



Municipal Servicing Standards

October 2018

LIST OF REVISION NOTICE DATES

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1	April 2017	Complete Copy issued April 2017
2	September 2018	Complete Copy issued October 2018

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1.0 INTRODUCTION

1.1 Definitions

For the purpose of these guidelines, the following definitions will be recognized:

- a) "**AODA**" means Accessibility for Ontarians with Disabilities Act.
- b) "**Township**" shall mean The Corporation of the Township of Cavan Monaghan.
- c) "**Contractor**" means a person, partnership, or corporation who contract to undertake the execution of work commissioned by the Township.
- d) "**Curb Ramp**" means a ramp that is cut through a curb or that is built up to a curb.
- e) "**Depressed Curb**" means a seamless gradual slope at transitions between sidewalks and walkways and highways and is usually found at intersections (IASR 80.26 & 80.27).
- f) "**Developer**" shall mean the Owner or party specifically named in a Development Agreement or in a Subdivision Agreement.
- g) "**Engineer**" shall mean the Director of Public Works for the Township of Cavan Monaghan or his designate.
- h) "**Owner's Engineer**" shall mean a consulting engineer retained by the Owner responsible for the design of the subdivision.
- i) "**Inspector**" means the person(s) authorized and supplied by the Township to see that the installation is executed according to the specifications and the approved plan(s).
- j) "**Main**" means every sewer pipe, except services and portions of private sewers, installed on the public road allowance or on any other land upon which the Township has obtained easements.
- k) "**OPSD**" means Ontario Provincial Standard Drawings.
- l) "**OPSS**" means Ontario Provincial Standard Specifications.
- m) "**OBC**" means Ontario Building Code.
- n) "**Subdivider**" means the Owner or Party specifically named in a Subdivision Agreement.

1.2 Metric Usage

All plans, drawings, specifications, details, descriptions, notes or any other terms included in the Engineering drawings, specifications and tender package are to be dimensioned or referred to in the Metric system of measurement.

2.0 SUBDIVISION PROCESS AND SUBMISSION REQUIREMENTS

2.1 Subdivision Procedures

2.1.1 Draft Plan

Draft Plan approval including all conditions must be issued by the Township prior to any subdivision engineering review being conducted. The draft plan should illustrate all aspects required under the planning act and should clearly identify the following elements:

- Right of way widths
- Cul-de-sac and ROW radii
- Daylighting triangles
- All property lines for proposed lots and blocks including frontage widths
- Servicing blocks/easements and reserves
- Existing contour lines and drainage features
- Table summarizing lot/block numbers and areas

The draft plan should be accompanied by a Functional Servicing Report which conveys the means by which the proposed development will be provided with Municipal services. The FSR should be prepared in accordance with Section 2.2 Other supporting studies may be required by the Township or other agencies to support the draft plan application.

Preconsultation with the Township and County is strongly encouraged prior to draft plan submission to ensure that the proponent understands the process and any requirements specific to their site.

2.1.2 Engineering Submissions

Following Draft Plan approval, the engineering design drawings and supporting reports should be submitted to the Township for review. The engineering submission will consist of the following documents and drawings:

- Subdivision engineering plans
- Stormwater management report and drawings
- Geotechnical report
- Confirmation of sufficient water and sewer capacity
- Tree Preservation Plan (if required)
- Environmental Impact Study (if required)
- Noise Study (if required)
- Traffic Impact Study (if required)
- Other supporting studies as identified by commenting agencies

Submission requirements are identified in Section 2.2

2.1.3 Subdivision Agreement

The developer will be required to enter into a subdivision agreement with the Township. A standardized form of agreement is used, a copy of which is available from the Township Planner. The owner's engineer is expected to obtain a copy of the agreement and be fully conversant with its terms as well as the standards contained herein. The owner's engineer shall also be expected to provide and/or co-ordinate the following schedules for inclusion in the subdivision agreement.

- Schedule " " - Description and Cost of Works to be constructed
- Schedule " " - Approved Plans for Works to be constructed
- Schedule " " - Lot Grading and Drainage Plans
- Schedule " " - Parkland, Fencing, Landscaping and Tree Preservation

Financial Security in a form satisfactory to the Township shall be provided upon execution of the subdivision agreement, based on the engineers estimate of the work, to guarantee satisfactory performance of the work. The amount of financial security shall be as outlined in the agreement. Securities to the Township may be provided on a phase by phase basis as approved by the Township. The specific requirements related to release of securities are identified in the subdivision agreement.

All approved plans for the works to be constructed shall be reduced to legal size (8.5" X 14") for inclusion in the agreement. The reduced versions are to be photographic reductions of the originals having black lines on a white background. Photocopy reductions are not permitted.

The Estimated Cost of the Works as prepared by the owner's engineers and approved by the Township is required to be incorporated into the agreement. The estimate must be supported by a suitable breakdown by estimated quantity and unit price under the following general headings whereby it is assumed that individual unit prices will include taxes as they are applicable:

- Roads (To top of base course, surface course and curbing)
- Storm Sewer System (Complete)
- Water Distribution System (Complete)
- Sanitary Sewer System (Complete)
- Streetlights
- Signs/Barricades
- Sidewalks (Concrete/Asphalt)
- Fencing (All types including Noise Attenuation)
- Boulevard Landscaping (Topsoil and Sod)

- Grading (Excavation and Fill Placement for road construction and those additional areas which may be designated for pre-grading)
- Other Underground Utilities (Electric, Telephone, Cable TV, Gas)
- Parkland Improvements
- Tree Planting (If Required)
- Engineering & Inspection (7%)
- Contingencies Allowance (five (5%) percent of the total engineers cost of the works)
- G.S.T. 7%

Should construction of any one phase be unduly deferred the Township reserves the right to re-examine the engineer's estimate and request an update based on current construction costs.

2.1.4 Building Permits

Building permits will not be issued until such time as the Township has issued Interim Acceptance of the subdivision. The Township may, at its discretion, allow up to 10% of the building lots to commence construction of unoccupied Model Homes prior to Interim Acceptance to facilitate marketing of the subdivision. Conditions for issuance of building permits for Model Homes are as outlined below:

The conditions on which the Township generally will issue permits for the construction of unoccupied Model Homes are as follows:

- The Subdivider shall have constructed a minimum 6.1 metre access road from an open public road to the lot upon which the model home is to be constructed. The access shall be paved to the base course asphalt stage with full curb and gutter.
- The Subdivider shall construct a gravel turning circle, or approved equivalent, at the end of any such access road, in accordance with the Building Code Act.
- An in-service fire hydrant shall be located within 90 metres of the model house, based on vehicular travel distance.
- At the time of commencement of construction of a model house, no portion of a model house shall be constructed within 15.0 metres of any other building with an unfinished exterior, other than another model house.
- Water services shall not be turned on.
- The Subdivider shall maintain, at its sole cost, the access road and turning circle, including snow ploughing, until issuance of the Interim Acceptance Certificate for the fronting public street.
- The Subdivider covenants and agrees that no model house shall be occupied for residential purposes prior to the issuance of the Interim Acceptance Certificate for the fronting public street.

Typically, the Township requires a letter from the Subdivider's Engineer indicating the above conditions are met, prior to the issuance of Model Home Permits.

2.1.5 Interim Acceptance

Building Permits are typically available after an Interim Acceptance Certificate is issued by the Township after the fulfilment of the following requirements, and a specifically worded written certification from the Subdivider's engineer detailing how they have been completed:

- Storm sewer, sanitary sewer, and water distribution systems have been completed and the sewers connected to outlets all to the satisfaction of the Township Engineer.
- Interim 'As Constructed' road Plan and Profile drawings showing 'As Constructed' locations, inverts, lengths and slopes of all storm and sanitary sewers and structures, sewer lot service locations redrawn as measured to the downstream manhole and invert elevations and locations at the property line. The Township requires that both the plan and profile components of the drawings be significantly re-drawn to accurately reflect the 'As Constructed' conditions. The submitted 'As Constructed' drawings must be signed and sealed by a professional engineer. Once the 'As Constructed' drawings are reviewed and approved by the Township of Cavan Monaghan, they shall be provided on a CD or DVD in digital form in both PDF format and AutoCAD (DWG) format in the proper UTM coordinate system.
- 'As Constructed' storm and sanitary sewer design calculations/charts have been provided to the Township Engineer based upon the 'As Constructed' pipe slopes. Design flows arising out of minor changes to the manhole and catchbasin locations need not be altered from the approved design sheets, but pipe flow capacities based on 'As Constructed' slopes should be modified.
- Leakage and deflection testing of the sanitary and storm sewers have been certified and submitted by the Subdivider's Engineer.
- The full width of the road allowances have been rough graded, the granular base, all manhole and catchbasin adjustments to base course level, full asphalt base and full curb and gutter have been completed, including temporary turning circles at the termination of road allowances where necessary, all trenched road crossings have been completed and restored, and the streets have been connected to an existing assumed street, and all emergency accesses have been completed to base asphalt. There should be unencumbered access for any emergency vehicles to all lots within the subdivision.
- An overall composite utility plan, signed and approved by all utility companies, showing the various utility services has been completed if not previously submitted.
- An 'As Constructed' survey of the stormwater management facility has been completed and submitted to the Township and that the water quality design parameters and stage-storage-discharge are in conformance with the approved design.

