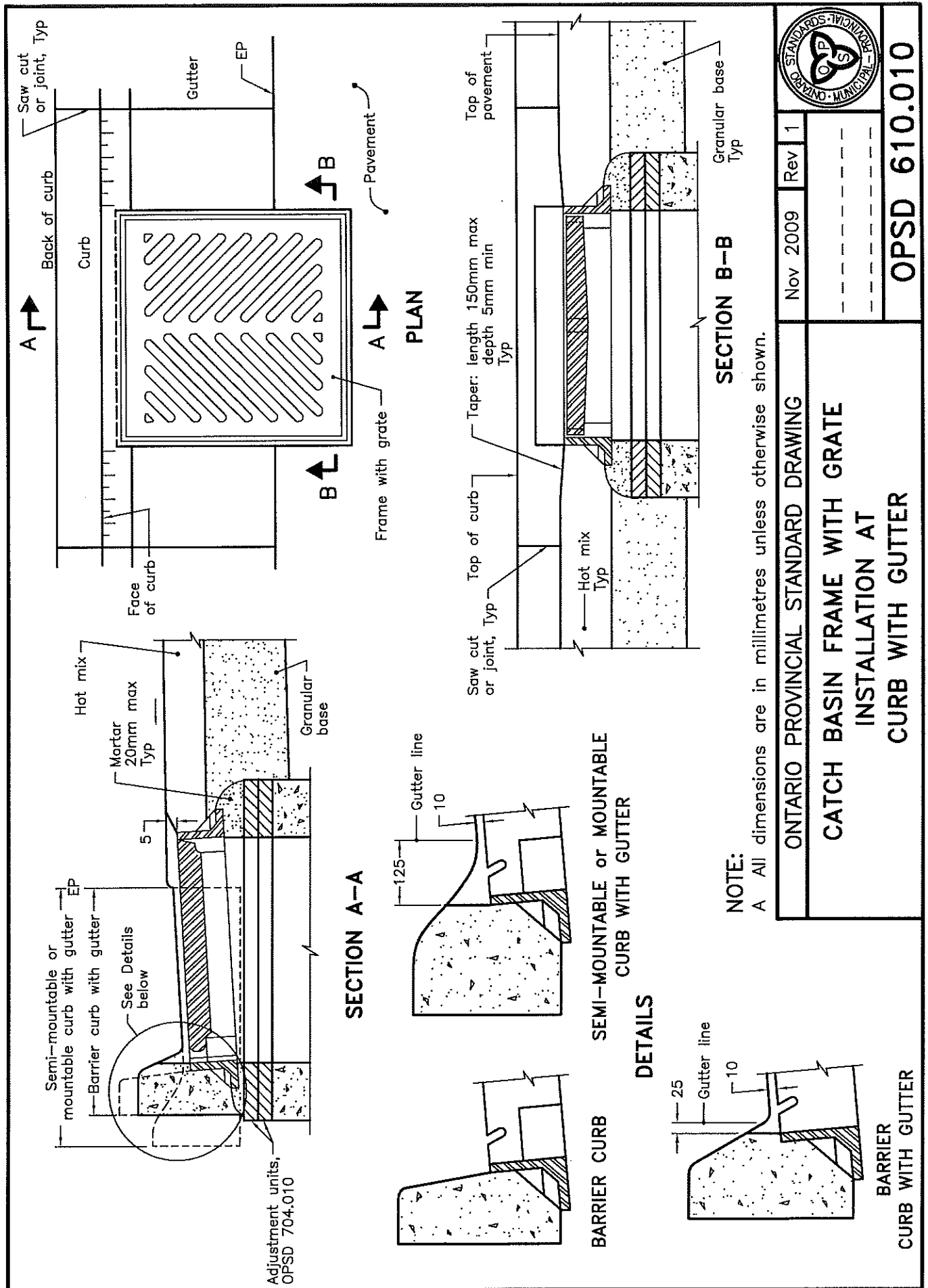
Restraining and Retaining Rings for PVC and DI Watermain
(400mm and under)

DETAIL 6

Date:
January 2017

Revision No: 1





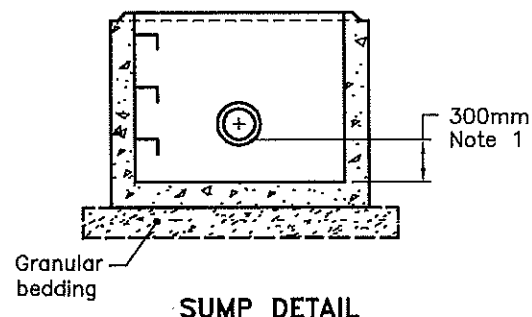
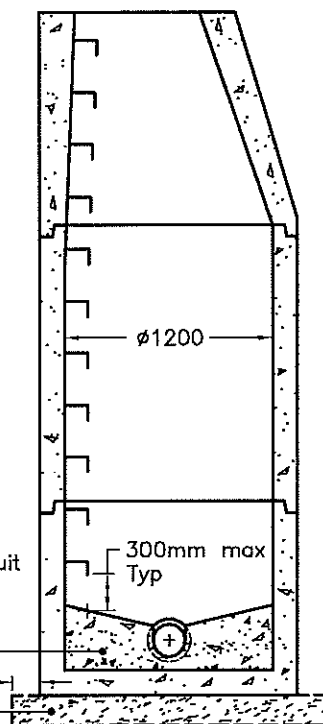
Tapered top
See alternative C

Riser sections
as required

Monolithic base with inlet
and outlet openings to suit
See alternatives A and B

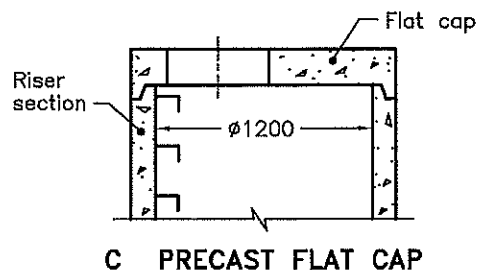
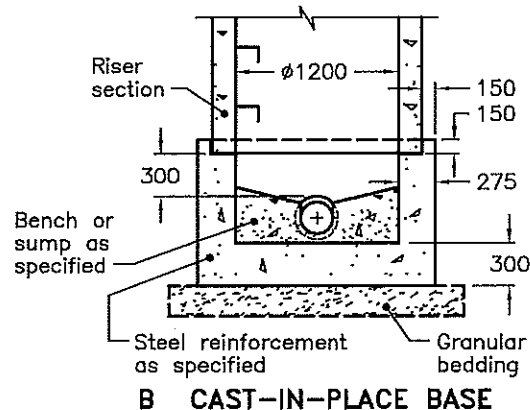
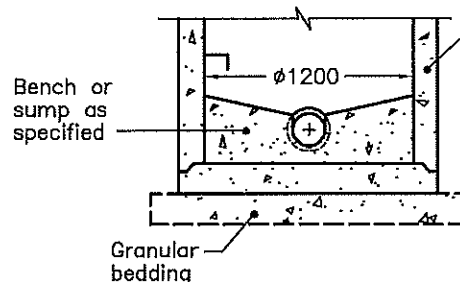
Bench or sump
as specified

300mm, Typ
Granular bedding



ALTERNATIVES

Bottom riser section with
inlet and outlet openings to suit



NOTES:

- 1 The sump is measured from the lowest invert.
- A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
- B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
- C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
- D Pipe support according to OPSD 708.020.
- E For benching and pipe opening details, see OPSD 701.021.
- F For adjustment unit and frame installation, see OPSD 704.010.
- G All dimensions are nominal.
- H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
MAINTENANCE HOLE**

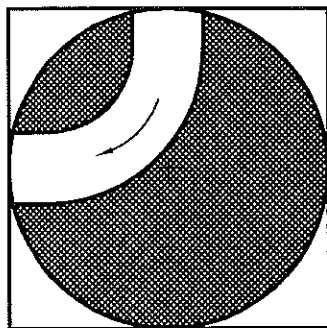
1200mm DIAMETER

Nov 2014

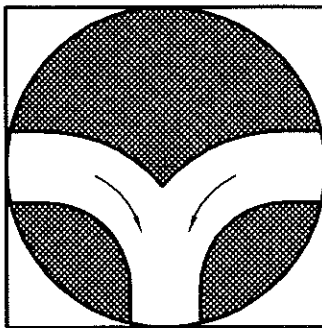
Rev 5



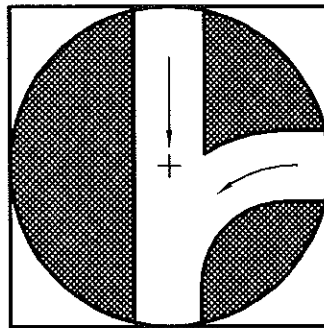
OPSD 701.010



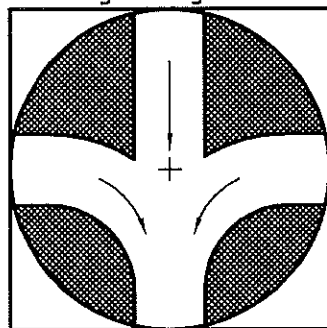
1. Right angle bend



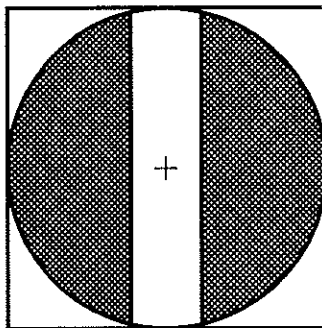
2. Tee connection



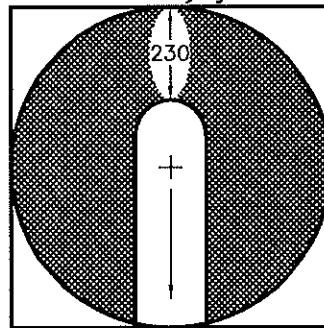
3. Three way junction



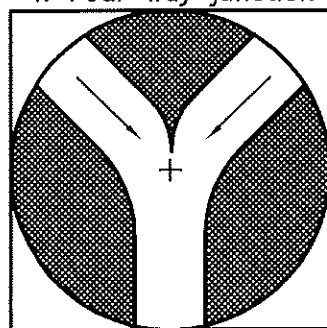
4. Four way junction



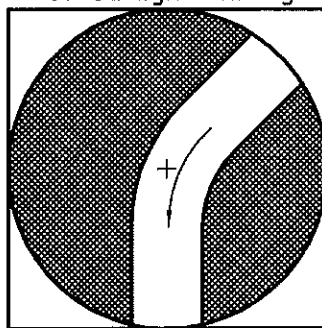
5. Straight through



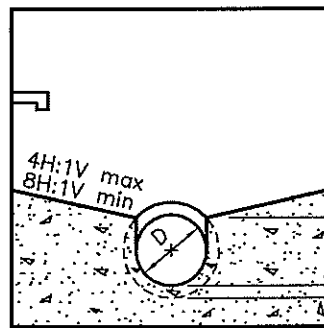
6. Dead end



7. Wye connection



8. 45° bend



Section

MAXIMUM SIZE HOLE IN THE WALL IN PRECAST RISER SECTIONS

Maintenance Hole Diameter	No. 1—4	No. 5 and 6	No. 8	No. 7	
				Inlet Hole	Outlet Hole
1200	700	860	780	700	860
1500	860	1220	960	860	1170
1800	1220	1485	1220	1220	1485
2400	1485	2020	1760	1485	2020
3000	1930	2450	2300	1930	2450
3600	2470	3085	2730	2470	3085

NOTES:

1 Slopes shall be maintained from the outlet hole opening for top of benching.

A Concrete for benching shall be 30MPa.

B When benching is hand-finished, it shall be given wood float finish, channel shall be given steel trowel finish.

C Benchng slope and height shall be as specified.

D When specified, maintenance holes that are 1200mm in diameter with a uniform channel for 200 or 250mm pipe may be prebenched at the manufacturer with standardized benching slope and channel orientation.

E All dimensions are nominal.

F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

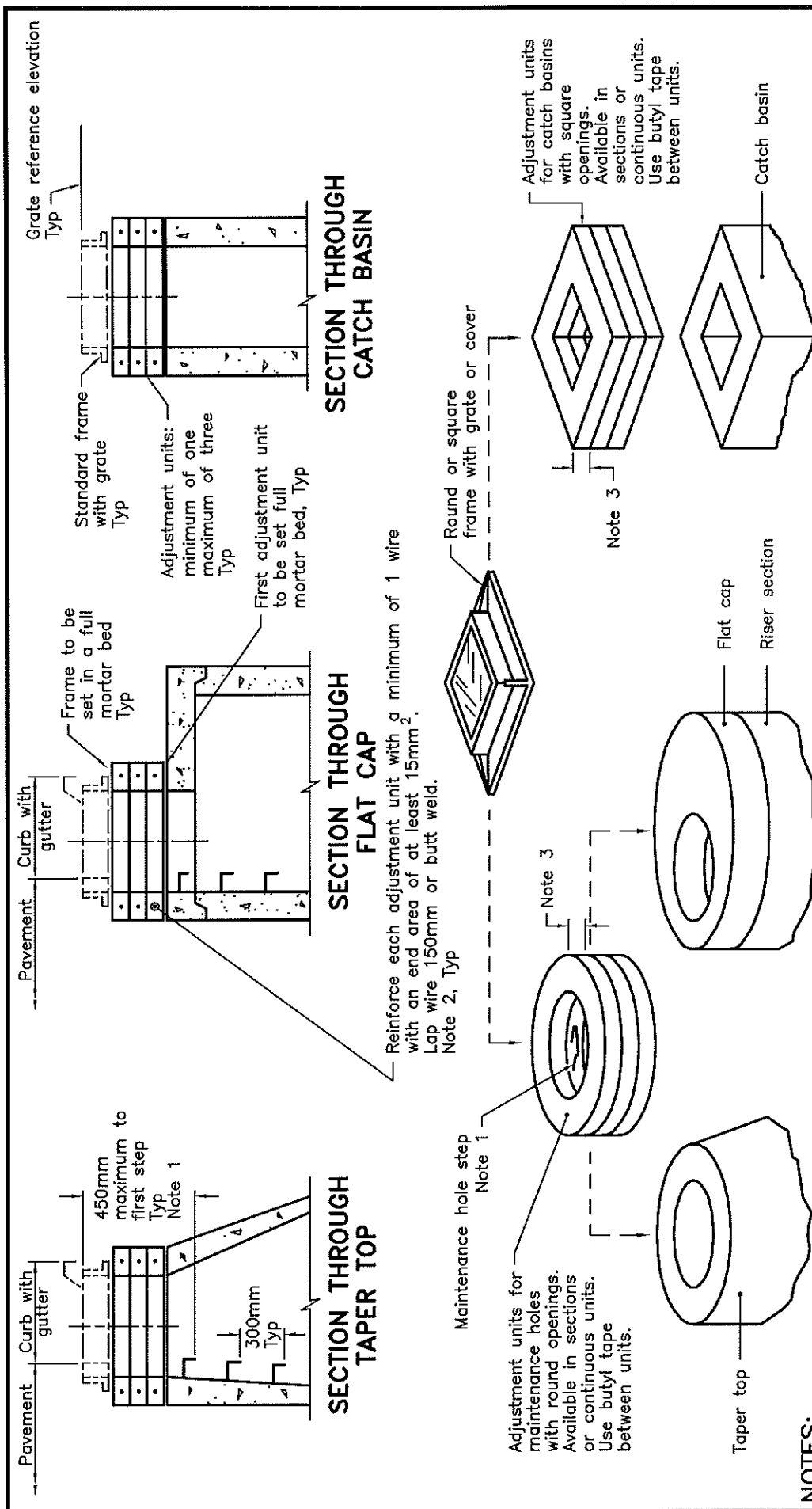
Nov 2014

Rev 4

**MAINTENANCE HOLE BENCHING
AND PIPE OPENING ALTERNATIVES**

OPSD 701.021





NOTES:

- 1 If first step is in an adjustment unit, the adjustment unit shall be of the type manufactured with a step in place.
- 2 Centre reinforcing in adjustment unit ± 10 mm.
- 3 Round and square adjustment units are available in sizes of 50, 75, 100, 150, and 300mm.