- The lots have been rough graded to within 750 mm of finished grade in conformity with the general lot grading plan and further specific elements of the plan have been established, such as rear yard swales common to and crossing through several lots, as deemed essential by the Township Engineer so that subsequent builders may conform readily to the plan.
- The Subdivider has erected an adequate and legible sign at or near the subdivision entrance clearly depicting the land use designations within the Subdivision and on the immediately abutting lands and the arterial and collector streets as recited in the Official Plan. Temporary sedimentation pond lots and Stormwater Management facilities shall also be clearly shown and labelled on the signs. The size, content and location of each sign shall be approved by the Township Engineer in advance of erection.
- The Subdivider has erected temporary street name signs and traffic control signs at all intersections to the satisfaction of the Township Engineer. The street name signs shall be located and orientated properly for both streets and shall be labelled on both sides.
- The Subdivider has marked the municipal address and lot number on the water service markers at each lot or block.
- The Subdivider has made arrangements to maintain the Public Services and emergency routes to the satisfaction of the Township Engineer. Satisfactory arrangements shall include an undertaking by the Subdivider's Engineer that the Public Services, including stormwater management and sedimentation and erosion control facilities, will be inspected on a weekly basis and/or after rainfall events and that deficiencies will be immediately rectified to the satisfaction of the Township Engineer and that contact information for the contractor for subdivision maintenance is provided.
- The Subdivider has posted an irrevocable Letter of Credit to secure completion of its remaining obligations pursuant to the Subdivision Agreement to the satisfaction of the Township Engineer, which typically includes Lot Grading Certification and completion of Surface Works. Additionally, all of the outstanding invoices for work performed by the Township pursuant to the Subdivision Agreement must be paid in full.
- A written acknowledgement from the Township of Cavan Monaghan Fire Chief or his designate has been received to the effect that the Subdivider has made satisfactory arrangements for the sequence of building construction so as to create fire breaks during the period of construction and further that adequate access is available for Fire Department vehicles. The Subdivider's Engineer typically provides a Fire Break Plan for submission to the Township's Fire Department to assist in this process.

2.1.6 Subdivision Assumption

The mechanism for subdivision assumption by the Township is detailed in the Subdivision Agreement. The Subdivider, typically through their Engineer, may request a Final Acceptance Certificate upon completion of the following:

- The public services outlined in the Subdivision Agreement have been completed in a satisfactory manner based on an inspection by the Township and have been fully paid for. In general, the surface asphalt will not be permitted to be placed until after a minimum of one full winter season after the completion of binder asphalt and a minimum of 75% of the houses are completed.
- The Subdivider has provided a certificate of Current Value, from the Subdivider's Engineer, establishing the value of the Public Services being assumed by the Township upon expiry of the Warranty Period.
- The Subdivider has provided the Township Engineer with one full set of final "As Constructed" drawings showing the Public Services including completed surface asphalt and sidewalks. These drawings must be provided in a digital form on a CD or DVD in PDF format and AutoCAD (DWG) format in the proper UTM coordinate system. The "As Constructed" drawing set should include the final "As Constructed" Stormwater Management drawing set arising out of a recent (within 90 days) detailed survey of the pond undertaken soon after the pond has been drained and all sediment removed from both the forebay and the main cell.
- Within 3 months prior to final lift of surface course asphalt, the Subdivider has performed full length closed circuit television (CCTV) inspections and sewer ratings of the sanitary and storm sewers in accordance with the Township's Standards. All defects shall be reported by the Subdivider's Engineer to the Township and recommended repairs and shall be approved by the Township Engineer. Upon completion of the required repairs, a final set of CCTV inspection videos and ratings shall be submitted for approval along with a certification from the Subdivider's Engineer that the videos were reviewed and all sewers and structures appear to be in accordance with Township standards noted above. The Township shall be given 3 weeks to review and approve the final video submission prior to placement of surface asphalt.
- The Subdivider has provided written confirmation from an Ontario Land Surveyor that all standard iron bars within the Subdivision, as shown on the registered plan, have been located, made visible, are flush to grade and, if necessary, replaced.
- Upon the Township Engineer's provision to the Subdivider a certificate indicating that the Public Services have been completed to the satisfaction of Township Engineer (herein referred to as the "Final Acceptance Certificate"), the Subdivider shall continue to be solely responsible for the maintenance of the Public Services in a state of good repair for twelve (12) months following the date of the Final Acceptance Certificate

(herein referred to as the Warranty Period) and shall promptly remedy any defects in the work appearing within such period. The Warranty Period shall not expire until the final inspection has been arranged by the Subdivider and carried out by the Township, and any defects identified by the final inspection have been repaired by the Subdivider. In the latter part of the Warranty Period, Township staff will prepare a report to Township Council in relation to the acceptance of the subdivision as Council Approval will be required prior to assumption. Within fourteen (14) days of the final inspection, or the repair of any defects identified by the final inspection performance security shall be returned to the Subdivider and the Township shall acknowledge in writing that the Public Services have been fully assumed by the Township.

2.2 Submission Requirements

2.2.1 Functional Servicing Report

Accompanying the Draft Plan submission, shall be a Functional Servicing Report for the proposed development which, among other things, shall include the following:

- All roadway location and alignments and intersections, including right of way widths and intended road classifications.
- Parkland, open space and stormwater management blocks.
- Existing and proposed watercourses and channelization
- Any known floodplain and wetland boundaries.
- Confirmation of adequate water and sewer servicing.
- Geotechnical and hydro-geotechnical reports including slope stability and potential well and septic system impacts. Hydro-geotechnical reports should make estimations of seasonally high groundwater table in relation to the proposed preliminary grading plans, servicing trenches, and stormwater management facilities. A water balance assessment should also be included.
- Preliminary stormwater management report including water quality and sediment and erosion control plans. Size of SWM block should be confirmed and consideration of maintenance access and buffers included.
- Preliminary sanitary sewer assessment including confirmation of downstream capacities, and required pumping station locations.
- Confirmation with Bell/Enbridge/Cable/Hydro of available servicing.

- In areas where the proposed subdivision is located within a portion of a larger area to be developed, the Functional Servicing Report must consider how the servicing of the subject application does not limit or encumber future development.
- Tree Preservation Plan
- Traffic Study (if applicable)
- Noise Study
- Parking study (if applicable)

2.2.2 Engineering Plans

All development requiring municipal servicing shall be designed and constructed under the supervision of the Owner's Engineer, who shall be a Professional Engineer registered with the Professional Engineers of Ontario. All final drawings and relevant reports submitted to the Township shall bear the seal of the registered Professional Engineer responsible for the design of the project. Drawings are to be A1 size and at a scale which is adequate to show sufficient detail of proposed works and provided in paper and digital format.

The Engineer shall submit, in triplicate, copies of plans, specifications and pertinent design calculations for the proposed municipal services in accordance with the requirements of the Township.

The plans, specifications and other documentation submitted will be reviewed by the Township. One copy of information submitted will be returned to the Consulting Engineer noting any required revisions. When the plans, specifications and other design calculations are approved, the Township will sign as the municipality and/or applicant, all applications for submission to the appropriate regulatory agencies. No construction work shall begin on any project until the Township is satisfied that approvals have been received from the regulatory agencies and the requirements, financial and otherwise, of the Subdivision/Development Agreement have been complied with.

The following plans shall be submitted to the Township for review:

- A) Title Page
- B) Servicing Plans
- C) Lot Grading Plans
- D) Plan and Profile Drawings
- E) Storm Sewer Catchment Area Plan
- F) Sanitary Sewer Catchment Area Plan
- G) Erosion and Sediment Control Plan
- H) Tree Preservation Plan
- I) Stormwater Management Pond Plan
- J) Landscape Plan

- K) Composite Utility Plan
- L) Lighting Photometrics Plan
- M) Standards and Specifications Plan.

In addition to the engineering plans, the following supporting documents shall be submitted to the Township for review:

- A) One copy of the signed Draft Plan of Subdivision.
- B) One copy of the Draft Plan Conditions.
- C) A covering letter providing an overview of the submission and confirmation that all drawings reflect Draft Plan conditions.
- D) Storm Sewer Design Charts for both 5 year flows and 100 year hydraulic grade line calculations.
- E) Sanitary Sewer Design Charts.
- F) Stormwater Management Report. The stormwater management report shall be signed and stamped.

2.2.2.1 Title Page

The title page shall contain the following:

- A key plan showing the project location in relation to the surrounding streets and major features. The plan must include a north arrow.
- A drawing index listing all plans within the set.
- The project name and contact information for the developer and consultant

2.2.2.2 Overall Servicing Plan

The Servicing Plan(s) shall be drawn at a scale of 1:500. In the event the entire subdivision cannot be contained on one sheet, additional drawing(s) shall be provided and the plans may overlap. The Servicing Plan shall contain the following:

- The proposed lot and block layout, dimension, and numbering matching the final
- M Plan.
- Lot frontage dimensions.
- Driveway locations.
- Storm sewers and catchbasins, manholes and catchbasin manholes.
- Sanitary sewers and manholes.
- Watermains and hydrants.
- Roads, curbs and sidewalks.
- Storm, sanitary and water services for each lot.
- All external watermains, sanitary sewers, storm sewers and drainage courses
- that are required to service the subdivision.

2.2.2.3 Plan and Profile Drawings

Plan and Profile drawings are required for all streets, pipe outfalls, easements and watercourses. The Plan and Profile Drawing(s) shall be arranged within the set such that all streets have their own drawing(s). The Plan and Profile drawing shall be drawn at a scale of 1:500 horizontally and 1:50 vertically. Where a street requires more than one plan, match lines with stationing should be provided with NO overlap of information. The plan and profile portions of the drawing should be in line vertically with each other and shall have consistent stationing. Plan and Profile Drawings should include the following:

- The proposed lot and block layout within the plan component
- Lot frontage dimensions on all lots and blocks.
- Chainage stationing shown every even 20 metres on the profile component (in sync. with grid lines) and 100 metres on the plan component.
- Chainage stationing at all road intersections for both roads.
- Existing ground profile along centre of right of way and existing left and right elevation marks corresponding to the edge of the right of way at even 20 metre stations.
- Proposed centerline profile including all longitudinal slopes, crest and sag K values, PVI station and elevations and vertical curve lengths. Horizontal centerline radii and BC and EC data should be shown on the plan portion. Where change in vertical grade is less than 1.5%, no vertical curve is required.
- Where plan and profile is an extension of an existing road, show profile extending at least 40 metres into the existing road to ensure proper profile transition. Lesser distances of existing road may be permitted where there is little change in the grade. The limits of construction including stationing must be shown on both the plan and profile portion.
- All storm sewer, sanitary sewer, and watermain information including structures such as manholes, catchbasins, hydrants, valves, etc., should be shown. The profile portion should include: size, material type, class, length and slope of pipes, manholes sizes, related OPSD numbers, and inverts at manholes, catchbasin lead crossings, etc. Non-standard manhole details or manhole benching must be shown on the drawings.
- Grading details of cul-de-sac where minimum gutter grades are proposed.
- Watermain bends and vertical clearances must be shown at crossings.
- All water, storm and services should be shown (in different linetypes) as well as driveway locations.
- Rear yard catchbasin profiles shall be drawn in conjunction with the proposed surface lot grading and minimum underside of footing. Manholes required at the main line intersection with rear yard catchbasins.
- Vertical Benchmark and UTM information required within title block. At least one vertical benchmark must be shown within or adjacent to the site and at least two fixed UTM horizontal control points are needed. Where additional benchmarks have been established within the subdivision since final approval, these benchmarks should be indicated on the drawing prior to 'As Built' submission.
- Road, boulevard, sidewalk and right of way widths, sidewalk locations and curb and right of way radii at intersections and bends.
- Above ground utility information.

2.2.2.4 Lot Grading Plans

Lot grading plans shall be prepared in accordance with this guideline and contain the following information:

- Lot Grading Plans must be drawn at a minimum scale of 1:500.
- Indicate a north arrow.
- All elevations should be referenced to a metric geodetic municipal benchmark.
- Show all existing and proposed lot numbers and blocks.
- Show all proposed rear lot catch basins, pipes, top of grate elevations and inverts, and easements.
- Show existing contours.
- Show existing and proposed elevations at lot corners.
- Show adjacent topography and drainage patterns.
- Show all existing structures, vegetation, natural features on, or adjacent to the subject property.
- Indicate specified house grade, top of foundation elevations, steps in foundation, low openings and garage floor elevations including proposed driveway grade.
- Show proposed road grades and elevations on all streets with arrows indicating direction of slope.
- Show proposed elevations along boundary of all blocks abutting single family and semi-detached lots in the subdivision.
- The maximum side slopes on swales should be 3 horizontal to 1 vertical. All swales must have a minimum depth of 150 mm. Swales within the development are to be centered on property lines. Swales abutting other properties are to be constructed entirely within development lands.
- The maximum slope of all embankments should be 3:1. Where grades greater than 3:1 are proposed a retaining wall should be constructed. All 3:1 or steeper are to be indicated on the plan, clearly defining the limits of the slope.
- The proposed direction of overland flow shall be indicated on the plans by arrows. High points and all changes in grade are to be clearly noted on the plan, with spot elevations.

- All Regional Flood and Fill Lines, verified by the Conservation Authority, must be indicated on lot grading plans where developments are adjacent to existing watercourses.

Storm and Sanitary Sewer Area Drawings

These drawings can either be drawn at 1:500 in relation to the Lot Grading Plans or can be drawn at either 1:750 or maximum 1:1000 to encompass a greater area. Storm Sewer Area drawings shall outline and indicate the tributary area and runoff coefficient for each location (typically a catchbasin) being analyzed. The Sanitary Sewer Area drawing should outline and indicate catchment areas and assumed population parameters (and landuses where mixed) for each manhole. The storm and sanitary sewer design sheets shall be consistent with these drawings.

Tree Preservation Plan

The Tree Preservation Plan at a maximum scale of 1:1000 should indicate all existing significant tree and shrub cover (drip lines) on the site and indicate which vegetation is to be preserved and which ones are to be removed. Detailed inventory is required for any trees greater than 300mm diameter. The Tree Preservation Plan should be consistent with the grading requirements of the Lot Grading Plan.

Sediment and Erosion Control Plan

The Sediment and Erosion Control Plans should indicate all proposed erosion control measures including details and timing of installation, inspection, maintenance and removal. The Sediment and Erosion Control Plans are typically prepared in conjunction with the Lot Grading Plans and Stormwater Management Reports. Temporary stockpiling areas must be noted on the plan.

Stormwater Management Pond Plan

The Stormwater Management Pond Plan should provide enough information in both plan and profile to properly construct the approved proposed stormwater management basin. Horizontal scale shall be a standard even value. Stormwater Management Pond drawings should include the following:

- Location, size, grading, and berming for the proposed facility. Maximum allowable slopes are 3:1 and slopes within 3 horizontal metres of the permanent pool level should be 5:1 maximum with 7:1 preferred.
- Permanent pool, extended detention, 5 and 100 year ponding levels as well as regulatory floodplain elevations (where applicable) should be indicated.
- Seasonally high groundwater table levels.
- Details and elevations of inlets and outlets including overflows must be provided.
- Pipe inlets should be above the 5 year level and pond outlets should be outside of the regulatory floodplain and at the very least above the 100 year level.

- The proposed berm widths and berm compaction and any water liner requirements should be noted.
- Proposed maintenance access roads, easements, pipe and overland outfall details.
- Vegetative cover and any proposed wet pond plantings and vegetative landscaping.
- Adequate buffer from any pond infrastructure to a property line.

Landscape Plan

- The Landscape Plan (or Tree Planting Plan) shall be drawn at a scale of 1:500 and should indicate location, species and specifications of the proposed boulevard trees, parkland plantings and any landscape screening areas for the subdivision.
- Traffic signs, light poles, and surface utility features should also be provided on the Landscape Plans.
- The Landscape Plan shall be prepared by a Landscape Architect in good standing with the Ontario Association of Landscape Architects.
- Landscape specifications, locations, and spacing shall be in conformance this document.

Composite Utility Plan

- The Composite Utility Plan shall be drawn at a scale of 1:500 and shall detail and locate all underground electrical, CATV, Enbridge Gas, and Bell Canada servicing including trenching details, road crossing, street lights, Bell and CATV pedestals, transformers and other street 'furniture' such as hydrants and proposed Canada Post box locations.
- The final composite utility plan shall be signed by all utilities including Peterborough Utilities whom have their own standards for Composite Utility Plans.
- Building envelopes
- Road crossing details
- Driveway location and widths
- Boulevard Trees and driveways should be shown on these plans.
- Specifications and locations for underground ducts for street lighting.
- Traffic signs

Street Lighting Photometrics Plan

- The Street Lighting Photometrics Plan shall illustrate the lighting levels (metric units) on all proposed streets within the subdivision at a maximum grid spacing of 2.5 metres.
- The drawings should clearly demonstrate that the lighting levels meet TAC Guide for the Design of Roadway Lighting Standards or approved equivalent.
- The design approach (i.e. Luminance or Illuminance) should be stated on the drawing as well as Average Luminance (or Illuminance) and Uniformity Ratios for all streets.
- The assumed streetlight luminaires and pole type and height should be consistent with the electrical drawings and the pole height and locations should be consistent with the Composite Utility Plans and approved road cross-sections.

- A signed and sealed covering letter or report in support of the design should accompany the plans.

2.3 Construction Approvals/Inspections

The Engineer or Consulting Engineering firm responsible for the works shall be required to provide full-time inspection during construction. The Engineer shall also be responsible for the submission of paper and AutoCAD file drawings to make a complete set of "As Constructed" drawings, following the completion of the works. Drawings to be A1 size. If items described in the tender drawings were constructed in variance to the designs illustrated in the approved proposed construction drawings. As recorded submissions shall be prepared to accurately record how municipal works were actually constructed. As-recorded drawings should also include: locations and inverts of sanitary and storm services; locations of water services.

2.3.1 Construction Prerequisites

The following shall be considered pre-requisites to the commencement of construction:

- Engineering plan approval including approval from all outside agencies having jurisdiction.
- All construction related permits/approvals in place
- Acceptance of the owner's contract documents.
- Posting of the certificate of insurance and other as set forth in the subdivider's agreement.
- Delivery of all forms of consent, securities and payments as provided for in the subdivision agreement.
- Execution and delivery by the Owner/Developer of the subdivision agreement and all deeds and easements for lands to be given to the Township and other public agencies.
- A pre-construction meeting.
- Delivery of 3 sets of all final design plans plus 2 copies of all reports.

2.3.2 Pre-Construction Meeting

Having met the pre-requisites for the commencement of construction, the owner's engineer shall request a pre-construction meeting to be arranged through the office of the Public Works Department just prior to construction. The consultant shall contact the utility companies and any other agencies which are perceived to have an interest in the construction. It is expected that the developer's engineer and contractor will attend, as well as a direct representative of the development firm.

The owner will be required to provide an approximate schedule of construction, a list of subcontractors, and a list of materials, mix designs etc., to be used in the construction of the subdivision (materials must have Municipal approval). Minutes of the meeting will be taken by

the owner's engineer and circulated to all in attendance upon a draft being reviewed and approved the Public Works Department.

In addition to any other interested parties the following must be in attendance at the pre-construction meeting: the Owner's Engineer and their Site Inspector, the General Contractor's representative and Township of Cavan Monaghan staff as required.

2.3.3 Inspection and Testing

All works to be constructed shall be inspected and tested under the direction of a professional engineer as approved or designated by the Township's Director of Public Works. Inspection services will be provided in new subdivisions as follows:

The owner's engineer is approved by the Township to provide full time inspection in the subdivision. The Township or a representative of the Township will provide periodic part time inspection at pertinent inspection intervals.