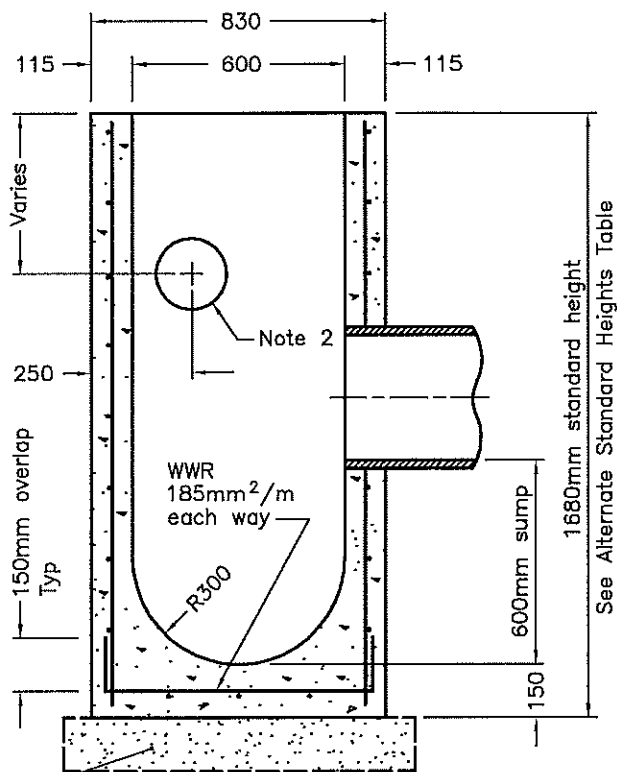
A Adjustment units shall not extend beyond the outside edge of the structure.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2014	Rev 3
PRECAST CONCRETE ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS			
		OPSD 704.010	

150mm overlap, Type

WWR $185\text{mm}^2/\text{m}$ each way

PLAN



SECTION B-B


- 1 Outlet hole size 525mm diameter maximum, location as required.
- 2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.

A Centre reinforcing in base slab and walls $\pm 20\text{mm}$.

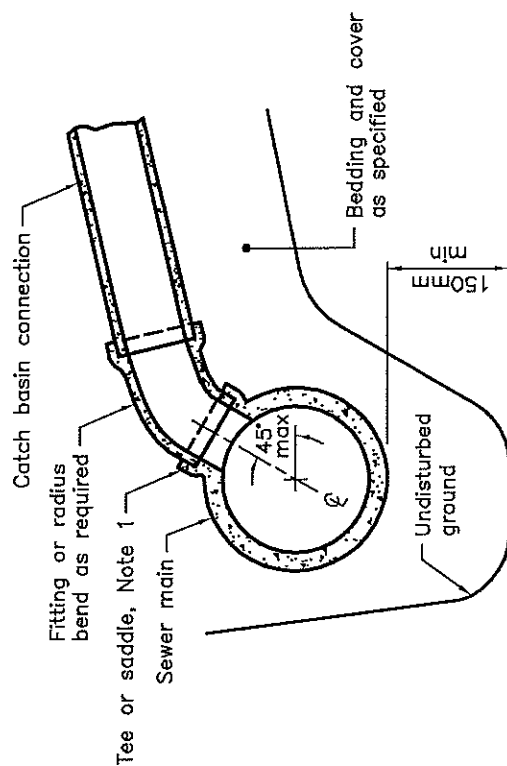
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.

- C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

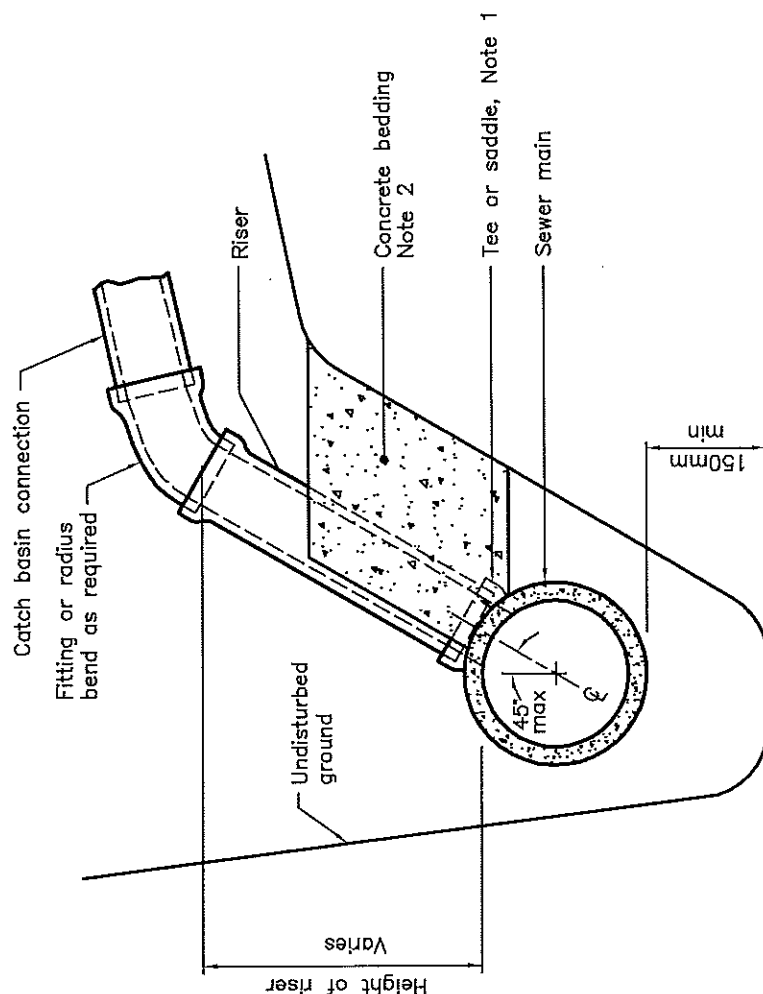
Nov 2014	Rev	3
----------	-----	---

Nov 2014	Rev	3	
<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 2px;"></div>			

OPSD 705.010



CONNECTION WITHOUT RISER



CONNECTION WITH RISER

NOTES:

- 1 For sewers smaller than 450mm dia, connections shall be made using approved factory made tees. For all other sizes, either factory made tees or approved saddles may be used.
- 2 Riser bedding shall have a minimum width of riser pipe outside diameter plus 600mm.
- A Approved cut-in tool shall be used for field installed tees and saddles.
- B Maintenance holes shall be used at the main sewer to connect catch basin connections greater than 300mm.
- C All dimensions are in millimetres unless otherwise shown.

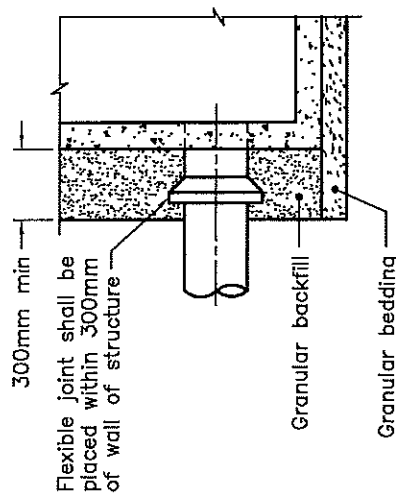


Nov 2016 Rev 3

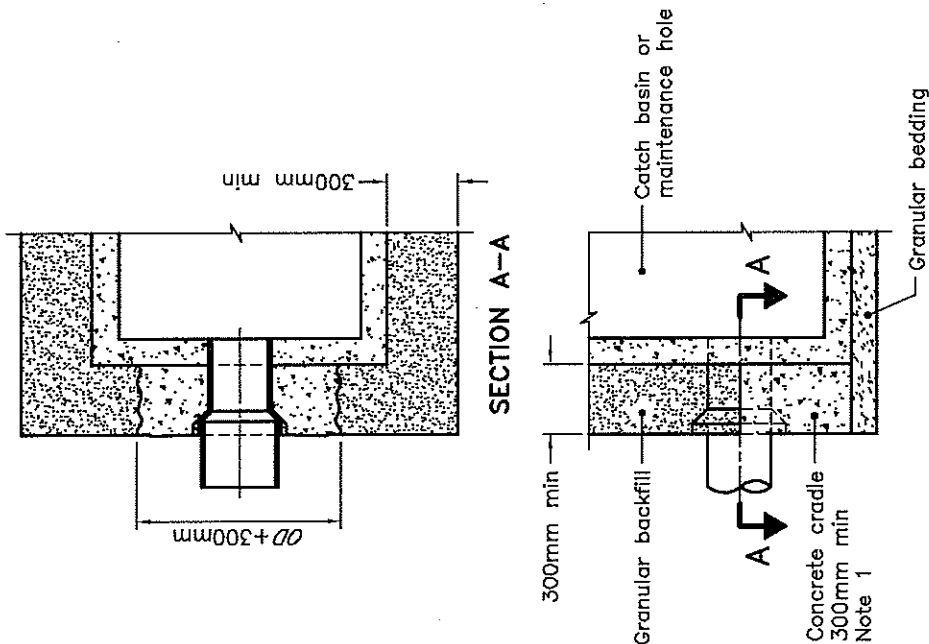
ONTARIO PROVINCIAL STANDARD DRAWING

CATCH BASIN CONNECTION FOR RIGID MAIN PIPE SEWER

OPSD 708.010



ELEVATION
FLEXIBLE JOINT
RIGID AND FLEXIBLE PIPE



ELEVATION
CONCRETE CRADLE
RIGID PIPE

For installation of these connectors refer to manufacturer's instructions.
 A full length of pipe may be used in conjunction with a flexible watertight connector.

FLEXIBLE, WATERTIGHT CONNECTOR
RIGID AND FLEXIBLE PIPE

NOTES:

- 1 Pipe shall be supported with concrete or unshrinkable fill to the first pipe joint.
- A All dimensions are in millimetres unless otherwise shown.

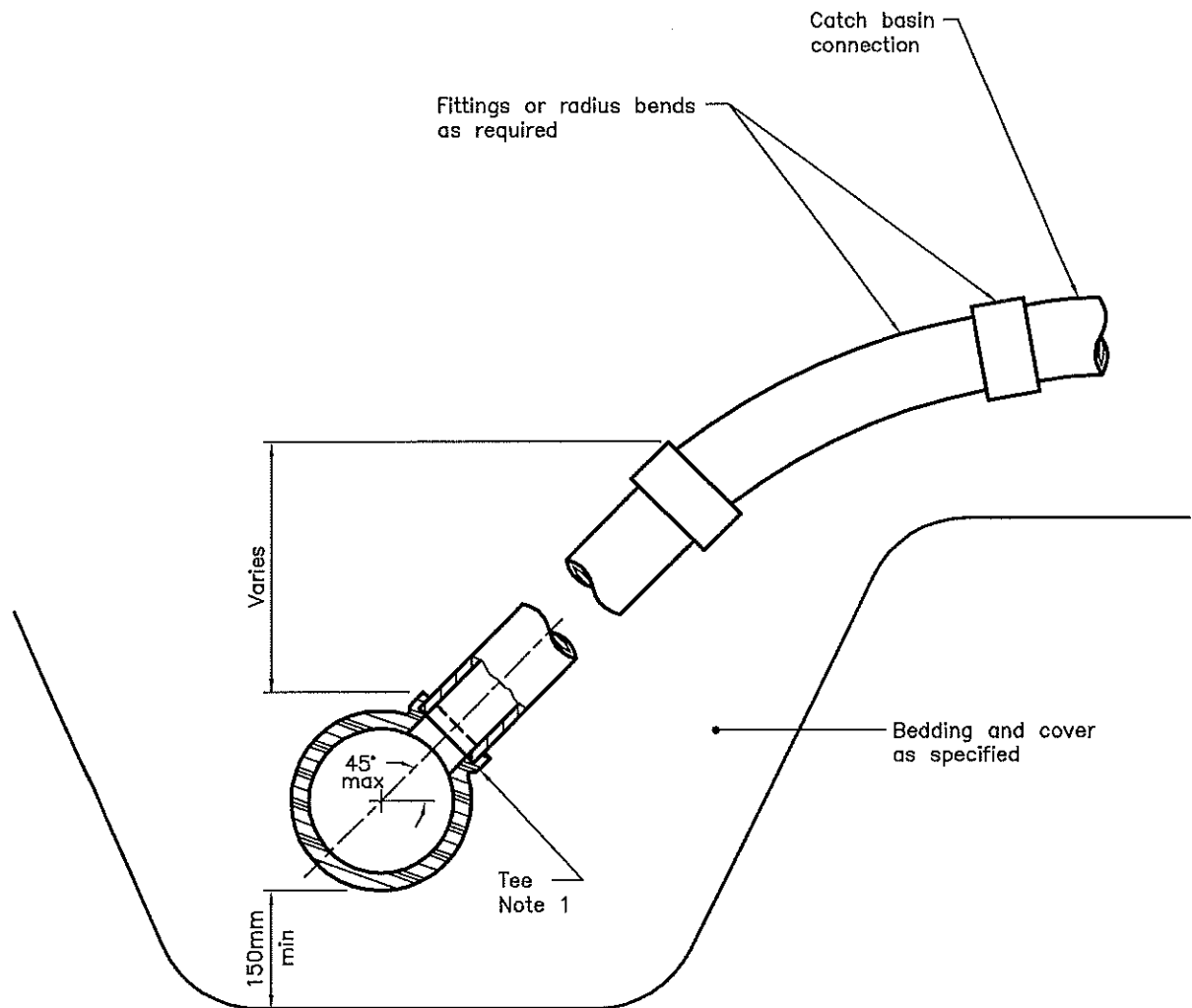


ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2016 Rev 4

SUPPORT FOR PIPE
AT CATCH BASIN
OR MAINTENANCE HOLE

OPSD 708.020



NOTES:

- 1 For catch basin connections 300mm in diameter or less, factory made tees shall be used.
- A For catch basin connections greater than 300mm in diameter, maintenance holes shall be used at the main sewer.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2016

Rev 3

**CATCH BASIN CONNECTION
FOR FLEXIBLE MAIN PIPE SEWER**



OPSD 708.030

PIPE DIA mm	AREA m ²	TRENCH WIDTH	MAXIMUM HEIGHT OF FILL					
			210 kPa Stiffness PSM DR 41		320 kPa Stiffness PSM DR 35 and PS 320		625 kPa Stiffness PSM DR 28	
			≤ Trench Width	> Trench Width	≤ Trench Width	> Trench Width	≤ Trench Width	> Trench Width
100	0.008	0.40	9	7.2	9	7.5	13.5	8.2
135	0.014	0.54	9	7.2	9	7.5	13.5	8.2
150	0.020	0.95	9	7.2	9	7.5	13.5	8.2
200	0.030	1.00	9	7.2	9	7.5	N/A	N/A
250	0.050	1.05	9	7.2	9	7.5	N/A	N/A
300	0.070	1.10	9	7.2	9	7.5	N/A	N/A
375	0.110	1.20	9	7.2 *	9	7.5 *	N/A	N/A
450	0.160	1.25	9	7.2 **	9	7.5 **	N/A	N/A
525	0.220	1.30	9 *	7.2 **	9 *	7.5 **	N/A	N/A
600	0.280	1.40	9 *	7.2 **	9 *	7.5 **	N/A	N/A
675	0.360	1.50	9 *	7.2 **	9 *	7.5 **	N/A	N/A
750	0.440	1.60	9 *	7.2 **	9 *	7.5 **	N/A	N/A
900	0.640	1.70	9 **	7.2 **	9 **	7.5 **	N/A	N/A

NOTES:

- 1 For installations in Type 4 soil, height of fill shall be calculated from first principles.
- 2 For installations in Type 3 soil, height of fill shall be calculated from first principles.
- A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
- B Minimum height of fill over top of pipe shall be 300mm or one pipe diameter, whichever is greater.
- C The table is based on backfill density of 1900 kg/m³.
- D This OPSD shall be read in conjunction with OPSD 802.010 and 802.013.

- LEGEND:**
- * Note 1
 - ** Note 1 and 2
 - N/A Not Available
- E Height of fill greater than 9.0m shall be calculated from first principles.
- F All dimensions are in metres unless otherwise shown.



Nov 2015	Rev	3
-----	-----	-----

ONTARIO PROVINCIAL STANDARD DRAWING

HEIGHT OF FILL TABLE

POLYVINYL CHLORIDE GRAVITY SEWER PIPE

210, 320, and 625kPa

OPSD 806.040


DR	MAXIMUM HEIGHT OF FILL	
	Embankment Condition	Trench Condition
51	7.0	11.5
41	7.2	11.8
32.5	7.7	12.6
26	8.6	14.2
25	8.9	14.6
21	10.4	17.1
18	12.7	21.0
14	20.2	33.1

LEGEND:

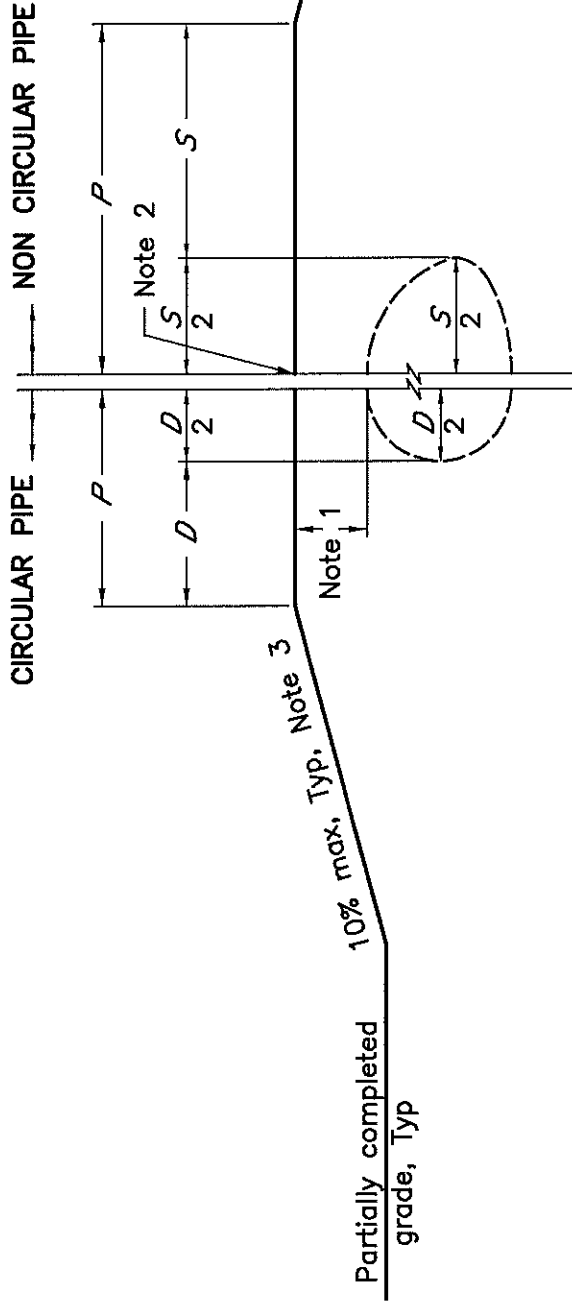
DR = Dimension ratio = $\frac{\text{Average outside diameter of the pipe, mm}}{\text{Minimum wall thickness, mm}}$

NOTES:

- A For installation in Type 4 and Type 3 soil, or if $E' < 6864 \text{ kN/m}^2$, the height of fill shall be calculated from first principles.
- B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
- C The transition width, width of trench above the pipe when trench condition transitions to embankment condition, shall be calculated from first principles.
- D The maximum height of fill is dependent on the DR of the pipe, regardless of the diameter of the pipe.
- E Minimum height of fill over top of pipe shall be 300mm or one pipe diameter, whichever is greater.
- F This OPSD shall be read in conjunction with OPSD 802.010 and OPSD 802.013.
- G All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2014	Rev	1	
HEIGHT OF FILL TABLE POLYVINYL CHLORIDE PRESSURE PIPE FOR DIFFERENT DIMENSION RATIOS		-----			

		OPSD 806.060			



NOTES:


- 1 MINIMUM HEIGHT OF FILL FOR HEAVY EQUIPMENT CROSSING:
 - For Flexible Pipe, the height of fill over top of pipe shall be 800mm or $\frac{D \text{ or } S}{4}$ plus 300mm whichever is greater.
 - For Rigid Pipe, the height of fill over top of pipe shall be 1000mm min.
- 2 When protection is higher than subgrade, it is to be removed to subgrade level before placing granular base.
- 3 When protection is also used by public vehicular traffic, the maximum slope shall be 5%.

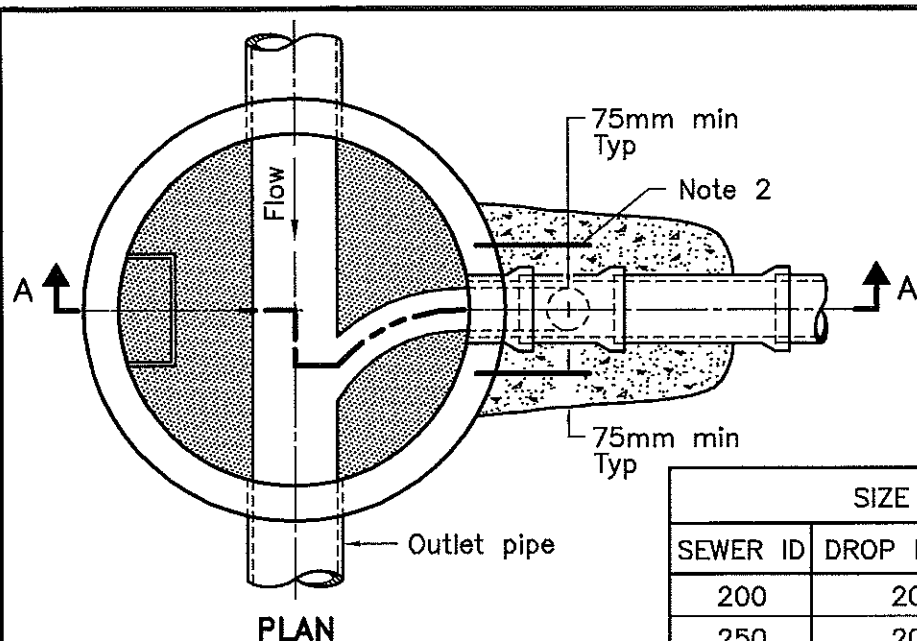
A This Standard to be used in conjunction with OPSD-802.010 to 802.014, 802.020 to 802.024, 802.030 to 802.034, 802.050 to 802.054, 803.030 and 803.031.

B All dimensions are in millimetres or metres unless otherwise shown.

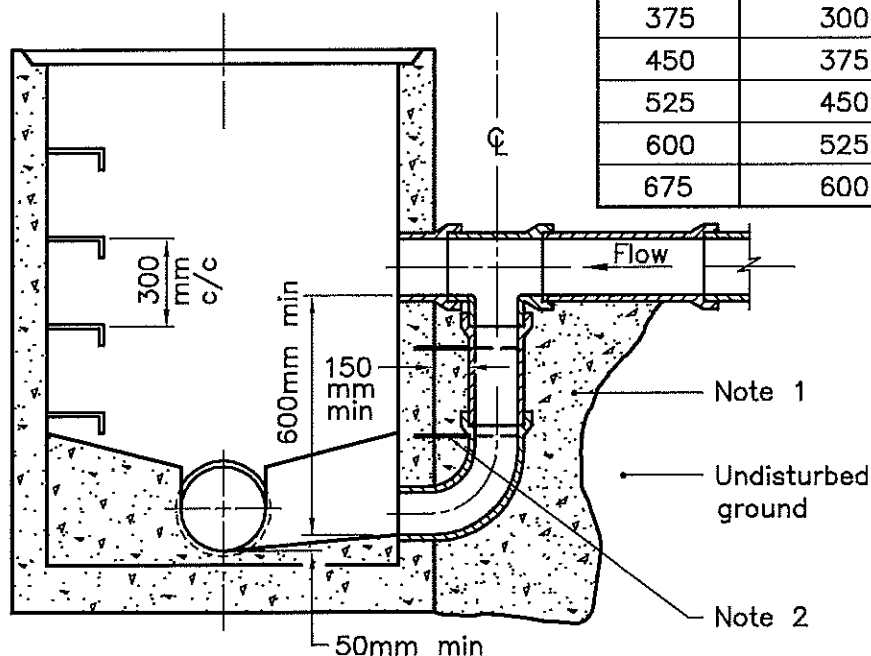
LEGEND:

- P = 1500mm, or $1.5D$ or $1.5S$ whichever is greater.
 D = Inside diameter of circular pipe
 S = Span of non circular pipe.

	1996 09 15 Rev	Date
--- Date ---	ONTARIO PROVINCIAL STANDARD DRAWING PIPE PROTECTION AGAINST HEAVY CONSTRUCTION EQUIPMENT	OPSD - 808.010



SIZE OF DROP PIPE		
SEWER ID	DROP PIPE ID	APPLICATION
200	200	Storm and Sanitary
250	200	Storm and Sanitary
300	250	Storm and Sanitary
375	300	Storm and Sanitary
450	375	Storm
525	450	Storm
600	525	Storm
675	600	Storm



SECTION A-A

NOTES:

- 1 Concrete shall be placed to undisturbed ground and the outside face of the maintenance hole, but there shall be a minimum of 150mm of 15MPa concrete around the drop pipe.
 - 2 Concrete shall be secured to the maintenance hole with 450mm long, 13mm diameter threaded rods and drilled expansion anchors down either side of the drop pipe at 300mm centres.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

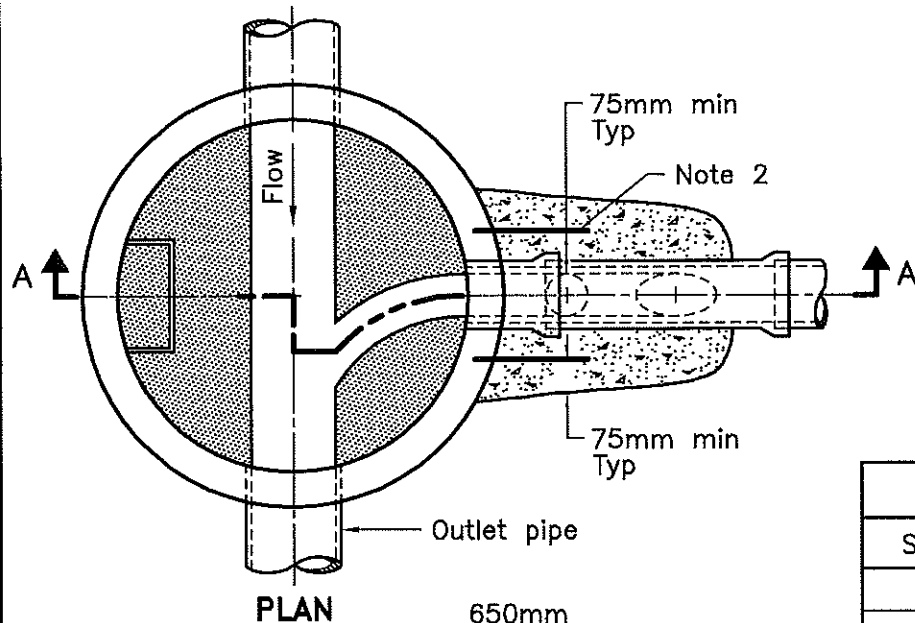
Nov 2016

Rev 3

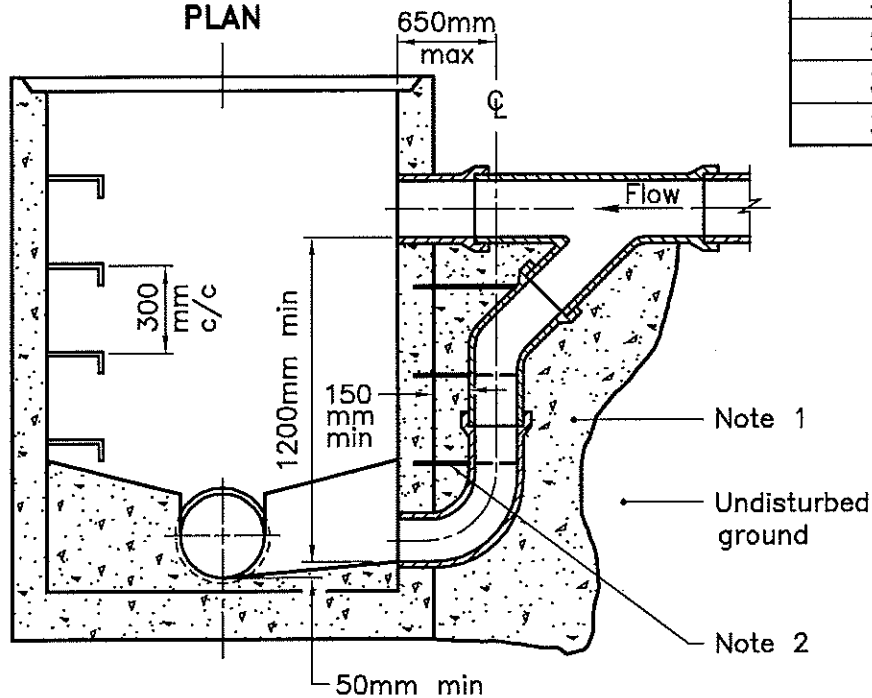
**CAST-IN-PLACE
MAINTENANCE HOLE DROP STRUCTURE TEE**

OPSD 1003.010





SIZE OF DROP PIPE	
SEWER ID	DROP PIPE ID
200	200
250	200
300	250
375	300



SECTION A-A

NOTES:

- 1 Concrete shall be placed to undisturbed ground and the outside face of the maintenance hole, but there shall be a minimum of 150mm of 15MPa concrete around the drop pipe.
 - 2 Concrete shall be secured to the maintenance hole with 450mm long, 13mm diameter threaded rods and drilled expansion anchors down either side of the drop pipe at 300mm centres.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