The owner's engineer shall make every reasonable attempt to maintain consistency in regard to on-site inspection. If an alternate inspector is to be assigned to the project the owner's engineer shall notify the Public Works Department and obtain his or her concurrence. If unforeseen circumstances require the immediate substitution of the designated inspector, the Public Works Department shall be notified as soon thereafter as possible.

Inspection Frequency Table

Type of Operation		Owner's Engineer	Township of Cavan Monaghan
Pre-Construction Meeting	(1)	A	A
Clearing and Grubbing		P	A
Stripping Topsoil		P	A
Below Ground Works			
Check bench marks & control bars		A	A
Check Trenching, Bedding, and Backfilling Operations		F	A
Verify Acceptability of Materials		P	A
Check Layout & Monitor installation of below ground works		F	A
Monitor Testing of Watermain (leakage)	(1)	F	A
Monitor Chlorination (Water)	(1)	F	A
Monitor Testing of San. Sewer and maintenance holes	(1)	F	A
Utility trenching (Electric, Telephone, Cable, Gas)	(1)	P	A
Utility Trench Backfill	(1)	F	A
Compile Information and Prepare As-Built Drawings		F	
Above Ground Works		F	
Checking grade and layout of all above ground works		F	A
Monitor Road sub excavation and placement of Granulars	(1)	P	A
Check Rough grading of boulevards		P	A
Check pre grading of lots/Swales/Parkland/Storm Ponds		F	A
Check Base Asphalt	(1)	F	A
Check Streetlight Installation and Wiring	(1)	F	A
Check Curb and Gutter Installation	(1)	F	A
Walkways	(1)	F	A
Fencing (Noise, Berms, Misc.)		P	A
CCTV sewers	(1)	F	A
Check Top Course Asphalt	(1)	F	A
Boulevard Landscaping	(1)		A
Park Landscaping/Street Trees	(1)	A	A
Other			
Prepare Weekly Progress Reports		A	A
Security Reduction Requests	(1)	A	A
Administering Deficiency Inspections	(1)	A	A

F=Full time inspection, P=Part time inspection, A=As required to establish compliance

(1) Indicates mandatory involvement by Township of Cavan Monaghan – Public Works Engineering Services staff.

2.3.4 Duties of the Owner's Engineer During Construction

The owner's engineer shall ensure that an approved construction inspector is present on site for the purpose of ensuring quality control during construction. The following functions are considered mandatory.

Start Up

- Attend pre-construction meeting
- Check all benchmarks on the plan for accuracy
- Check elevations of any receiving sanitary or storm sewers to ensure conformance with plan elevations
- Check for adequate control for layout i.e. survey bars
- Obtain asphalt curves, asphalt and concrete mix designs, sieve analysis, and aggregate sources; to be forwarded to the Township and the chose testing company

Underground Work

- Record top of rock elevations
- Check horizontal and vertical alignment and grades of all works
- Verify acceptability of material on site
- Inspect bedding installation and confirm proper compaction
- Inspect coverage of sewer pipes and verify clearances
- Check to make sure sufficient cover on watermain
- Check manhole and catchbasin locations to ensure they meet plan dimensions
- Check tops of maintenance holes and catchbasins to ensure they are low enough to accommodate frames and grates plus at least one lift of modulo and mortar bed for frame and gate
- Ensure all maintenance holes are properly benched and have sufficient rungs
- Complete all necessary testing for sanitary sewer system (air test, mandrel, Leakage, etc.) as well as for watermains (continuity of tracer wire, chlorination, etc.) and record information
- Record all "As-Built" information and complete lateral sheets for each lot.
- Check final elevations for frame and grates of all maintenance holes, catchbasins and ditch inlets, which are not in the pavement.

Road works

- Check sub base to make sure it is to grade; complete compaction testing
- Complete compaction testing and testing of granular materials
- Check curb grades, location and layout

- Ensure all storm inlets are in accordance with the approved design elevation
- Take air tests, slump tests, and cylinders on all concrete pours (curb and sidewalk)
- Check final road base elevations prior to base course asphalt to ensure proper crown and proper depth between top of base and top of gutter
- Ensure manhole frames and grates are constructed to the proper grade and crossfall at base course asphalt grade including all gate valve boxes
- Sample both surface and base course asphalt
- Prior to surface course asphalt, confirm and witness CCTV; CCTV reports and tapes to be reviewed and commented upon
- Prior to surface course paving, make sure all manhole and catchbasin frames are properly adjusted including all gate valve boxes
- Ensure all ditch inlet structure grates and storm outfall grates are properly secured
- Check sidewalk alignment and grades
- Check sidewalk base material and compaction, check sidewalk forms to ensure proper thickness
- Check Mud Mat to ensure compliance to the Townships standards and that materials being transported off site do not enter onto roadways etc. (See Standard R-1)

Utility Trenches, Street Lights, Boulevards, and Street Trees

- Check location and depth of utility trenches
- Check location of ducts
- Check location and grade of transformer pads, pedestals, etc.
- Ensure road crossings and utility trenches are properly backfilled and compacted
- Check location of street lights and ensure they are vertical
- Sod and landscaping is checked at acceptance for compliance
- Confirm stakeout of street trees and confirm species planted

Miscellaneous

- If required by the Township – complete weekly progress reports which are forwarded to the Township which details the work completed, identifies significant deficiencies, details progression of work versus the contractors schedule of work, appends all test results, etc.
- Certification from a Professional Engineer that the works have been installed in accordance with the approved engineering drawings; both at above and below ground stages of construction
- Complete deficiency inspections and reports
- Verify security reduction requests

- Check all rip rapped areas for dimensions, grade, size, quality of rock and installation of filter cloth
- Check all storm water management facilities for grade and dimensions
- Check all major drainage swales and rear yard swales for grades and alignment
- Monitor construction of berms and noise attenuation fences
- Monitor construction in park areas
- Check construction of walkways and fencing
- At completion of all landscaping, check fire hydrant flange elevation to ensure the minimum 150 mm clearance
- Check all gate valves and curbstops for visibility and operation
- Tie in all maintenance holes and gate valves which are not in the pavement

2.3.5 Quality Control/Inspection Frequency (Minimum Standards)

The owner's engineer shall ensure that quality control and inspection frequency is carried out in accordance with the following tables:

Area	Min. % Compaction	Minimum Frequency/Intervals*	Test Location/Identification
Mainline Sewer - Bedding Cover and Trench Backfill	98	50m at random depths, 0.3m max. lift for first 150m and 100m thereafter	Street, Distance from Downstream manhole
Mainline Watermain - Bedding Cover and Trench Backfill	98	50m at random depths, 0.3m max. lift for first 150m and 100m thereafter	Street, Station and Offset
Road Subgrade Utility Crossings	100	50m at random depths, 0.3m max. lift for first 150m and 100m thereafter	Street, Station and Offset
Service Trenches (Water, Sanitary, Storm)	98	First 2 trenches and every trench thereafter	Lot Number
Curb and Gutter Sidewalk	100	50m at random depths, 0.15m max lift	Street, Station and Offset (left or right)

Granular Road Base	100	50m at random depths, 0.15m max lift	Street, Station and Offset (left or right)
Asphalt	100	50m, Each lane	Street, Station and Offset (left or right)
Existing Driveway Reinstatement	100	Random	Lot or House Number and Distance

*Testing shall be done at all changes of soil types and/or types of mechanical compaction.

2.3.6 Inspection by Township of Cavan Monaghan Staff

Township of Cavan Monaghan staff will attend the site at periodic and random intervals to ensure that the level of inspection is adequate. Where inspection is being carried out by the owner's engineer, all costs incurred by the Township in attending to the periodic and random inspections will be invoiced to the owner in accordance with the subdivider's agreement. Payment shall be due as set out in the subdivision agreement. Any and all information regarding the work in progress shall be made available on request to the Township's inspection personnel. Not limiting the generality of the foregoing, the owners engineer shall notify the Township at least 48 hours in advance of all key steps in the construction process. The owner will provide the Public Works advance of all key steps in the construction process. The owner will provide the Public Works Department with a statement signed by a professional engineer certifying that all works were inspected and that they adhere to the plans and specifications approved by the Township of Cavan Monaghan.

2.3.7 Site Trailer

Unless waived in writing by the Township, an onsite heated and air conditioned office trailer with desk, chair and telephone shall be provided for the general use of the onsite inspector and Township's inspection personnel.

2.3.8 Site Meetings

Site meetings may be called by the Public Works Department as required to monitor the work in progress and to discuss and resolve matters of mutual interest or to resolve any on site difficulties.

2.3.9 Plan Revisions

Engineering Drawing revisions are to be reviewed and approved by the Township prior to issuance. Requests for design alterations shall be coordinated by the owner's engineer who shall submit copies of the proposed revision to the Planning and Development Department together with a covering letter outlining the nature of the change. The number of plan copies required for review will be determined by the Planner depending upon the nature of the proposed revision at which time he/she will determine the need to involve other Departments. Upon approval the Director of Public Works, other affected agencies may be contacted. Upon all necessary approvals being granted, eight (8) copies of the revised plan(s) shall be submitted to the Township for internal use and for distribution to inspection personnel on site.

2.3.10 “As-Built” Drawings

As-Built information will be recorded by the on-site inspector as the work progresses and in turn the information shall be provided to the design engineer. Within 3 months of substantial completion of the underground works and the subsequent issuance of the “Certificate of Substantial Completion of the Underground Infrastructure”, As-Built drawings in digital format compatible with AutoCAD software shall be provided to the Public Works Department for distribution to Township Departments. The digital copy shall be accompanied with 2 (two) hard copies.