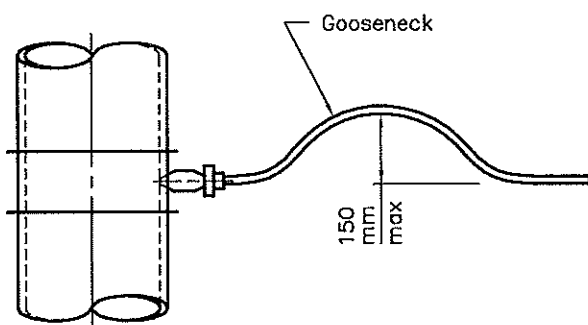
Nov 2016 Rev 3

CAST-IN-PLACE
MAINTENANCE HOLE DROP STRUCTURE WYE

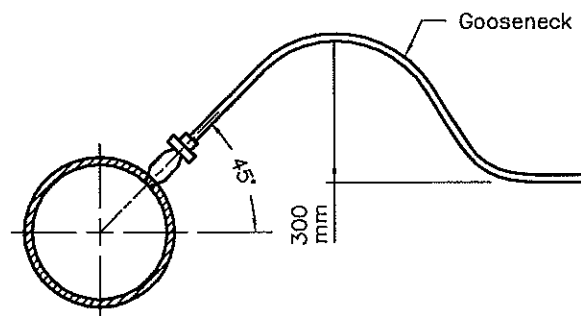


OPSD 1003.020

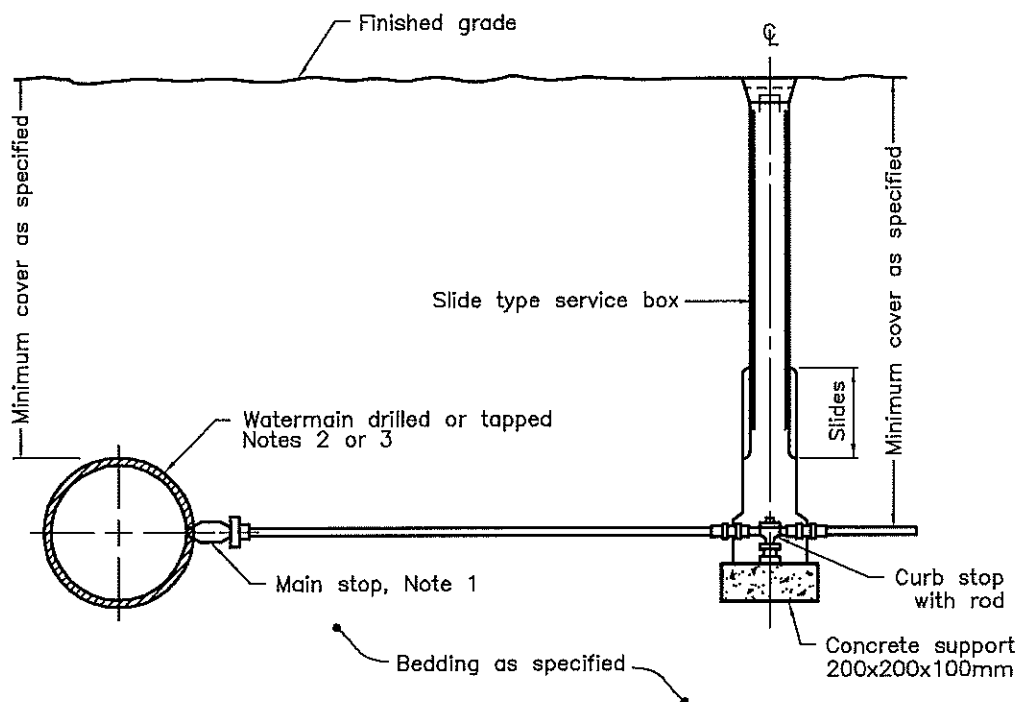




HORIZONTAL GOOSENECK



VERTICAL GOOSENECK OPTION



VERTICAL SECTION

NOTES:

- 1 For plastic service pipes, install main stop at 15° above horizontal with a minimum 1.2m long gooseneck.
- 2 Direct tap ductile iron pipe with approved tool with standard AWWA inlet thread.
- 3 Service connections to plastic watermains shall be made using service saddles or factory made tees.
- A When specified, the vertical gooseneck option shall be used.
- B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
- C All water services shall be installed 90° to the longitudinal axis of the watermain.
- D Backfill material within 500mm of service box shall be native or imported, as specified.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

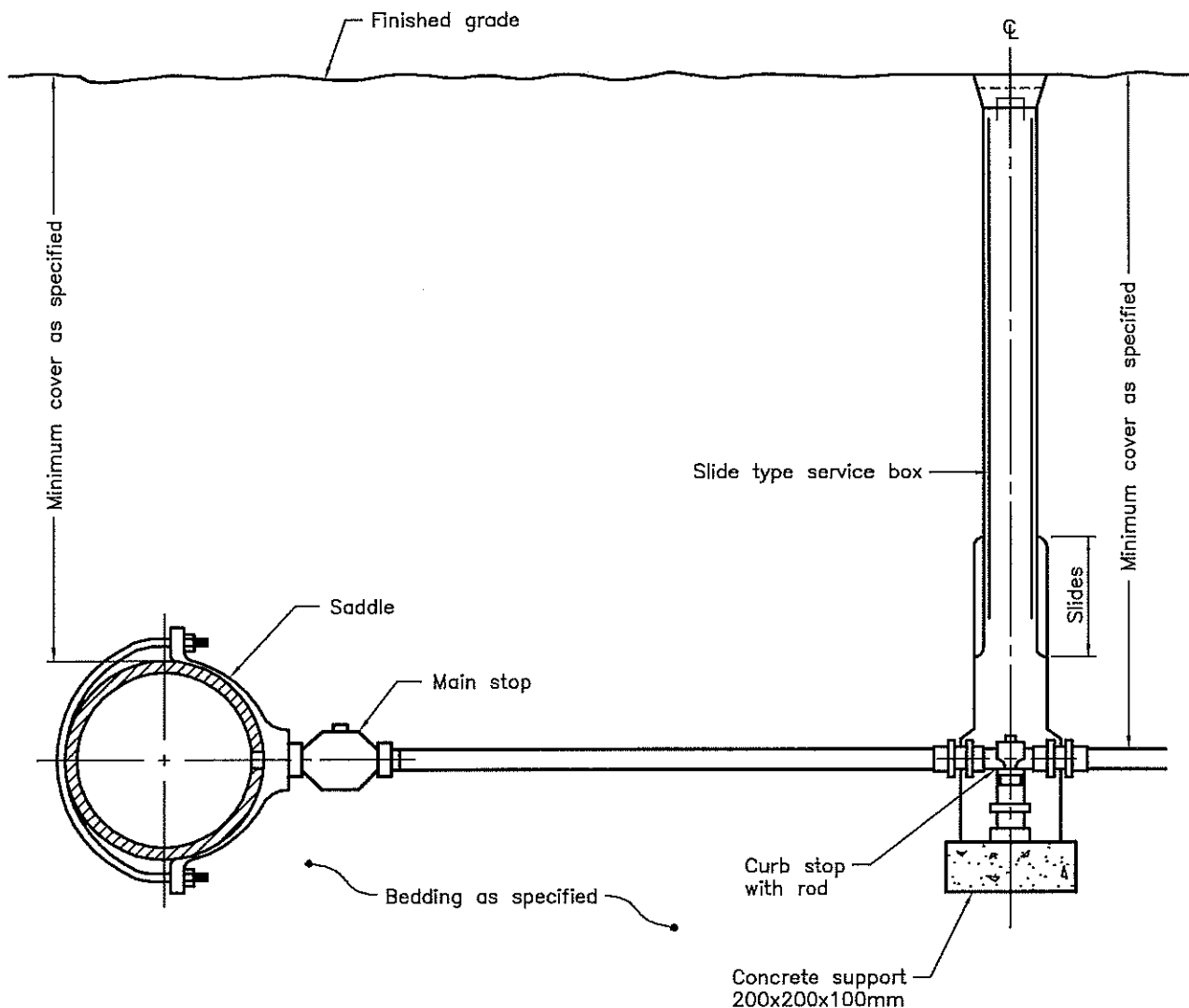
Nov 2013 Rev 3

**WATER SERVICE
CONNECTION**

19 and 25mm DIAMETER SIZES


OPSD 1104.010



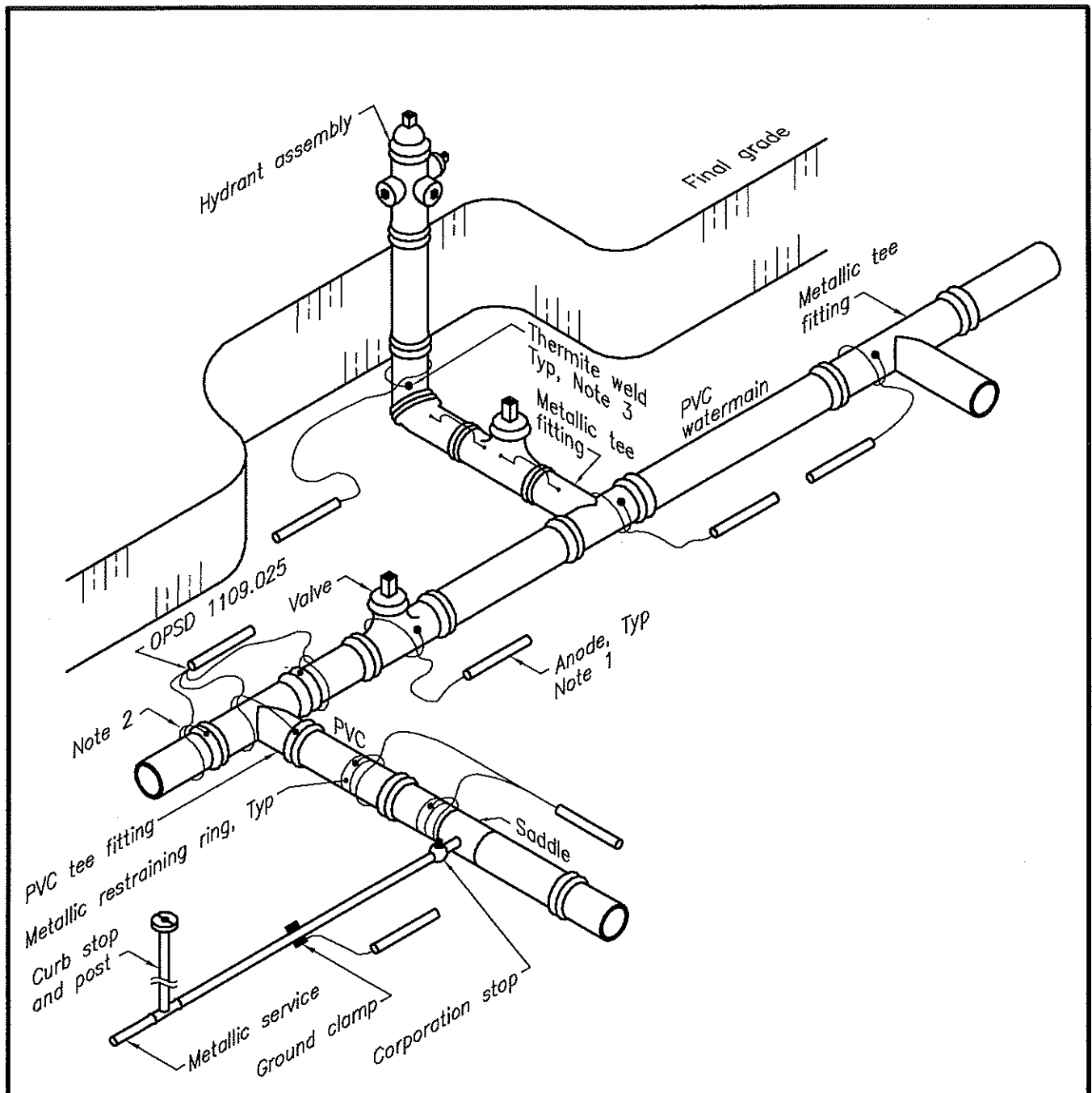


NOTES:

- A Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
- B All water services shall be installed 90° to the longitudinal axis of the watermain.
- C Backfill material within 500mm of service box shall be native or imported, as specified.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2013	Rev	2	
WATER SERVICE CONNECTION 32, 38, and 50mm DIAMETER SIZES		-----			

		OPSD 1104.020			



NOTES:

- 1 Anode shall be placed at least 1.0m away from the water system pipe and appurtenances and as deep as the bottom of the pipe and appurtenances. Minimum distance between anodes shall be 1.0m.
- 2 Anode connecting wire shall be loosely wrapped around pipes and fittings and knotted.
- 3 Protective coating shall be applied to all thermite welds.

ONTARIO PROVINCIAL STANDARD DRAWING

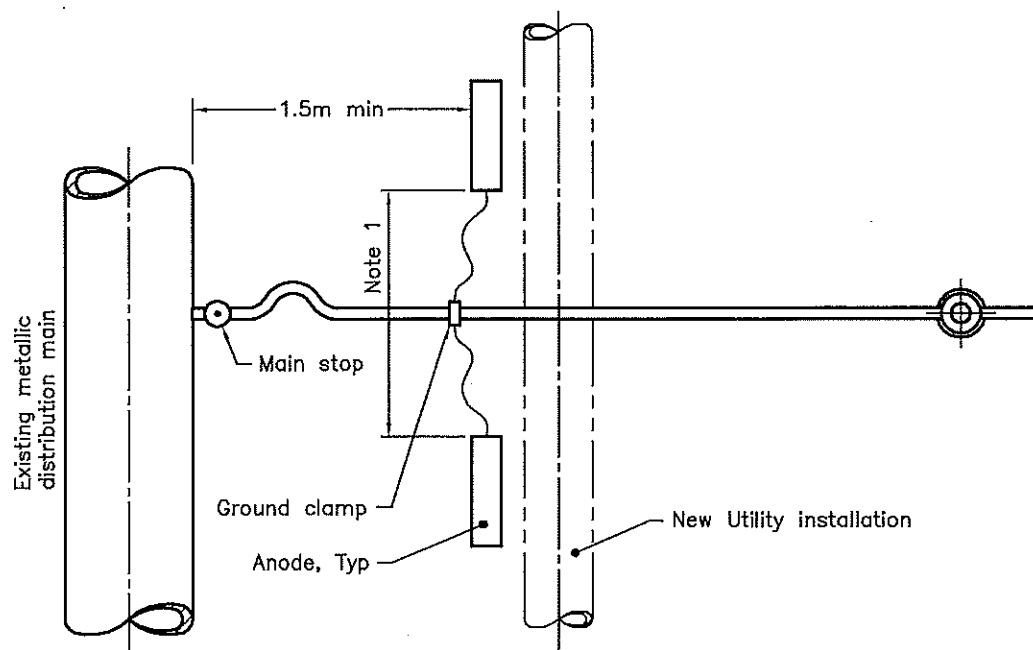
CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS

Nov 2015

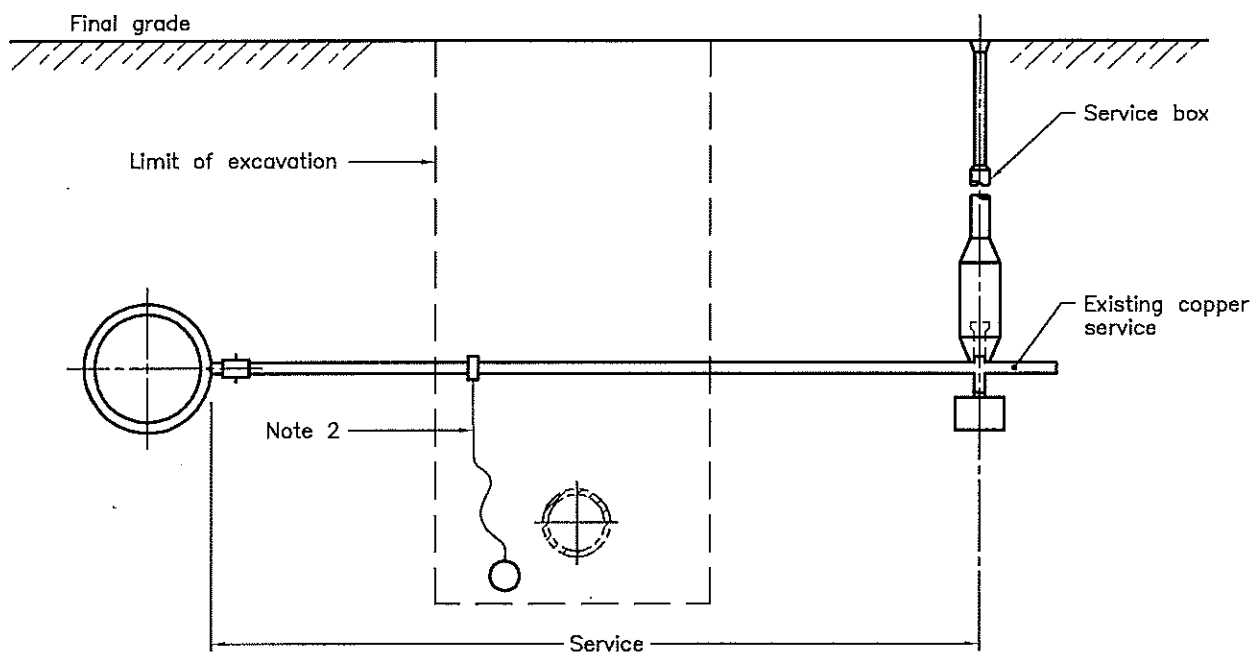
Rev 2



OPSD 1109.011



PLAN



ELEVATION

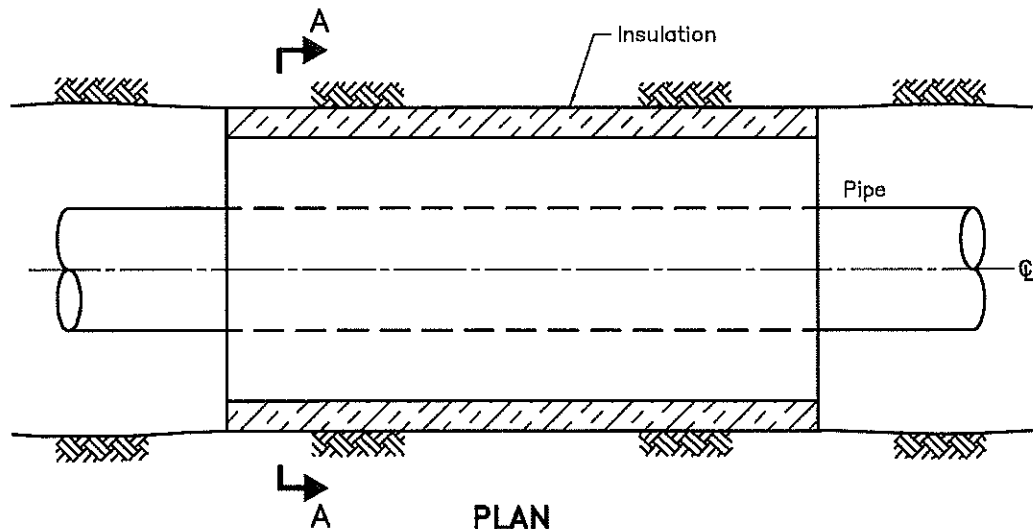
NOTES:

- 1 Anodes shall be spaced as far apart as anode wires and excavation permit.
- 2 When the watermain is exposed, the connection may be made with a thermite weld on the existing watermain.

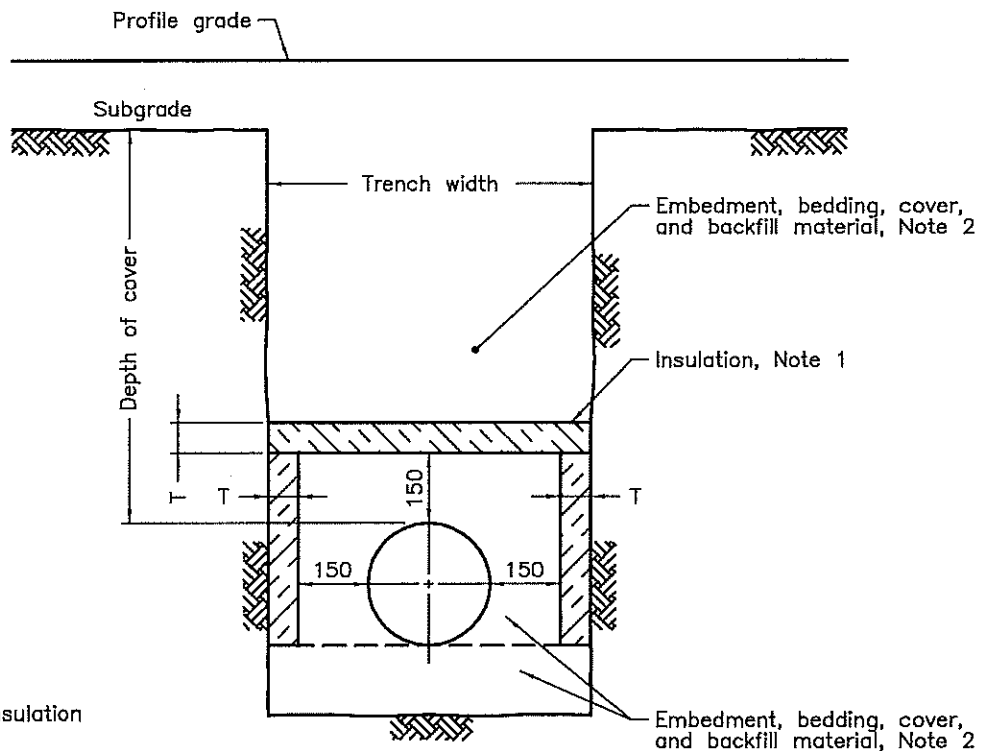
A All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 1
CATHODIC PROTECTION OF EXISTING METALLIC WATERMAINS EXPOSED SERVICE OR PIPE METHOD	-----	
	OPSD 1109.012	





PLAN



T = thickness of insulation

SECTION A-A TYPICAL PIPE INSULATION DETAIL

NOTES:

- 1 The insulation material shall be extruded polystyrene according to OPSS 1605 with a minimum compressive strength of 275 kPa.
- 2 Pipe embedment or bedding, cover, and backfill shall be according to:
 - a) Flexible OPSD 802.010, 802.013, 802.020, and 802.023.
 - b) Rigid - OPSD 802.030, 802.031, 802.032, 802.033, 802.050, 802.051, 802.052, and 802.053.
- A Minimum insulation thickness shall be 50mm.
- B Joints shall be staggered for multiple insulation sheets.
- C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 0

INSULATION FOR
SEWERS AND WATERMAINS
IN SHALLOW TRENCHES

OPSD 1109.030



Appendix I: Guidelines for Stormwater Management

1.0 INTRODUCTION

This document is Appendix I to the CRCA Environmental Planning Policies (2015). It should be read in conjunction with the CRCA Environmental Planning Policies, as well as municipal stormwater guidelines where they have been prepared. These guidelines will be updated from time to time. CRCA staff encourage consultation early in the design process to determine specific requirements, coordinated through our Planning Office.

Stormwater management is a very important aspect of any site development. Where it is implemented correctly, it minimizes downstream hazards such as flooding and erosion, and maintains and improves water quality by capturing site pollutants before they reach receiving waterbodies such as lakes and streams.

The need for stormwater management is established by various legislation and policies, including the Canada Fisheries Act (protection of fish habitat), the Ontario Lakes and Rivers Improvement Act (in-stream works), the Ontario Water Resources Act (water quality and hydrologic performance), and the Ontario Planning Act and the associated Provincial Policy Statement (water quantity and quality). Conservation Authorities provide input on stormwater management requirements, and also apply regulations under the Ontario Conservation Authorities Act regarding work within, and near, waterbodies. Additionally, the riparian rights doctrine of common law requires consideration of impacts to upstream and downstream users.

The Ministry of Environment has prepared the Stormwater Management Planning and Design Manual (SWMPDM) (2003), which contains useful information to assist with design and construction of stormwater management controls. Some municipalities in the Cataraqui region have stormwater management design standards that are also used to review development plans.

The following outlines the guidelines of the Cataraqui Region Conservation Authority for stormwater management in the region.

2.0 GENERAL GUIDELINES

The goals of stormwater management are:

1. to protect waterways from increasing/excess erosion, increasing flows and flooding, decreasing flows and drying up, water takings and diversions. This is implemented

by attempting to mimic the pre-development condition hydrograph in the post-development condition hydrograph.

2. to maintain the water balance and groundwater recharge.
3. to maintain or improve water quality.

The CRCA encourages master drainage planning for all development areas. Master drainage plans are prepared on a subwatershed basis, and identify the approach to meet targets for the area, specify methods of stormwater control, and outline the general location and size of stormwater facilities. These plans should be structured so as to account for a variety of implementation scenarios, in terms of: the order and timing of development, the type and form of development, and land tenure. Master drainage plans need to be reviewed and updated to reflect current standards on a regular basis, at least once every five years.

All stormwater management plans should be consistent with existing watershed plans, subwatershed plans or master drainage plans. The development proponent is responsible for checking with the local municipality and with the CRCA to determine if any such plans exist. If so, then the development proponent is required to demonstrate that the proposed development's drainage system is consistent with those plans. If a master drainage plan has been prepared but is no longer considered valid, then the preferred approach is for the master drainage plan to be updated in light of the proposed development.

The size and complexity of a proposed development often decides the size and complexity of the stormwater report.

In general, the CRCA will encourage the preparation of master drainage plans and other major stormwater management reports for plans of subdivision (e.g. neighbourhood scale development with multiple landowners) and in support of site plan control for large scale residential, commercial, industrial, or institutional developments.

Standard stormwater management reports will generally be recommended for plans of subdivision, and in support of site plan control for small or medium scale residential, commercial, industrial, or institutional developments.

At the discretion of CRCA staff, an abbreviated (brief) stormwater management report, may be allowed in certain circumstances.

2.1 Quantity

While the rational method and the matching of pre and post development peak flows at various event return periods have been used together as an estimation tool for hydrograph matching, they should not be used as the sole method of analysis. The rational method was developed in the 19th century as a method for sizing storm sewers, and is not appropriate for pond design. There are drainage area limitations for the rational method, but may be considered adequate in some situations (e.g. - very small sites).

A hydrologic/hydraulic model is the best way to compare undeveloped and developed site runoff characteristics. Pre-development and post-development hydrographs should also be examined in an attempt to provide a match. While exact hydrograph matching is generally not possible due to an increase in the volume of water in the post-development condition, the goal is to match as closely as possible to protect streams from increased flow, erosion and flooding, as well as decreasing flows to the point of drying up the stream.

If the development proponent proposes post-development peak flows which exceed pre-development peak flows, then the proponent will be responsible for conducting all necessary hydrologic and hydraulic studies to prove that the post peak flows can be released from the site without any adverse upstream or downstream impacts on flood risk or watercourse erosion. These studies must show this to the satisfaction of planning and regulatory authorities including the local municipality and the CRCA. Prior to making any such submission, the proponent should consult with the CRCA to determine the specific technical analyses that will be required to support higher site release flows.

2.2 Quality

In terms of quality control, capturing the more frequent, smaller events and the start of larger events (called the first flush) that typically wash contaminants off the hard surfaces, and holding them for a minimum of 24 hours, has been shown to reduce the volume of sediments and contaminants in the water.

Quality controls need to be based on watershed studies, master drainage plans, or master stormwater management plans, where they exist. Where such plans do not exist, Normal (level 2) protection, as defined by the Ontario Ministry of the Environment, will generally need to be achieved. Some receiving waterbodies that are coldwater streams or lakes, wetlands, the Bay of Quinte, or other environmentally-sensitive waterbodies will require enhanced protection. Consult with the CRCA for the level of protection necessary for the receiving waterbody.

Further, quality storage should be designed to provide a minimum of 24 hours of detention for settling of particles, and provide a sediment forebay at the SWM inlet to collect additional sediment.

2.3 Treatment Options

Treatment options should be considered, in order of preference, by lot-level and conveyance control, and end-of-pipe treatment. Low Impact Development (LID) techniques should be considered where suitable conditions exist. Credit Valley Conservation (CVC) and the Toronto Region Conservation Authority (TRCA) have produced a very useful guideline for Low Impact Development Stormwater Design that is available on their websites (<http://www.creditvalleyca.ca/> and <http://trca.on.ca/>).

Best management practices (BMPs) are a stand alone stormwater management option for small sites, and are encouraged for all sites. Some BMPs, which are typical low impact development (LID) techniques, include:

- Reduced lot grading
- Grassed swales
- Vegetative buffer strips
- Infiltration pits/trenches/basins
- Sand filters
- Pervious pipe systems.

Supporting sizing calculations are to be included in the design reports where these or other types of controls are proposed.

New developments should be designed to incorporate all reasonable and practical means of minimizing direct surface runoff, including:

- Minimizing the amount of impervious area
- Maximizing the amount of existing vegetated area (treed areas, grassed areas) that is retained within the development design, to help maximize opportunity for infiltration of surface water
- Diverting roof drainage to vegetated areas to give the water opportunity to soak into the ground.

The CRCA encourages, and is open to, new and innovative ideas where they are shown (through scientific research and monitoring) to be reasonable, effective and environmentally sound for the CRCA area.

3.0 REPORT CONTENT

The CRCA reviews stormwater management reports with respect to the legislation and policies identified above. Reports which do not meet the basic CRCA requirements for breadth of content may not be reviewed until modifications have been made to fulfill these requirements. All reports should be typed, clearly legible, use SI (metric) measurements, and include applicable, legible maps and plans with sufficient, identified scales appropriate for review.

Stormwater management reports shall include the following:

Title Page

- Development name and name of proponent
- Date of issue and revision number
- Consultant contact information

Introduction

- Development location (with key map), municipality (existing and geographic), Lot, Concession, civic address
- Size of property (ha)
- Size of development (ha)

- Type of development
- Existence, date of creation, and phase of development in a Master Drainage Plan, where applicable
- Proposed development phasing, and its impact on the effectiveness of the stormwater system as a whole

Background

- Site history
- Information on existing development/land use
- Plan layout of existing, and proposed site
- Areal extent and description of all types of pervious and impervious surfaces present including:
 - Buildings
 - Asphalt
 - Gravel
 - Landscapes including lawn, long grass, trees, etc
 - Ponds
 - Waterways
- Runoff coefficients
- Site constraints
- Receiving waterbodies: identification, location relative to the site, existing condition/issues
- Any geotechnical properties of the local soil including permeability, depth to bedrock, water table levels, etc.