The As-Built plans shall include:

- Inverts of all gravity sewers at the maintenance holes
- Inverts of all gravity sewer laterals at the property line
- Top of watermain elevation
- Pipe lengths and grade
- Pipe materials
- Top of grate, inlet and manhole elevations
- Tie-ins to all water valves including curb stops (at all non-standard locations) from the 2 nearest property corners or 2 permanent structures.
- Tie-ins to maintenance holes from the 2 (two) nearest property corners of two (2) permanent structures.
- Trench rock elevations
- Street addresses as provided the Township of Cavan Monaghan

Following substantial completion of all works within the subdivision the owner’s engineer shall provide the Township with any disk updates to the As-Built plans resulting from any deviation in the placement of the above ground infrastructure, together with the following:

- Three (3) complete sets of As-Built prints on bond paper
- One (1) complete digital set on CD or equivalent

All drawings and data files become the property of the Township and its agents may use these drawings and data files as the Township sees fit, without compensating the owner or the owner’s engineer. (See General – As-Built plans).

2.3.11 Closed Circuit Television Examination and Air Testing of Sewers

A video examination shall be carried out throughout the entire length of sanitary and storm sewer systems in accordance with the provisions outlined in the Appendix herein. The examination shall be carried out prior to the application of the first lift of asphalt. A second

CCTV inspection shall be conducted prior to assumption of the development.

The CCTV inspection shall be carried out in the presence of the Township's designated representative who shall assist in the co-ordination of the work. Notwithstanding the foregoing, the sanitary and storm sewers shall be air tested in accordance with OPS Specifications if required.

2.3.12 Progress Reports/Inspection Records

The owner's engineer shall prepare weekly reports indicating:

- Works completed
- Work in progress
- Any change orders and/or directions to the contractor involving issues of non-compliance
- Adherence to the construction schedule
- All test results for construction completed during the period

Upon completion, copies of the weekly report are to be furnished to the Township's Public Works Department for internal distribution.

3.0 SANITARY SEWERS

3.1 General

The objective of Sanitary Design Works is to provide sewage systems that:

- Can be sustained by the water resources upon which services rely
- Are financially viable and complies with all regulatory requirements
- Protects human health and the natural environment
- Improves efficiency in the Township's existing sanitary system network
- Are in accordance with the Township of Cavan Monaghan's Official Plan and Zoning By-law

3.2 References

In addition to the standards specified in this manual, sanitary sewer designs shall follow current standards and in conformance with the following standards, specifications or publications:

- Ministry of the Environment and Climate Change (MOECC) Guidelines for the Design of Sanitary Sewage Systems
- Ontario Provincial Standard Specifications
- Municipal Engineers Association Design Manual
- Township of Cavan Monaghan Official Plan and Zoning By-law

3.3 Design Sheets and Drainage Area Plans

Calculations demonstrating there is sufficient capacity in the proposed sewer system must be provided. Calculations should be completed in accordance with this section and presented in a sanitary sewer design sheet. Calculated peak flows should not exceed 80% of the full flow capacity of the sewer.

Sanitary drainage area plans must be submitted showing the contributing area upstream of the proposed section of sewer, any sub-areas, population and peak flows, proposed sewer runs and manhole with appropriate numbering. The numbering system must be consistent between the drainage area plan and design sheets.

3.4 Non-Permitted Flows

Roof leaders, weeping tile or foundation drains and sump pumps shall not be connected to the sanitary sewer system. No hazardous waste is permitted to enter the sewer system as defined under EPA Regulation 347.

3.5 Sewer Easements

Sewer easements must be a minimum of 3.0 m wide for single sewer. If multiple utilities share the easement space, the easement requirements will be determined on a case-by-case basis.

3.6 Pipe Design Requirements

The following formulae shall be used in the design of sewer systems:

Standard Formulas to be used or Approved Equivalent

Formula	Equation	Criteria
Kutter Formula	$C = \frac{k_1 + \frac{k_2}{S} + \frac{k_3}{n}}{1 + \frac{n}{\sqrt{R}} * (k_1 + \frac{k_2}{S})}$	C = Chezy's roughness coefficient (m ^{1/2} /sec) S = Friction slope (m/m) R = Hydraulic Radius (m) n = Kutter's roughness (unitless) k ₁ = Constant 23 k ₂ = Constant 0.00155 k ₃ = Constant 1
Babbitt Peaking Formula	$PF = \frac{5}{p^{0.2}}$	P = Population (thousands)
Harmon Peaking Factor	$M = 1 + \left(\frac{14}{4 + p^{0.5}}\right)$	P = Population (thousands)
Peak Sanitary Flow	[Number of People]*[Average Flow Per Person(L/s)]*[Peaking Factor (L/s)]+Infiltration(L/s)	
Capacity Flow	$Q_{cap} = \left(\frac{D^{2.67} * S^{0.5}}{0.211 * n}\right) * 1000(L/s)$	D = Pipe size (mm) S = Slope (grade) of pipe (%) N = Roughness coefficient
Manning Equation	$V = \frac{1}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$	V = Velocity (m/s) N = manning roughness coefficient (n = 0.013 for smoothed walled pipes) R = Hydraulic radius in meters (m) S = Hydraulic Gradient (m/m)
Headloss Across Manholes	$H = \frac{k(V_2^2 - V_1^2)}{2g}$	H = Headloss (m) K = coefficient V ₁ = Entrance Velocity (m/s) V ₂ = Exit velocity (m/s) g = acceleration due to gravity (m/s ²)

3.7 Design Flows

Daily Design flows should be as follows:

a) Residential

(i) Per Capita Flow

- For new infrastructure use 450 l/day/capita
- Peak the average flow using the Harmon formula;

(ii) Population

1) Official Plan Status: (Usually implemented for large areas)

- a. Low Density = 25 units/ha @ 3.5 people/unit
- b. Medium Density = 75 units/ha @ 2.4 people/unit
100 units/ha @ 2.4 people/unit
- c. High Density = 110 units/ha @ 2.0 people/unit
250 units/ha @ 2.0 people/unit

2) Lot Basis: (Typically used for most studies)

- a. Single Family = 3.5 people/ unit
- b. Semi-Detached, Three or more Bedroom Townhouse = 3.5 people/unit
- c. Two Bedroom Townhouse = 2.4 people/unit
- d. Two to Three Bedroom Apartments = 2.0 people/unit
- e. Bachelor or One Bedroom Apartments = 1.6 people/unit

3) Area Basis: (Where there is mixed land uses, establish flow as the total of the individual land uses. e.g. residential, commercial, industrial, etc.)

- a. Single Family = 25 units/ha @ 3.5 people/unit = 88 people/ha not considering roads. 19.2 units/ha @ 3.5 people/unit = 67 people per hectare considering roads.
- b. Semi-Detached = 30 units/ha @ 3.5 people/unit = 105 people/ha not including roads, 82 people per hectare with roads.
- c. Multi-Family = 75 units/ha @ 2.4 people/unit = 180 people/ha.
- d. Bachelor or one bedroom apartments = 110-250 units/ha @ 1.6 people/unit = 176 – 400 people/ha.
- e. Two – Three bedroom apartments = 110-250 units/ha @ 2.0 people/unit = 220 – 500 people/ha.

b) Commercial / Institutional

- Average flow 1.15 l/s/ha;
- Use higher design flows for point sources known to have significantly greater flows than the average design allowance; (e.g. car washes or other high water uses).
- Peak using a factor of 2.5 resulting in peak flows of 2.9 l/s/ha.

c) Schools

Elementary

- Average flow 0.35l/s/100 students
- Peak using a factor of 1.5 resulting in peak flows of 0.52 l/s/100 students

Secondary

- Average flow 0.491l/s/100 students
- Peak using a factor of 1.5 resulting in peak flows of 0.74 l/s/100 students

d) Infiltration (extraneous flows)

- 0.28 l/s/ha for typical sanitary sewer assessments.
- In certain circumstances, higher inflow or infiltration rates, either by a per hectare basis, or point source(s) may be required to be implemented within the calculations due to known extraneous sources or sensitive receiving sewers.

3.8 Sanitary Sewer

3.8.1 Pipe Diameter

The minimum pipe diameter for gravity sewer systems shall be 200 mm. All sewers shall be designed based upon design flows not exceeding 80% pipe capacity.

3.8.2 Pipe Slope and Velocity

All gravity sewers shall be designed with minimum pipe slopes of 0.5%. Due to expected low flows, the first run of sewer or first 25 upstream dwelling units (whichever is greater) shall be designed with a slope of 1%.

Sewers shall be designed so that pipe velocity is a minimum of 0.6 m/s and a maximum velocity of 3.0 m/s.

3.8.3 Pipe Cover and Bedding

To prevent freezing and provide for adequate gravity flow from building foundations, the distance between the finished grade and pipe obvert should be a minimum of 2.75 m.

Pipe bedding shall be in accordance with OPSS and be based on the recommendations of the geotechnical report for the soil conditions on site.

3.8.4 Pipe Material

Sanitary gravity sewer shall be either PVC or concrete. PVC pipe shall be DR or SDR rated and conform to OPSS 1841, CSA B182.2. Concrete sewer pipe shall be in accordance with OPSS1820 and CSA A257.2 and certified under the OCPA. Concrete shall be used for pipe sizes greater than 600 mm. Concrete pipe class shall be determined by the pipe size, depth of cover and soil conditions on site.

3.9 Maintenance Holes (MH)

All manholes shall conform to OPSD 700 standards. Where pipe of different sizes are connected to a MH, the crowns of the inlet pipe (s) shall not be lower than the crown of the outlet. The difference in invert elevations between inlets and outlets shall be as indicated in MOE guidelines.