Analyses

Quantity Control Analyses

- Quantity control provided for the minor through regulatory (2 year through 100 year) return periods
- Hydrologic/hydraulic matches assessed so that post-development peak flows equal pre-development peak flows, and in addition that the post-development hydrograph matches the pre-development hydrograph
- Appropriate calculations and tables. These should be sufficient for CRCA review and should conform to the guidelines outlined by the municipality.
- Appropriate storm, runoff coefficients, assumptions and equations that conform to the guidelines outlined by the CRCA and the municipality. Intensity Duration Frequency (IDF) curves are available for Kingston and Brockville, and should be used.
- An examination of more than one storm distribution (and duration) including a worst-case scenario. The Chicago storm distribution was designed for extreme rainfall in Chicago and surrounding areas of Illinois, it is not appropriate for eastern Ontario. It overestimates peak flows, and thereby does not properly match the pre and post hydrographs, and may result in oversizing of ponds, and oversizing of pond outlet structures. Instead, a storm distribution created from specific Canadian data is more appropriate, such as an AES (Atmospheric Environment Service) or Hydrotek storm distribution.

- The runoff coefficient (C) and time of concentration (t_c) values used in the calculations shall be appropriate for the existing site (or Ontario) and the proposed *development*. For instance, the FAA (Federal Aviation Administration) time of concentration formula was designed (1970) specifically for use on airport runways in the US, it is therefore not appropriate for any other use, and has recently (2009) been discontinued for use on airport runways by the FAA.
- Equations, assumptions and units used
- For stormwater management reports that are prepared in support of the redevelopment of a site, an assessment of runoff for the state of the land prior to any development (pre-development condition), and also for the state of the land with existing development.
- The method of control (e.g., BMPs, dry pond, wet pond, wetland, infiltration, enhanced catch basin)
- Calculations to support open channel, flow control, and major flow path designs
- Examination of the impact of the control method on groundwater recharge

Quality Control Analyses

- Quality control for the 25 mm storm held for 24 hours, with Normal Protection (MOE, 2003) is generally required. Some locations on coldwater streams or lakes, wetlands, waterbodies draining toward the Bay of Quinte, or other environmentally-sensitive waterbodies will require more stringent protection. Consult with the CRCA for the level of protection necessary for the receiving waterbody.
- Sample calculations for each equation used
- Naming of all variables, constants, units and equations
- The method of control
- Properly designed sediment forebay to capture sediment at the inlet to the SWM facility

Controls

- Stage-storage-discharge table
- Detailed drawings, plan view, elevation view, cross-section through outlet structure
- Minimum freeboard of 0.3 m at regulatory event must be used
- Outlet(s) location are to be shown
- Emergency overflow outlet to convey major event flow if normal outlet becomes blocked (or larger than major event is received)
- Sediment forebay(s)
- Planting plan: native, non-cultivar species appropriate for frequency of inundation are to be used whenever possible. The use of *persuasive planting* (e.g. rose bushes, hawthorns) shall be preferred over perimeter fencing, especially where the facility has been designed with safety features (i.e. a shallow permanent pool, benching, gentle sideslopes, etc.).
- Safety concerns
- Extent of parking lot and roadway storage at 5 year and regulatory (100 year) return period events - maximum depth should be 0.25 m
- Snow storage location(s) for all parking facilities and private (internal) roads. Snow storage areas must be located as far as possible from the intended stormwater outlet and/or an adjacent *waterbody* and/or an identified *groundwater* recharge or discharge area, and be designed so as not to impair the function of stormwater management facilities.

- Maintenance access
- Maintenance and operations plan - including inspection and cleanout frequency
- Method of conveyance/outlet between site controls and receiving waterbodies to demonstrate that sufficient capacity exists
- Conveyance details: longitudinal slope, cross-section, subsurface drainage, rock check dams, etc.

Erosion and Sediment Control Measures

- Temporary and permanent measures:
 - prior to site construction (grubbing, pre-grading)
 - during construction
 - post-construction
- Location plan drawing
- Appropriate Ontario Provincial Specification Drawings (OPSD) included in drawing set
- Monitoring plan addressing monitoring provisions and frequency of monitoring of erosion and sediment control measures
- Removal plan for accumulated sediments

Recommendations and Conclusions

- Recommendations with descriptions, based on the analyses performed
- Long term maintenance and monitoring plan addressing monitoring provisions and frequency of stormwater controls
- Recommended notices to purchasers, or on title, regarding special setback or building freeboard provisions
- Signature
- Professional Engineer's Seal

Appendices

- Computer model input and output files
- Additional drawings
- Full calculation sheets
- Agencies consulted

4.0 DESIGN PARAMETERS

4.1 Applicable Storms

An applicable storm for the Cataraqui Region should be used for modeling purposes. As noted above, the examination of multiple storm distributions and durations should be conducted by consultants, and the most appropriate should be selected. Environment Canada has kept records and completed statistical analyses on historical rainfall events. The text *Hydrology of Floods in Canada* (Watt, 1989) recommends the Atmospheric Environment Service (AES) or Hydrotek storm distributions for use in Canada. The Chicago distribution is much less suitable.

However, care should be taken to ensure that the best design storm is chosen and used properly within the range of its applicability (Marsalek and Watt, 1984).

The storm duration should be greater than the time of concentration of the site, and a variety of durations should be examined to determine the worst case scenario. Time of concentration should be calculated for each site, using the appropriate method. A time of concentration method based on Canadian, or better Ontario, data is the most appropriate option.

For urban design, typically a rain event will result in the largest flows, but larger watersheds, and rural watersheds, may experience higher flows due to a combination rain/snowmelt event.

Plans shall be based on climate data from Atmospheric Environment Service (AES) stations that are representative of the subject area or site.

4.2 Ponds

Stormwater management ponds are recommended for quality and quantity control on all new development. Planned development should make adequate accommodation for stormwater management facilities. Some sites (e.g. redevelopments and, potentially, infill sites) may be too small to accommodate a pond and will require alternative stormwater control, such as those discussed in Sections 4.3 and 4.6.

All stormwater management ponds are generally required to provide both quality and quantity control. In rare cases the removal of the requirement for a quantity control pond may be considered, for instance if a site has direct drainage to Lake Ontario or the St. Lawrence River. Consideration for removal of the quantity control aspect is due to the size of the receiving water body, and the minimal effect an increase in volume will have on the flood hazard in that water body. It should be noted that even though a site may ultimately drain to a large body of water such as Lake Ontario or the St. Lawrence River, the conveyance path from the site to the water body must be considered from a flood hazard perspective, and the removal of the quantity control pond requirement may not be an option. In all cases, quality control will be required. Calculation of this quantity of initial storm runoff should be discussed with CRCA staff.

The following list contains a number of other considerations for pond design.

- Quality ponds should be designed to include a sediment forebay (settling basins) located at each inlet into the pond, and a permanent pool or wetland component. These will serve to increase pollutant removal efficiency. The ponds should be designed as per the SWMPDM.
- Quantity ponds can take the form of dry extended detention basins, wet ponds, wetlands, etc.
- All pond inlet and outlet orifices should be a minimum diameter of 75 mm (3 in.) to minimize the potential for plugging with sediment and/or debris.
- The bottom of the pond is to be lined with a 0.5 m clay liner in areas with a high groundwater table, permeable soils or bedrock and/or where infiltration of groundwater is undesirable.

- Upstream drainage not affected by the *development* should bypass any ponds in order to provide maximum pond efficiency, unless the pond is intended to provide control for that upstream area.
- Ponds and larger conveyances should have a minimum freeboard of 0.3 m during major events.
- Pond embankments should have a maximum slope of 5:1.
- Ponds should preferably be designed to include plantings of native species of Eastern Ontario stock, especially where adjacent to a receiving waterbody or other natural area.
- Species and proposed planting locations should be considered with respect to moisture tolerance, frequency and duration of inundation.
- Ponds should be amenities that are integrated into public *open space*; however, designers should also consider the safety aspects of these locations.
- Ponds should be fully constructed and ready to accept water **prior** to development.
- For areas where more than one phase of *development* has been proposed, the pond outlet should be designed such that it can be modified as the catchment area continues to be developed.
- Infiltration should be explored and used where appropriate, at all levels of control: lot-level, conveyance, and end-of-pipe. Consideration of the potential for groundwater contamination will be required when infiltration is proposed.
- Stormwater management reports should include maintenance plans, expected cleanout frequency, recommended inspection frequency, etc.

4.3 Swales

We recommend that swales be designed as per the Stormwater Pollution Prevention Handbook (MOE, 2001):

- minimum 0.75 m flat bottom;
- maximum 0.15 m³/s flow;
- maximum 0.5 m/s velocity;
- maximum 2 ha contributory drainage area;
- minimum 3(h):1(v) side slopes; and
- minimum 15 cm grass length (i.e., unmown vegetation).

The Ministry of Natural Resources Natural Hazards Technical Guides (MNR, 2001, 2002a and 2002b) recommend a velocity-depth product of less than 0.4 m²/s (velocity multiplied by water depth), with a maximum depth of 0.8 m, or a maximum velocity of 1.7 m/s; this has been deemed safe for people to traverse. In addition, a freeboard of 0.3 m between the top of bank and the regulatory water level is recommended.

4.4 Buffer Strips

Buffer strips are encouraged for water quality protection, as this has been found to remove a significant portion of suspended sediments and pollutants. Additional information on buffer strips is provided in Appendix 'F' to the CRCA Environmental Planning Policies. A riparian buffer minimum of 30 m is recommended, with exceptions made for special circumstances. Steeper

slopes, less porous soils, or other factors warrant an increase in buffer width. Wetlands are not considered buffers. The CRCA Riparian Buffer Guidelines recommend a buffer for protection not only of water quality, but of the general health of the stream, aquatic species and riparian zone.

4.5 Catch Basins

It is recommended that any catch basins being installed on a site be protected with sediment controls until the site has been stabilized. Examples include surrounding the catch basin with straw bales or placing geotextile underneath the catch basin grate, to keep sediment out of the storm sewer system and the receiving waterbody. Sediment should be removed, and properly disposed of, from around the catch basin once the site is stabilized, and then on a regular basis.

Where pipe/catch basin/parking lot storage is proposed, the maximum depth of ponding is to be no more than 0.25 m to facilitate safe vehicular access in parking lots.

Increased catch basin sump depth is recommended to increase sediment capture in the storm sewer network.

Regular sediment removal from catch basins is very important to the overall water quality protection aspect of this type of SWM control.

4.6 Other Types of Controls

Stormwater management methods such as enhanced catch basins (oil/grit separators), underground tanks, etc., will only be considered where there is not enough space to use other, more natural methods of management, in small redevelopment sites or infill projects, or where specific spill-control concerns are raised. Where these facilities are proposed, they should be designed as part of a treatment train approach including lot-level BMPs and conveyance controls.

Enhanced catchbasins may be supported for spill control and as the primary method of quality treatment on small urban sites (i.e., generally less than 1.0 ha) such as refuelling stations, especially as part of infill *development* or the redevelopment of a site. On other sites, enhanced catchbasins are generally not supported since new planned developments should make adequate accommodation for more natural forms of stormwater management (e.g., lot-level, conveyance, and end-of-pipe facilities).

The CRCA may support the use of underground storage tanks for quality control if used in conjunction with other proven measures to provide the necessary level of quality protection or where oversight would be provided by the Ministry of the Environment.

4.7 Cleaning, Maintenance and Monitoring

Temporary construction sediment and erosion control measures should be installed prior to any site disturbance, checked on a daily basis, remain in good working order until the site is

stabilized, and should be cleaned on a regular basis. Once the site has been stabilized and excess sediment removed, these temporary sediment and erosion controls should be removed.

All sediment deposition, catch basins, sediment forebays, sediment fences, etc., should be cleaned prior to the municipality assuming ownership (for public facilities), or prior to the owner paying the final installment to the contractor (for private facilities). All permanent sediment and erosion controls should be in good working order prior to assumption, or final payment.

The stormwater report should include a section on maintenance, cleaning, and monitoring of the SWM facilities for the duration of their operation. It should specify when maintenance is required (e.g. forecast when a SWM pond would be x% full). This information will be included in the Site Plan or Subdivision Agreement, as applicable.

5.0 APPROVAL PROCESS

Application for approval of proposed drainage systems for land developments must be made to the local municipality as part of the overall development approval process administered by the municipality.

The CRCA will review proposed development plans with respect to drainage and stormwater management requirements set out in these guidelines. The CRCA will assess a cost-recovery fee for its review of a stormwater report, based on the approved Plan Review Service Fee Schedule, as amended from time to time. Straightforward reports will typically be reviewed at the staff level. However, depending on scope and complexity, reports may be subject to a peer review, at the expense of the proponent.

Additional approvals may be required depending on the specific design and type of drainage system being proposed, such as a permit under Ontario Regulation 148/06: Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses.

The development proponent is responsible for obtaining any and all necessary approvals related to stormwater management. These approvals will include but are not necessarily limited to: Ontario Ministry of Environment approval (Section 53 approval under Ontario Water Resources Act); Ontario Ministry of Natural Resources approval (Sections 14 and 16 under the Lakes and Rivers Improvement Act); and Fisheries and Oceans Canada approval (Section 35(1) under the Fisheries Act). The development proponent is responsible for determining approval requirements through discussion with the CRCA, the local municipality and the Ontario Ministry of the Environment.

The development proponent is responsible for completing any necessary environmental assessment (EA) that may be required under the Ontario Environmental Assessment Act or the Canadian Environmental Assessment Act. The development proponent is responsible for determining what EA requirements apply to the project.

REFERENCES

- Marselek, J., and W.E. Watt. 1984. *Design Storms for Urban Drainage Design*, Canadian Journal of Civil Engineering 11(3) pp. 574-584.
- Ontario Ministry of Environment. 2001. *Stormwater Pollution Prevention Handbook*. Queen's Printer for Ontario.
- Ontario Ministry of Environment. 2003. *Stormwater Management Planning and Design Manual*. Queen's Printer for Ontario.
- Ontario Ministry of Natural Resources. 2001. Great Lakes - St. Lawrence River System and Large Inland Lakes: Technical Guides for Flooding, Erosion and Dynamic Beaches in Support of Natural Hazards Policies 3.1 of the Provincial Policy Statement. Queen's Printer for Ontario.
- Ontario Ministry of Natural Resources. 2002a. Technical Guide – River and Stream Systems: Erosion Hazard Limit. Queen's Printer for Ontario.
- Ontario Ministry of Natural Resources. 2002b. Technical Guide – River and Stream Systems: Flooding Hazard Limit. Queen's Printer for Ontario.
- Watt, W.E. 1989. *Hydrology of Floods in Canada*.

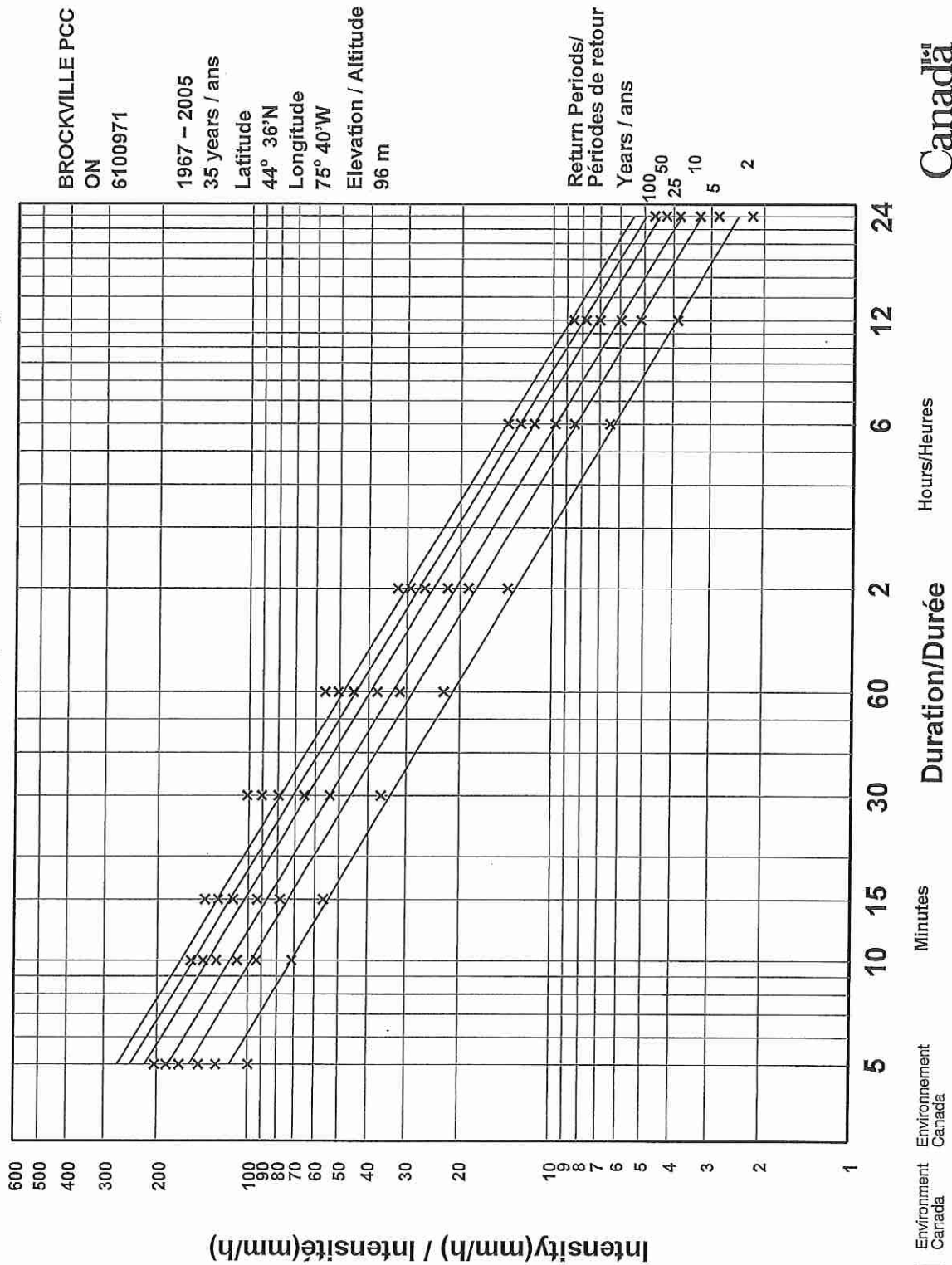
FOR MORE INFORMATION

Please contact the CRCA at 613-546-4228 or info@crca.ca, or visit our website at www.crc.ca.

Appendix K – Flow Calculations

Short Duration Rainfall Intensity–Duration–Frequency Data Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

2014/12/21



Canada

Hours/Heures

Duration/Durée

Minutes

Environnement
CanadaEnvironnement
Canada

Environment Canada/Environnement Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes
de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2014/12/21

BROCKVILLE PCC ON 6100971
Latitude: 44 36'N Longitude: 75 40'W Elevation/Altitude: 96 m
Years/Années : 1967 - 2005 # Years/Années : 35

Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1967	6.9	11.9	14.5	26.4	35.6	36.6	39.9	43.7	51.3
1968	5.8	7.9	8.4	9.9	16.0	24.4	39.6	48.0	54.4
1969	6.3	11.7	11.7	13.2	18.3	25.4	34.5	50.8	59.7
1970	11.2	13.0	19.0	20.6	26.2	40.4	41.7	46.2	62.2
1971	8.4	8.9	9.1	9.7	18.0	24.1	29.0	31.0	31.0
1972	9.7	14.2	17.0	18.8	23.4	27.4	46.5	62.2	64.0
1973	8.6	14.7	20.8	25.4	29.0	29.2	29.5	29.5	29.5
1974	19.3	27.9	38.1	49.3	52.1	54.1	55.1	55.1	55.1
1975	10.7	17.5	21.1	26.9	34.5	55.9	55.9	69.8	82.5
1976	7.4	13.2	15.2	16.8	19.6	27.7	30.2	35.1	40.1
1977	9.4	12.2	15.2	29.7	40.9	47.8	47.8	50.8	52.6
1978	7.4	10.4	10.8	11.2	13.3	16.6	21.4	24.6	24.6
1980	8.4	15.3	16.6	18.9	19.0	21.9	32.0	32.0	56.6
1981	-99.9	-99.9	-99.9	25.1	27.6	28.4	30.3	42.6	50.0
1982	10.1	16.2	19.4	22.6	23.9	28.6	62.5	70.4	70.4
1983	9.7	12.4	12.6	12.8	15.9	21.1	35.5	37.8	37.8
1984	5.2	7.4	8.8	14.2	22.3	31.8	37.7	39.4	39.4
1985	7.9	9.4	9.4	15.2	19.7	24.7	38.0	49.6	52.8
1986	9.8	15.7	23.0	42.2	48.4	50.2	55.6	63.0	64.7
1987	7.6	10.2	10.8	15.4	21.4	31.4	42.4	50.7	61.2
1988	5.2	7.0	8.4	9.5	13.2	16.4	29.4	41.4	42.2
1989	11.2	20.4	29.4	47.9	49.0	52.6	89.0	89.5	89.7
1990	6.4	12.8	15.5	17.2	19.4	19.7	35.8	37.4	42.0
1991	7.6	8.8	11.0	14.4	21.8	25.8	28.4	42.3	52.4
1992	5.9	7.2	8.0	12.6	24.4	37.0	45.3	46.4	46.4
1995	9.7	12.0	14.1	16.9	19.0	20.0	40.6	61.7	68.8
1996	6.4	12.6	14.9	22.7	29.6	34.2	38.6	40.2	58.4
1997	10.6	12.7	12.9	13.6	21.5	29.5	37.2	42.8	44.6
1998	10.9	16.7	21.0	22.5	25.2	29.4	31.5	35.4	41.6
1999	9.1	10.7	11.7	13.7	14.6	16.8	33.5	36.6	54.4
2000	6.0	7.4	9.7	12.3	17.4	22.2	30.8	34.0	43.9
2001	10.5	12.6	15.6	19.3	20.4	21.4	38.9	65.4	79.5
2002	7.1	9.0	9.2	9.2	9.8	13.8	32.1	39.4	42.4
2003	8.5	11.2	14.7	16.0	17.3	17.7	29.3	44.1	54.7
2004	12.1	17.7	18.3	24.7	25.3	31.8	63.6	100.0	109.6
2005	8.1	11.5	12.7	14.2	21.3	33.1	66.9	81.7	83.3
# Yrs. Années	35	35	35	36	36	36	36	36	36
Mean Moyenne	8.7	12.6	15.1	19.8	24.3	29.7	41.0	49.2	55.4
Std. Dev. Écart-type	2.6	4.2	6.3	9.9	10.1	11.1	13.7	17.0	17.7
skew. Dissymétrie	1.84	1.48	1.74	1.71	1.42	0.98	1.61	1.28	0.95
Kurtosis	9.50	6.99	7.36	6.03	4.81	3.52	6.28	4.66	4.57

*--99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité
pour une période de retour de 100 ans

Year/Année	Duration/durée	Data/Données	100-yr/ans
1974	5 min	19.3	17.0
1974	10 min	27.9	25.8
1974	15 min	38.1	34.9
1989	6 h	89.0	83.9

Environment Canada/Environnement Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes
de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2014/12/21

=====

BROCKVILLE PCC	ON	6100971
Latitude: 44 36'N	Longitude: 75 40'W	Elevation/Altitude: 96 m
Years/Années : 1967 - 2005	# Years/Années :	35

=====

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

Duration/Durée	2	5	10	25	50	100	#Years Années
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	
5 min	8.3	10.6	12.2	14.1	15.5	17.0	35
10 min	11.9	15.6	18.1	21.2	23.5	25.8	35
15 min	14.1	19.6	23.3	28.0	31.5	34.9	35
30 min	18.1	26.8	32.6	39.9	45.3	50.7	36
1 h	22.6	31.6	37.5	44.9	50.5	56.0	36
2 h	27.9	37.7	44.2	52.4	58.5	64.5	36
6 h	38.8	50.8	58.9	69.0	76.5	83.9	36
12 h	46.4	61.4	71.4	84.0	93.4	102.6	36
24 h	52.5	68.1	78.5	91.6	101.4	111.0	36

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

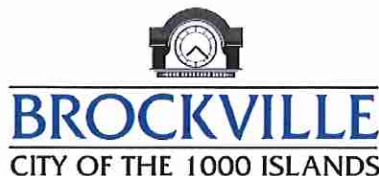
Duration/Durée	2	5	10	25	50	100	#Years Années
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	
5 min	99.4	127.4	145.9	169.2	186.6	203.8	35
	+/- 9.6 +/-	16.2 +/-	21.9 +/-	29.5 +/-	35.3 +/-	41.1 +/-	35
10 min	71.3	93.7	108.6	127.3	141.2	155.0	35
	+/- 7.7 +/-	13.0 +/-	17.5 +/-	23.6 +/-	28.3 +/-	32.9 +/-	35
15 min	56.3	78.6	93.4	112.1	125.9	139.7	35
	+/- 7.7 +/-	12.9 +/-	17.5 +/-	23.6 +/-	28.2 +/-	32.9 +/-	35
30 min	36.3	53.7	65.2	79.8	90.6	101.4	36
	+/- 5.9 +/-	10.0 +/-	13.5 +/-	18.1 +/-	21.7 +/-	25.3 +/-	36
1 h	22.6	31.6	37.5	44.9	50.5	56.0	36
	+/- 3.0 +/-	5.1 +/-	6.9 +/-	9.3 +/-	11.1 +/-	13.0 +/-	36
2 h	13.9	18.8	22.1	26.2	29.2	32.3	36
	+/- 1.7 +/-	2.8 +/-	3.8 +/-	5.1 +/-	6.1 +/-	7.1 +/-	36
6 h	6.5	8.5	9.8	11.5	12.7	14.0	36
	+/- 0.7 +/-	1.2 +/-	1.6 +/-	2.1 +/-	2.5 +/-	2.9 +/-	36
12 h	3.9	5.1	6.0	7.0	7.8	8.6	36
	+/- 0.4 +/-	0.7 +/-	1.0 +/-	1.3 +/-	1.6 +/-	1.8 +/-	36
24 h	2.2	2.8	3.3	3.8	4.2	4.6	36
	+/- 0.2 +/-	0.4 +/-	0.5 +/-	0.7 +/-	0.8 +/-	0.9 +/-	36

Table 3 : Interpolation Equation / Équation d'interpolation: $R = A \cdot T^B$

R = Interpolated Rainfall rate (mm/h) / Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

Statistics/Statistiques	2	5	10	25	50	100
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans
Mean of RR/Moyenne de RR	34.7	46.7	54.6	64.6	72.1	79.5
Std. Dev. /Écart-type (RR)	34.2	44.6	51.5	60.3	66.8	73.3
Std. Error/Erreur-type	5.9	11.8	15.6	20.5	24.2	27.8
Coefficient (A)	21.1	28.5	33.4	39.6	44.2	48.7
Exponent/Exposant (B)	-0.680	-0.685	-0.687	-0.689	-0.690	-0.690
Mean % Error/% erreur moyenne	5.9	8.9	10.1	11.3	12.0	12.6

Appendix L-1 – Application Form (Residential)



City of Brockville Application for Site Plan Control Residential Development

TO BE COMPLETED BY THE PLANNING DEPARTMENT:

Date Submitted:	Date Complete:	Fee Rec'd:	File No.:
-----------------	----------------	------------	-----------

1.0 Owner Information

Name of Property Owner(s):			
If a Corporation, name and position of Principals:			
Address (including Postal Code):			
Tel No.:	Cell No.:	Fax No.:	Email:

2.0 Applicant Information

Name of Applicant:			
Address (including Postal Code):			
Tel No.:	Cell No.:	Fax No.:	Email:

Note: If this application is signed by an applicant/agent on behalf of an owner, the owner's written authorization under section 5.0 of this application must be completed. If the owner is a corporation acting without agent, the application must be signed by an officer of the corporation with authority to bind the corporation.

To Whom is all correspondence to be sent? Owner ☐ Applicant ☐

3.0 Pre-Consultation and Supporting Documentation

3.1	Have you scheduled and completed a mandatory pre-consultation meeting with the City of Brockville Planning Staff as required under City of Brockville By-law 039-2012?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	If yes, please specify the date of the mandatory pre-consultation meeting: Date: _____	
	If not, please contact the Planning Department, Andrew McGinnis, Planner II – (613) 342-8772, ext. 4421; or email to: amcginnis@brockville.com , to arrange a pre-consultation meeting prior to submitting an Application for Site Plan Control.	
3.2	With respect to the submission of this application, the required supporting studies, additional information and materials required to be submitted are those that were discussed and listed as a requirement during the pre-consultation process. Please attach a list of the documents being submitted with the application. One (1) paper copy and one (1) digital (.pdf) copy of each document is required to be provided with the application. Should any of the required documents (as referenced above) not be available at the time of submission of your application, please indicate on the list the reason it is not available and a date when the City can expect to be in receipt of the document. Note: The application may not be considered to be complete until all reports have been received.	
3.3	Application fees are shown on Page 3 of this application form. Confirmation of said fees should be obtained at the Pre-consultation meeting.	

4.0 Details of Proposed Development					
Project Title:					
Type of Development:					
Site Location (address):					
Legal Description:					
Current Zoning of Site:					
Construction Value for Project:		Total Area of Building(s): (m ²)		% of Site covered by Building(s):	
Total Area of Site: (m ²)		Total Amenity Area: (m ²)		Density (# of units/hectare):	
Landscaped Area: (m ²)		Paved or Hard Surfaced Area: (m ²)		No. of Storeys:	
Total No. of Residential Units:		No. of Parking Spaces		Height of Building(s): (m)	
Residential Units by type:	Bachelor:	1 Bedroom:	2 Bedroom:	3 Bedroom:	4 Bedroom
Method of Snow Removal:					
Method and location of Garbage Storage:					
Method of Garbage Removal:					
Other Special Facilities Provided:					
Is/are the Building(s) to be a Condominium:					
5.0 Certification of Completeness – Site Plan Control Application					
This is to certify that this application for Site Plan Control Approval provides all of the information required by the City of Brockville, as specified in the Site Plan Control Manual, and is in conformity with the provisions of Zoning By-law 050-2014 (as amended). It is understood that in the event that any further information is required by the City of Brockville for consideration of the application, and where I/we are so advised by the City, the approval process shall be suspended until such required information is provided.					
Signatures:	[Owner]:			Date:	
	[Applicant/Agent]:				

6.0 Notes Respecting Submission of Application:

6.1 The current application fee for Site Plan Control can be found attached in Appendix 1.

6.2 Review by the Cataraqui Region Conservation Authority (CRCA) is required for amendments affecting sites within Environmental Protection and Waterfront Categories as depicted on Schedule "B" to the Official Plan for the City of Brockville.