3.9.1 Spacing and Location

Manholes shall be used at all changes in horizontal alignment, grade, pipe size or at termination of a sewer (including temporary works). The maximum spacing of manholes shall be :

Sewers 200mm to 450mm – 120m

Sewers 525mm or greater – 150m

3.9.2 Pipe Connections

Pipe connections at manholes shall be completed with factory installed rubber gaskets for PVC pipe. For concrete sewers, the pipe shall be parged and supported with a concrete cradle

3.9.3 Benching

All manholes require benching at bottom of the structure in accordance with OPSD 701.021. Benching height should be increased to obvert where applicable to increase hydraulic benefit if required.

3.9.4 Adjustment Units

Adjustment units shall be provided at all maintenance holes to ensure that proper grade is provided between the top of the structure and the lid. A minimum of one and a maximum of three adjustment units are permitted.

3.10 Service Connections

Separate sanitary services shall be provided to each building lot and each unit of a semi-detached or row house residential building. Building services from adjacent properties shall not be connected to each other. Sanitary services shall not be connected to a storm main. Water and sewer service shall not be connected at the property line until such time that the "Certificate of Substantial Completion of the Underground Infrastructure" or the required inspections and approvals by the Township's Building and Public Works Departments have been issued.

The first 40 building services connected to 200mm main shall be set above the spring line of the sewer main with proper “Y” fittings and with long radius bends. Building sewers connected to larger mains may be by a tee connection with the side of the tee rotated at between 22 1/2 degrees and 45 degrees above horizontal.

3.10.1 Location

Water and sewer services are not permitted in driveways or private sidewalks. Services shall not be connected directly to manholes.

Unconnected conventional and effluent sanitary laterals shall be brought to the property line, properly capped and clearly marked such that an installer can easily connect when necessary. Caps must withstand air testing of sewer including lateral services to the lot line. Capped services shall be appropriately marked to at least 1.0 meter above finished grade level with a 2” X 4” marker painted green.

3.10.2 Cover

The minimum cover for sanitary services will generally be a minimum of 1.5 m from the finished grade. Services of less than 1.5 m may be permitted on a case-by-case basis based on a professional engineer’s opinion/design. In such cases frost protection must be equivalent to 1.5 m cover.

3.10.3 Size

Building sewer services shall be sized to meet the Ontario Building Code.

3.10.4 Materials

Services shall be PVC, SDR28, and conform to CSA B182.2. Premanufactured tees shall be used for all service connections. Cleanouts shall be installed on the property line of each building; clean outs shall not be permitted in driveways.

3.11 Testing

The Township Officer shall be given 48 hours’ notice of all tests. Testing of gravity sewers and manholes shall be done by either a Water Exfiltration Test or an Air Test. Sewers shall be flushed immediately prior to the closed-circuit TV inspection.

3.11.1 Water Exfiltration Test

Unless the water table is 0.6 m (2ft.) or more above the top of the pipe, exfiltration tests shall be used.

Extent The complete sewer system including house connections and manholes shall be tested in accordance with OPS Specifications.

Procedure Any visible leak must be repaired.

The test section shall be sealed at its lower extremity by means of a Water tight plug. The test section shall be filled with water to the specified level in a manner to allow for the displacement of air in the line.

The minimum head measured from the crown of the pipe at the high end of the section under test shall be 0.6 m (2ft.), provided that maximum head on the line is not more than 4.752 m (15ft.).

The test shall stand completely full for 24 hours before test Measurements are commenced. The duration of the test shall be two (2) hours.

Manholes shall be tested independent of the sewer pipe for leakage by filling the chamber to the underside of the roof slab with water. The test duration shall be a minimum of three hours. No leakage shall be permitted in manholes.

Maximum allowable leakage of any test in gravity sewer:

$$\text{Allowable leakage in litres} = \frac{HDL}{5200}$$

Where: H=Duration of test in hours
D=Inside diameter of the pipe in millimetres
L=Length of pipe in test section in meters

3.11.2 Air Test

Shall not be used with concrete sewers.

Extent: The complete sewer system including house connections and manholes shall be tested in accordance with OPS Specifications.

Procedure: Based on OPSS 410, modified so that the pressure drop does not exceed 3.5 kPa over a time in minutes equal to the volume in cubic metres multiplied by 1.25.

3.12 Sewers Conveying Only the Liquid Portion of Sewage (“Low-Flow Technology”)

3.12.1 Mains – Design Criteria

No decrease in pipe size downstream shall be allowed unless otherwise approved by the Public Works Department.

Population design density based on gross population per hectare will be provided by Development Review. Contributing industrial, commercial and institutional design flows shall be considered on a case-by-case basis. Sealed systems shall be designed for an inflow/infiltration rate of zero.

Criteria	Size/Condition	Minimum	Maximum
Pipe Size*	If proven by a HGL analysis to the Township's satisfaction	75mm	
Velocity	Minimum design velocity can be less than the stated value if good engineering principles are used to meet the minimum scouring velocity necessary to create self-cleaning conditions once daily, upon approval of the Township.	0.15 m/s	3.0 m/s
Pipe Slope	If proven by a HGL analysis to the Township's satisfaction	0%	
Cover	Acceptable Fill	1.5m from the finished grade	
Peaking Factors	Substantiated peaking factor attenuation data from existing system installations will qualify.	4.0	2.75
Average Daily Domestic Flow	Zero infiltration		225 litres per person per day

Additional Criteria:

Manning's Roughness Coefficient

Shall meet the manufacturer's specification and MOE guidelines (typically $n=0.013$)

*Pipe Sizing

All main sizes must be approved by the Township's Public Works Department if good engineering principles are used and the designer can demonstrate that local contractors have existing equipment to facilitate the cleaning of such diameter piping.

3.12.2 Materials

Criteria	Specification
Pipe	Polyvinyl Chloride (PVC) pipe, DR 11 (minimum), CSA B137.3 and B137.2
Connections	Shop pre-manufactured tee connections shall be used for building sewer connections
Cleanouts	Municipal cleanouts at property line are required on all connections. Specifications as per product manufacturer's requirements and approval by the Public Works Department.

3.12.3 Maintenance Holes/Service Cleanouts

Sealed cleanouts shall be at a distance not greater than 150 meters to permit pressure-washing, if required, unless increased spacing can be flushed by existing servicing equipment.

Where required, cleanouts shall have odor control devices attached which will provide additional air flow through the system. Cleanouts on roadways shall have an approved load bearing casing installed to protect cleanout access piping.

All cleanouts shall be compatible with the Township of Cavan Monaghan equipment. Verification of compatibility per Township of Cavan Monaghan requirements shall be the responsibility of the Developer.

3.12.4 Service Connections

The crown of the main at the point where the service is connected shall be a minimum of 1.0m below the lowest floor grade of the buildings being serviced except where connection is by a pumped sewage connection with back flow prevention installed to protect the building being connected or where a solids-separation tank is employed.

Specifications

Criteria	Specification
Connections	The cleanout is installed off the exit side of the interceptor tank. Each dwelling connected to the effluent sewer must be equipped with a ball valve or check valve which shall be installed between dwelling and interceptor tank.
Materials	100 mm diameter for building connections to interceptor tanks 75 mm diameter for gravity discharge from interceptor tanks to sewer mains.

	50 mm diameter for pressure discharge from interceptor tanks to mains.
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3.12.5 Effluent Sewer System Interceptor Tanks

Design Criteria

Interceptor tanks shall be installed as recommended by the manufacturer and as follows:

Criteria	Specification
Access	Interceptor tanks shall be equipped with insulated access hatches that extend to the ground surface at both the inlet and outlet locations.
Elevations	The elevation difference between the inlet and outlet should be a minimum of 50mm.
Cover/Insulation	Insulation cover shall be at least 50 mm extruded polystyrene Dow Styrofoam HI-40 or equivalent, or as recommended by the geotechnical engineer.
Bedding	All tanks shall be installed on prepared foundation bedding, consisting of a 200mm thick bed of Granular "A" to OPSS 1010, compacted to 95% SPMDD. Native soil backfill shall be approved by the engineer prior to placement.
Filter	For gravity discharge from interceptor tank to sewer main, an effluent filter must be located in the effluent tank.

Materials

All interceptor tanks shall meet the requirements of CSA B-66-05: Design, Material and Manufacturing Requirements for Pre-fabricated Septic and Sewage Holding Tanks.

All concrete reinforcement shall meet the requirements of G30.18 M92 (R2002). Concrete shall be as per CSA A23.4, latest revision and shall not be less than 32 MPa (4,500psi) minimum compressive strength at 28 days with 6-8% air entrainment.

Tanks and connecting fitting shall be certified vacuum tested, resulting in a leak-proof assembly.

Specifications

Volumes for interceptor tanks shall conform to design standard provisions for daily design flow and septic tank capacities as stipulated within Sections 8.2.1.3 and 8.2.2.3 of Part 8 of the Ontario Building Code.

Testing

The Township Inspector shall be given 48 hours' notice of all tests.

3.13 Rural Wastewater Servicing

The requirements for wastewater disposal in rural development shall be discussed in the pre-servicing report. Prior to the Township approving the Draft Plan and the issuance of Conditions of Draft Approval by the approval authority, the method for disposing of wastewater will be determined for the Development either by means of a communal sewage or individual sewage systems.

Communal sewage collection and treatment systems shall be designed in accordance with current Ministry of the Environment Guidelines and Regulations and Township of Cavan Monaghan standards. Individual sewage systems shall be designed in accordance with the Ontario Building Code Regulation No. 403/97 as amended.

A Report outlining the soils capabilities of the site for sewage disposal shall be submitted with the Draft Plan. Additional soils testing required by the Township or the Ministry of the Environment will be completed as part of the design and any special requirements for construction or restricted areas shall be identified prior to Draft Plan Approval.

4.0 WATERMAIN DESIGN REQUIREMENTS

4.1 Water Supply System

Central water supply systems shall be designed in accordance with current Ministry of the Environment Guidelines and Regulations.

The pre-servicing report shall address the requirements for water supply to service the Development. Where connections are to be made to an existing municipal system, the capacity of existing wells and storage facilities will be considered when reviewing the requirements for new source wells and storage facilities. All water supply systems shall incorporate provisions for standby power, metering, chlorination, fire storage, precharged tanks to buffer the well pumps and security fencing of the site. Should the existing supply system not have sufficient capacity to provide for new development, the Developer's Engineer shall provide a Hydrogeological Report commenting on proposed sources for additional water supply and how any impacts on the existing ground water regime will be mitigated.

Fire flow protection and storage provisions shall be reviewed with the Township of Cavan Monaghan for each development during the initial stages of Draft Plan Approval. Any expansions to the existing water systems, together with the requirements for additional wells, storage facilities and/or trunk mains will be resolved at that time.

Development outside of currently serviced areas which will be serviced by private communal systems are discouraged by the Township. Developments outside the areas designated by Council as requiring municipal water supply systems, may be approved on the basis of individual wells and sewage disposal systems.

For developments proceeding with a Rural Standard and individual services, a hydrogeological report will be required to confirm the suitability of the site to support development on individual wells and septic systems. Private wells shall be designed in accordance with current Ministry of the Environment Design Criteria and Provincial Regulations and in accordance with the Township's Building By-law.

Township may require the addition of one or more sampling stations or flushing stations to ensure water quality standards are met. The number of stations required is dependant on the number of homes and the length of pipe to be installed (See Standard Drawing W6).

4.2 Watermains

Watermains with services to each lot or block shall be provided in accordance with the Ministry of the Environment Guidelines and the following Township of Cavan Monaghan Public Works Department design criteria:

Capacity:	Hazen-Williams formula in accordance with current Ministry of the Environment design criteria.
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Population:	See Section 3 - Sanitary Sewers
Design Flow:	Greater of Maximum Daily Demand plus Fire Flow or peak demand flow.
Average Day:	450 L/cap.d. (litres per capita per day)
Peaking Factor:	In accordance with current Ministry of the Environment design criteria.
Minimum Size:	150 mm diameter mains
Minimum Depth: of Cover	2.0 metres for mains and services.
Location:	In accordance with the Township of Cavan Monaghan typical road cross-sections. (See Standard Drawing R1 and R2.)
Material:	See Table 2.
Pipe Bedding:	As detailed in Table 1.
Fittings:	Ductile Iron, mechanical joint, AWWA C110 approved, pressure rating 1035 kPa. PVC bends and tees, to be used with mechanical joint restraints.
Valves:	One less valve than number of streets at an intersection with valve located at extension of Property Line of intersecting street. Maximum spacing between valves shall be 200 m on straight runs. Chambers will be required for all valves over 300 mm dia. (OPSD 1101.01)
Valve Type:	See Table 2.
Valve Boxes:	See Table 2.
Hydrants:	See Table 2. All new hydrants to be numbered as directed by the Township. In addition, they must be flow tested and have th tops painted the correct clour (hydrant body to be painted yellow, black Storz cap): <ul style="list-style-type: none">• Blue: 1500 gal/min and greater (5,678 L/min and greater)• Green: 1000-1499 gal/min (3,785 L/min - ,677 L/min)• Orange: 500-999 gal/min (1,893 L/min-3.784 L/min)• Red: under 500 gal/min (under 1,893 L/min)

- Non self-draining hydrants should have caps painted red.

All hydrants to be painted Yellow with black Storz cap.

Anchor tees to be used with hydrant installation.

Hydrant Spacing: 150 m maximum. To be measured along approved access road.

Services: All new services to be 25 mm diameter for industrial, commercial or multiple residential. 20mm when there is an existing 20mm service.

All services to be Type "K" copper pipe unless otherwise approved by the Township of Cavan Monaghan Public Works Department.

Temporary plastic blow-off pipes are required for all unconnected services.

Anodes: DZP-24, 10.9 kg shall be installed on all connections to existing iron watermain.

DZP-12, 5.4 kg shall be installed on all iron fittings, valves etc.

Mechanical Joint Restraints:

- Grip Ring Pipe Restrainer manufactured by Romac Industries Inc.
- Uni-Flange Series 1300 manufactured by Ford Meter Box Company, Inc.
- MJ Field Lok, Series PV manufactured by Clow Canada
- Series 350 Restrainers manufactured by Clow Canada
- Sigma One-Lok restraints manufactured by Sigma Corporation
- Sigma PV-Lok restraints manufactured by Sigma Corporation

Water Meters: All Domestic and ICI connections to the Municipal system are to be metered with AMR capability. Typical Domestic Meter Installation provided on Dwg. W7

4.3 Operation of Valves and Connection Procedures

The Developer's contractor shall not operate any valve or hydrant of the existing water distribution system. Operation of valves and hydrants on the municipal system shall only be undertaken by certified municipal staff.

No new watermain shall be connected to an existing watermain until all testing procedures have been completed and approved by the Township of Cavan Monaghan Public Works Department.

The new watermain shall be kept isolated from the existing waterworks system using a physical separation until satisfactory bacteriological testing has been completed and accepted by the Township. Water required to fill the new main for hydrostatic pressure testing, disinfection, and flushing shall be supplied through a temporary connection between the existing water system and the new main (refer to Std. Dwg. W4 and W5). The temporary connection shall include an appropriate and approved cross-connection control device (reduced pressure zone backflow preventor or a double check valve assembly). Public Works Department may require written certification of the backflow preventer operation in accordance with CAN/Canadian Standards Association-B64 Series Manual.

At the beginning of each new watermain installation, a minimum of one (1) swab shall be installed. Swabbing of the new watermain shall be completed prior to hydrostatic testing.

4.4 Hydrostatic Testing

- 4.4.1 Hydrostatic testing shall be conducted under the supervision of the Township of Cavan Monaghan Public Works Department upon completion of the watermain including services and backfilling.
- 4.4.2 A test section shall be either a section between valves or the completed watermain.
- 4.4.3 Test pressure shall be 1035 kPa.
- 4.4.4 The test section shall be filled slowly with water and all air shall be removed from the pipeline. A twenty-four (24) hour absorption period may be allowed before starting the test. The test section shall be subjected to the specified continuous test pressure for two (2) hours.
- 4.4.5 The leakage is the amount of water added to the test section to maintain the specified test pressure for the test duration. The measured leakage shall be compared with the allowable leakage as calculated for the test section. The allowable leakage is 0.082 litres per millimetre of pipe diameter per kilometre of watermain per for the two (2) hour test period.
- 4.4.6 If the measured leakage exceeds the allowable leakage, all leaks shall be located and repaired and the test section shall be retested until a satisfactory result is obtained.
- 4.4.7 Watermain Pressure Test Form shall be completed for all installations.

Form is as shown on Page No. 40.

4.4.8 Watermain hydrostatic testing is to be tested up to curb stop.

4.5 Flushing and Disinfecting Watermains

4.5.1 Flushing and disinfecting operations shall be conducted under the supervision of the Township of Cavan Monaghan Public Works Department. The Public Works shall be notified at least two (2) business days in advance of the proposed date on which flushing and disinfecting operations are to commence.

4.5.2 Liquid chlorine solution shall be introduced so that the chlorine is distributed throughout the section being disinfected. The chlorine shall be applied so that the chlorine concentration is 50 mg/L minimum throughout the section. The system shall be left charged with the chlorine solution for twenty-four (24) hours.

4.5.3 Sampling and testing for chlorine residual will be carried out by the Township of Cavan Monaghan Public Works Department. The chlorine residual will be tested in the section after twenty-four (24) hours. If tests indicate a chlorine residual of 25 mg/L minimum, the section shall be flushed completely and recharged with water normal to the operation of the system. If the test does not meet the requirements, the chlorination procedure shall be repeated until satisfactory results are obtained.

4.5.4 Watermain shall be flushed in a sequence approved by the Township of Cavan Monaghan Public Works Department. The Public Works may permit or require the flushing to be carried out in stages as sections of the system are completed. Flushed sections shall be protected from contamination.

4.5.5 The Contractor shall provide acceptable equipment and chemical additives to dechlorinate the water that must be wasted. Chlorinated water discharged to the sanitary sewer shall be discharged at such a low flow rate or dechlorinated prior to discharge so that there is no possibility of chlorine residual remaining in the waste water when it reaches the waste water treatment plant. Total residual chlorine in water discharged into storm sewers, drainage ditches or watercourses shall not exceed 0.2 mg/L.

4.5.6 Recharge the watermain with Municipal water and hold.

4.5.7 After final flushing, and before the watermain is approved for connection of the new main to the existing water system, two consecutive sets of water samples, taken at least 24 hours apart, shall be collected, every 350 metres, plus from the end of the line and from each branch. Certified staff from the Public Works Department shall collect for bacteriological samples.