The fee for review, as shown in Appendix 2 must be submitted with the application for amendment in order to be considered a complete application. The CRCA fee should be provided in a separate cheque made payable to the Cataraqui Region Conservation Authority.

All fees are to be confirmed at the Pre-consultation Meeting.

6.3 Requirements for Submission:

- One (1) complete copy of the Application for Site Plan Control;
- Eight (8) paper copies of drawings (full size – 24" x 36);
- One (1) paper copy of drawings reduced to 11" x 17";
- One (1) digital copy (.pdf) of drawings - emailed, or copied onto a CD and submitted with application;
- One (1) paper copy and one (1) digital copy of all documents as required in Section 3.2.
- Required fees (as noted in 6.1 above) are to be submitted to the Planning Department for review and processing (fees to be confirmed at the pre-consultation meeting).

Drawings must be submitted in collated sets.

Appendix L-2 – Application Form (Comm./Ind./Inst.)



BROCKVILLE
CITY OF THE 1000 ISLANDS

City of Brockville Application for Site Plan Control Commercial, Industrial, Institutional

TO BE COMPLETED BY THE PLANNING DEPARTMENT:

Date Submitted:	Date Complete:	Fee Rec'd:	File No.:
-----------------	----------------	------------	-----------

1.0 Owner Information

Name of Property Owner(s):			
If a Corporation, name and position of Principals:			
Address (including Postal Code):			
Tel No.:	Cell No.:	Fax No.:	Email:

2.0 Applicant Information

Name of Applicant:			
Address (including Postal Code):			
Tel No.:	Cell No.:	Fax No.:	Email:

Note: If this application is signed by an applicant/agent on behalf of an owner, the owner's written authorization under section 5.0 of this application must be completed. If the owner is a corporation acting without agent, the application must be signed by an officer of the corporation with authority to bind the corporation.

To Whom is all correspondence to be sent? Owner ☐ Applicant ☐

3.0 Pre-Consultation and Supporting Documentation

3.1	Have you scheduled and completed a mandatory pre-consultation meeting with the City of Brockville Planning Staff as required under City of Brockville By-law 039-2012?	Yes <input type="checkbox"/> No <input type="checkbox"/>
	If yes, please specify the date of the mandatory pre-consultation meeting: Date: _____	
	If not, please contact the Planning Department, Andrew McGinnis, Planner II – (613) 342-8772, ext. 4421; or email to: amcginnis@brockville.com , to arrange a pre-consultation meeting prior to submitting an Application for Site Plan Control.	
3.2	With respect to the submission of this application, the required supporting studies, additional information and materials required to be submitted are those that were discussed and listed as a requirement during the pre-consultation process. Please attach a list of the documents being submitted with the application. One (1) paper copy and one (1) digital (.pdf) copy of each document is required to be provided with the application. Should any of the required documents (as referenced above) not be available at the time of submission of your application, please indicate on the list the reason it is not available and a date when the City can expect to be in receipt of the document. Note: The application may not be considered to be complete until all reports have been received.	
3.3	Application and review fees are listed in Appendix 1 and 2. Confirmation of said fees should be obtained at the Pre-consultation meeting.	

4.0 Details of Proposed Development		
Project Title:		
Type of Development:		
Site Location (address):		
Legal Description:		
Current Zoning of Site:		
Construction Value for Project:	Total Area of Site: (m ²)	Total Area of Building(s): (m ²)
% of Site covered by Building(s):	Landscaped Area: (m ²)	No. of Storeys:
Paved Area: (m ²)	Paved or Hard Surfaced Area: (m ²)	Height of Building(s):
Type of Use by Storey:	1 st storey:	2 nd storey:
	3 rd storey:	4 th storey and higher:
Number of Parking Spaces:	Number of Barrier Free Parking Spaces:	Loading Spaces:
Method of Snow Removal:		
Method and location of Garbage Storage:		
Method of Garbage Removal:		
Other Special Facilities Provided:		
Is the Building to be a Condominium:		
5.0 Certification of Completeness – Site Plan Control Application		
This is to certify that this application for Site Plan Control Approval provides all of the information required by the City of Brockville, as specified in the Site Plan Control Manual, and is in conformity with the provisions of Zoning By-law 050-2014 (as amended). It is understood that in the event that any further information is required by the City of Brockville for consideration of the application, and where I/we are so advised by the City, the approval process shall be suspended until such required information is provided.		
Signatures:	[Owner]:	Date:
	[Applicant/Agent]:	

6.0 Notes Respecting Submission of Application:

6.1 The current application fee for Site Plan Control can be found attached in Appendix 1.

6.2 Review by the Cataraqui Region Conservation Authority (CRCA) is required for amendments affecting sites within Environmental Protection and Waterfront Categories as depicted on Schedule "B" to the Official Plan for the City of Brockville.

The fee for review, as shown in Appendix 2 must be submitted with the application for amendment in order to be considered a complete application. The CRCA fee should be provided in a separate cheque made payable to the Cataraqui Region Conservation Authority.

All fees are to be confirmed at the Pre-consultation Meeting.

6.3 Requirements for Submission:

- One (1) complete copy of the Application for Site Plan Control;
- Eight (8) paper copies of drawings (full size – 24" x 36);
- One (1) paper copy of drawings reduced to 11" x 17";
- One (1) digital copy (.pdf) of drawings - emailed, or copied onto a CD and submitted with application;
- One (1) paper copy and one (1) digital copy of all documents as required in Section 3.2.
- Required fees (as noted in 6.1 above) are to be submitted to the Planning Department for review and processing (fees to be confirmed at the pre-consultation meeting).

Drawings must be submitted in collated sets.

Appendix L-3 – Application Form (Mixed Use (Comm./Res.))



BROCKVILLE
CITY OF THE 1000 ISLANDS

City of Brockville Application for Site Plan Control Mixed Use Development (Commercial/Residential)

TO BE COMPLETED BY THE PLANNING DEPARTMENT:

Date Submitted:	Date Complete:	Fee Rec'd:	File No.:
-----------------	----------------	------------	-----------

1.0 Owner Information

Name of Property Owner(s):			
If a Corporation, name and position of Principals:			
Address (including Postal Code):			
Tel No.:	Cell No.:	Fax No.:	Email:

2.0 Applicant Information

Name of Applicant:			
Address (including Postal Code):			
Tel No.:	Cell No.:	Fax No.:	Email:

Note: If this application is signed by an applicant/agent on behalf of an owner, the owner's written authorization under section 5.0 of this application must be completed. If the owner is a corporation acting without agent, the application must be signed by an officer of the corporation with authority to bind the corporation.

To Whom is all correspondence to be sent? Owner ☐ Applicant ☐

3.0 Pre-Consultation and Supporting Documentation

3.1	Have you scheduled and completed a mandatory pre-consultation meeting with the City of Brockville Planning Staff as required under City of Brockville By-law 039-2012?	Yes <input type="checkbox"/> No <input type="checkbox"/>
	If yes, please specify the date of the mandatory pre-consultation meeting: Date: _____	
	If not, please contact the Planning Department, Andrew McGinnis, Planner II – (613) 342-8772, ext. 4421; or email to: amcginnis@brockville.com , to arrange a pre-consultation meeting prior to submitting an Application for Site Plan Control.	
3.2	With respect to the submission of this application, the required supporting studies, additional information and materials required to be submitted are those that were discussed and listed as a requirement during the pre-consultation process. Please attach a list of the documents being submitted with the application. One (1) paper copy and one (1) digital (.pdf) copy of each document is required to be provided with the application. Should any of the required documents (as referenced above) not be available at the time of submission of your application, please indicate on the list the reason it is not available and a date when the City can expect to be in receipt of the document. Note: The application may not be considered to be complete until all reports have been received.	
3.3	Application and review fees are listed in Appendix 1 and 2. Confirmation of said fees should be obtained at the Pre-consultation meeting.	

4.0 Details of Proposed Development					
Project Title:					
Type of Development:					
Site Location (address):					
Legal Description:					
Current Zoning of Site:					
Construction Value for Project:		Total Area of Site: (m ²)		Total Area of Building(s): (m ²) % of Site covered by Building(s):	
Total Commercial Area: (m ²)		Total Residential Area: (m ²)		Total Amenity Area: (m ²)	
Landscaped Area: (m ²)		Paved or Hard Surfaced Area: (m ²)		Density (# of units/hectare):	
Total No. of Residential Units:		No. of Storeys:		Height of Building(s):	
Residential Units by type:	Bachelor:	1 Bedroom:	2 Bedroom:	3 Bedroom:	4 Bedroom
Type of Use by Storey:		1 st storey:		2 nd storey:	
		3 rd storey:		4 th storey and higher:	
Commercial Parking Spaces:		Residential Parking Spaces:		Loading Spaces:	
Method of Snow Removal:					
Method and location of Garbage Storage:					
Method of Garbage Removal:					
Other Special Facilities Provided:					
Is the Building to be a Condominium:					
5.0 Certification of Completeness – Site Plan Control Application					
This is to certify that this application for Site Plan Control Approval provides all of the information required by the City of Brockville, as specified in the Site Plan Control Manual, and is in conformity with the provisions of Zoning By-law 050-2014 (as amended). It is understood that in the event that any further information is required by the City of Brockville for consideration of the application, and where I/we are so advised by the City, the approval process shall be suspended until such required information is provided.					
Signatures:	[Owner]:			Date:	
	[Applicant/Agent]:				

6.0 Notes Respecting Submission of Application:

6.1 The current application fee for Site Plan Control can be found attached in Appendix 1.

6.2 Review by the Cataraqui Region Conservation Authority (CRCA) is required for amendments affecting sites within Environmental Protection and Waterfront Categories as depicted on Schedule "B" to the Official Plan for the City of Brockville.

The fee for review, as shown in Appendix 2 must be submitted with the application for amendment in order to be considered a complete application. The CRCA fee should be provided in a separate cheque made payable to the Cataraqui Region Conservation Authority.

All fees are to be confirmed at the Pre-consultation Meeting.

6.3 Requirements for Submission:

- One (1) complete copy of the Application for Site Plan Control;
- Eight (8) paper copies of drawings (full size – 24" x 36);
- One (1) paper copy of drawings reduced to 11" x 17";
- One (1) digital copy (.pdf) of drawings - emailed, or copied onto a CD and submitted with application;
- One (1) paper copy and one (1) digital copy of all documents as required in Section 3.2.
- Required fees (as noted in 6.1 above) are to be submitted to the Planning Department for review and processing (fees to be confirmed at the pre-consultation meeting).

Drawings must be submitted in collated sets.

Appendix L-4 – Appendix 1 to Applications

PLANNING FEES 2017 (including Finance Office and Fire Dept.) in accordance with City of Brockville By-Law No. 006-2017 **(Effective April 1, 2017)** (all Planning Fees are tax exempt)

APPENDIX “1”

SITE PLAN CONTROL APPROVAL	
<i>Applications for Site Plan Control Approval are required to be submitted with the required fees noted below; including CRCA fees if applicable.</i>	
Fees for processing site plan applications: * Parking Lots Only All Other Site Plan Control Applications Reactivation of Application	 \$455.00 per submission \$900.00, plus \$50/dwelling unit or \$0.50/sq.m. (maximum of \$3,000.00) \$900
Fees for engineering review of site plans: With less than 100 parking spaces With more than 100 parking spaces Minor Change – Building Minor Change – all other	 \$220.00 per submission \$440.00 per submission \$ 55.00 per submission \$155.00 per submission
Cataraqui Region Conservation Authority (CRCA) Fees: CRCA reviews Site Plan applications for Multiple Residential, Commercial, Industrial and Institutional projects where applicable.	 CRCA fees for review of Planning Applications are listed on Appendix 2. Payment of said fees shall be made payable to CRCA.
Lapsed Agreement: When the Corporation of the City of Brockville has entered into a Site Plan Control Agreement with a person or corporation and that Agreement has lapsed, a fee shall be payable to the Corporation of the City of Brockville for any new application for the same project or the reactivating of the original Agreement.	 \$880.00
Approval of Minor Change to Site Plan	 \$155.00 per submission
Amendment to Site Plan Control Agreement: * When the Corporation of the City of Brockville has entered into a Site Plan Control Agreement with a person or corporation and that Agreement requires to be amended, a fee of shall be payable to the Corporation of the City of Brockville.	 \$275.00 <i>*Plus registration fee - \$100.00 (refundable if registered by Applicant)</i>

Appendix L-5 – Appendix 2 to Applications
PLANNING FEES 2017 (including Finance Office and Fire Dept.)
in accordance with City of Brockville By-Law No. 006-2017
(Effective April 1, 2017)
(all Planning Fees are tax exempt)

APPENDIX “2”

Schedule “B” – By-Law 006-2017
Cataraqui Region Conservation Authority (CRCA)
Plan Review Service Fee Schedule¹
(Effective April 1, 2017)

Application Type	Fee⁽²⁾	Notes
Plan of Subdivision	\$2,155.00 \$975.00 \$635.00	Conditions of Draft Approval Clearance of Conditions Lapsed Draft Plan Approval, Resubmission or Amendment
Plan of Condominium	\$1,295.00	
Official Plan Amendment	\$635.00 (minor) ⁽³⁾ \$975.00 (major)	Where these applications are submitted concurrently, the fee for a zoning by-law amendment is waived.
Zoning By-law Amendment	\$305.00	See Official Plan note above.
Consent	\$360.00 / lot	Fees for the review of applications required to fulfill a condition of consent approval are waived.
Minor Variance	\$305.00	Where the application is submitted with a site plan control application, the fee for a minor variance application is waived.
Site Plan Control	\$305.00 (minor) ⁽³⁾ \$1,295.00 (major)	
Reports⁽⁴⁾	\$290.00 \$695.00 \$1,400.00	Brief Standard Major

Notes:

- (1) All fees for the review of an application and supporting reports must be received before written comments will be provided.
- (2) Significant amendments to an application or report or resubmission within a period of three (3) years will be charged a review fee of 50 per cent of the current fee. A resubmission after three (3) years will be considered a new application and will be subject to the full current fee.
- (3) Minor refers to single residential or small single-unit commercial applications. Major refers to all larger-scale applications.
- (4) Report fees shall apply to any report circulated in support of an application. Reports include: floodplain delineation/hyrotechnical studies, erosion and slope stability studies, terrain analyses, stormwater management reports, environmental impact statements, hydrogeological studies or similar assessments of natural resources.

PLANNING FEES 2017 (including Finance Office and Fire Dept.)
in accordance with City of Brockville By-Law No. 006-2017
(Effective April 1, 2017)
(all Planning Fees are tax exempt)

Descriptions of Reports

Brief Reports are those prepared in the form of a letter of opinion from a qualified professional, which generally relate to the development of a single lot, usually for residential purposes.

Standard Reports are those prepared for small or medium scale residential, commercial, industrial, or institutional developments.

Major Reports are those prepared for subdivisions and large scale commercial, industrial, or institutional projects, or may include the integrated assessment of multiple topics.