- 4.5.8 All water samples will be collected by the Township of Cavan Monaghan Public Works Department and analyzed by a certified laboratory. Two - 200 ml bacteriological sample (bottles supplied by the Township ONLY) must be obtained at each location. The sample form is to be filled out requesting for PA and background analysis and is to include the samplers license number. Each sample collected must include a Total and Free Chlorine residual reading.
- 4.5.9 The Township will pay Laboratory expenses for the initial first set of sampling required for bacteriological results. If the disinfection fails to produce satisfactory samples, disinfection and testing shall be repeated at the contractor's expense including water usage until satisfactory samples have been obtained.
- 4.5.10 The Township of Cavan Monaghan minimum requirements for acceptability of bacteriological tests are:
- | | |
|-----------------|--------------------------------|
| E-coli Coliform | 0 CFU/ 100mL |
| Total Coliform | 0 CFU/ 100mL |
| Background | not greater than 25 CFU/ 100mL |

4.6 Commissioning of New Main

- 4.6.1 When all of the tests including the bacteriological samples are satisfactory, approval from the Public Works Department for the main to be connected to the existing water system must be obtained.
- 4.6.2 All new piping and appurtenances placed in the connection of the new main and existing waterworks system must be disinfected with a 1-% solution of sodium hypochlorite or equivalent method.
- 4.6.3 The system shall not be put into operation until clearance has been given by the Township of Cavan Monaghan Public Works Department



Watermain Pressure Test Form
(To Be Completed For All New Installations)

Project: _____ Contract No: _____

Area: _____ Date: _____

Contractor: _____

Required Test Pressure: _____

Pipe Material: _____

Diameter (mm): _____

Length Tested: _____

Allowable Leakage in litres = 0.082 x Dia.(mm) x Length (m) FOR 2 HOURS
(OPSS701.07.22.03) 1000

Minimum time test required(hours): _____

Maximum volume loss allowed for (hours): (litres): _____

Actual period of time the main was under pressure(hours): _____

Actual measured volume loss(litres): _____

Test Results: Satisfactory Unsatisfactory

Comments: _____

Chlorine Required in litres = 0.039 x Dia.(m) ² x Length(m) x 1(OPSS 701.07.23)%
Concentration of Chlorine
(decimal)

Public Works Signature _____

Contractor(s) Signature _____

Inspector(s) Signature _____

5.0 STORM DRAINAGE

5.1 General

Storm sewer systems may consist of one or any combination of pipes, ditches, culverts, manholes, catchbasins and stormwater management facilities that convey stormwater. Storm sewers shall be designed to collect runoff from private and public lands. Storm drainage systems shall be designed with consideration being given to Major and Minor systems. Minor systems are to be conveyed to the receiver (stormwater management facility or watercourse) via sewers. Major flows are to be conveyed via overland routes.

5.2 References

The storm drainage system shall adhere to these guidelines and the following documents:

- Ministry of the Environment Guidelines for the Design of Storm Sewers
- Ontario Provincial Standard Specifications
- Municipal Engineers Association Manual

5.3 Design Sheets and Drainage Area Plans

Calculations demonstrating there is sufficient capacity in the proposed sewer system must be provided. Calculations should be completed in accordance with this section and presented in a storm sewer design sheet. Calculated peak flows should not exceed 85% of the full flow capacity of the sewer.

Storm drainage area plans must be submitted showing the contributing area upstream of the proposed section of sewer, any sub-areas, runoff coefficient, proposed sewer runs and manholes/catchbasins with appropriate numbering. The numbering system must be consistent between the drainage area plan and design sheets.

5.4 Design Requirements

The following requirements shall be used in the design of storm sewer systems:

Rainfall Intensity: City of Peterborough Airport, Atmospheric Environment Weather Station

Design Storm: Minor System: 5 Year storm local sewers
10 high value commercial development downtown
business and trunk collectors.

Major System: Regional Storm expressed as the Timmins Storm or 1/100 year (whichever generates greater runoff values).

Rural System: 1/25 Year storm for road culverts.
1/10 Year storm for driveway culverts.

Runoff Coefficients: In accordance with MTO Drainage Manual or other approved standard.

Inlet Time: Major System: Bransby Williams 10 minute minimum

Minor System: Bransby Williams 10 minute minimum

Pipe Roughness: Manning's "n" value, 0.013 for concrete, and PVC pipes.
Manning's "n" value, 0.024 for corrugated steel pipes.

Pipe Capacity: Sewers - Manning's Formula (full flow)
Culverts - MTO Drainage Manual, Section 'D'

5.5 Storm Sewer

All storm sewer shall meet the following requirements:

Pipe Materials: See Table 2.

Pipe Bedding: See Table 1.

Minimum Velocity: 0.75 m/s

Maximum Velocity: 4.5 m/s

5.6 Catchbasins and Manholes

All storm sewer structures shall meet the following requirements:

Maintenance Hole Spacing: 100 m for pipes up to 1200 mm dia.
150 m for pipes greater than 1200 mm dia.

Maintenance Hole Diameter: Minimum of 1200mm diameter or as manufacturer's specifications.

Structure Pipe: Brick, block and non-shrink grout shall be used for the connection of

Connections: All pipes at structures.

Structure Adjustment: Precast concrete adjustment units to be used.
Minimum 150 mm adjustment allowance.
Maximum 300 mm adjustment allowance.

No brick, block or steel lift rings permitted.

Catchbasin Spacing: 75 m maximum.

In-Line Drains: Where storm sewers are extended along rear yard swales behind multiple unit blocks, in-line drains are to be installed every two units.

Twin Inlet Catchbasins: Required at sag points.

Blind Connections: Not permitted to storm sewers under 900 mm diameter.

Sumps: 450 mm diameter pipes and under require 600 mm sump in catchbasins and maintenance holes.

Benching: Required for pipes over 450 mm diameter.

Minimum Cover: 1.2 metres

Minimum Size: 300 mm
Single CB leads 250 mm
Twin Inlet CB leads 300 mm
375 mm culvert

5.7 Storm Services

All storm services shall meet the following requirements:

All lots to have service connection for foundation drain sump pumps. Gravity connections at building not permitted. See Std. Dwg. S2.

Service Connections: Minimum size: 100 mm
Minimum Grade: 1%
Minimum depth @ Property Line: 1.2 metres

Services to be located 1.5 m minimum from side lot line, for singles locate on low side of lot. One service/residential unit for singles, semis, row or block townhouses. See Std.Dwg.S1 for service layout.

All connections to be made with an approved pre-fabricated tee or "Kor-N-Tee".

Roof Drains: All roof drains shall discharge to surface.

Storm Sewer Outlets: Suitable bank and stream bottom erosion protection must be provided ie., headwalls, rip rap, CSP end section, etc.

Subdrain: 6 m - 100 mm diameter geotextile wrapped subdrain required upstream of all storm structures and in both directions at sags in the road profile. Additional subdrain as required by geotechnical consultant.

5.8 Testing

Sewers shall be air or water tested to 350kPa (50psi) to ensure there is no system exfiltration.

The Developer shall provide all labour, equipment and materials to carry out the tests, and repair or reconnect services to where necessary. The Developer shall arrange the tests for sections of sewer between cleanouts or manholes.

Any sections of sewer which fails to meet the requirement of this section shall be repaired and re-tested.

Maintenance Holes shall be tested in accordance with O.P.S.S. 407

Field testing of storm sewers shall be tested in accordance with O.P.S.S. 410

6.0 STORMWATER MANAGEMENT DESIGN REQUIREMENTS

6.1 General

All developments within the Township will require stormwater management measures in order to mitigate impacts of development on downstream properties. The intent of these measures is to limit the quantity of runoff to pre-development levels and to maintain water quality to sensitive downstream receivers. All developments will require the preparation and implementation of stormwater management reports.

6.2 References

Stormwater management shall be in accordance with these guidelines and the following documents:

- Stormwater Management Planning and Design Manual by MOECC
- Otonabee Region Conservation Authority (ORCA) Guidelines
- Low Impact Development Guidelines by CVC/TRCA
- Low Impact Development Guidance Manual by MOECC

6.3 Drainage Areas

For smaller sites (drainage areas up to 1 Hectare), peak flows may be calculated using the Rational Method and storage volumes may be calculated using the Modified Rational Method.

For larger developments, a computational hydrologic model (Visual Otthymo) will be required to calculate peak flows and stormwater management storage requirements.

6.4 Quantity Control Requirements

Quantity controls shall be implemented such that the post-development release rates are limited to the pre-development release rates for each of the 2 through 100-year storm events. In cases where there are downstream capacity issues, the Township may impose stricter post-development release rates to protect downstream properties or infrastructure.

When designing stormwater management facilities, a range of storm distributions and durations shall be evaluated. The facility design shall be based on the storm producing the largest volume and not necessarily the peak flows.

6.5 Quality Control Requirements

Quality control shall be in accordance with the MOECC SWPDM and ORCA requirements. The minimum level of quality control in the Township shall be Normal, as defined in the MOE SWPDM.

6.6 Erosion and Sediment Control

Erosion and sediment control plans shall be prepared for each phase of development. The plans shall clearly depict the means by which erosion and sediment transport will be reduced during construction. Calculations supporting the proposed ESC measures may be included in the SWM report for the development.

7.0 ROADWAYS

The following Township of Cavan Monaghan Road Design Criteria for residential roads applies to local and minor collector streets:

7.1 Standard Road Section

The residential roadway section is shown on Standard Drawing D1 & D2. This section designates standard locations for all Municipal Services and other utilities.

7.2 Geometric Standards

Streets with a 20 m, 22 m and 26 m Right-Of-Ways (ROW) will have minimum pavement width of 8.0 m, 9.5 and 14.0 m respectively. This width does not include the concrete gutter. The minimum pavement radii for intersections shall be 10.0 m and 16.8 m on a cul-de-sac with an island and 16.8 m on a cul-de-sac without an island (permanent or temporary). The minimum property radius on a cul-de-sac shall be 20.0 m.

The following standards are to be followed, however, specific conditions may warrant some change. Any change will require approval from the Township of Cavan Monaghan.

Minimum Grade:	To maintain 0.50% minimum on gutter grade.
Maximum Grade:	8.0 %
Vertical Curves:	Vertical curves to effect gradual change between tangent grades are to be used in accordance with the MTO Geometric Design Standards.
Horizontal Curves:	Use in accordance MTO Geometric Design Standards.
Cross Fall:	2%
Asphalt Depth:	80 mm Minimum on Local Residential -40mm HL8 and 40mm HL4 90 mm Minimum on Collector & Arterial. -50mm HL8 and 40mm HL4 50 mm on temporary cul-de-sac or temporary access roads.
Granular Depth:	Depending on soil conditions and a geotechnical report, but no less than: 150 mm Granular "A" 450 mm Granular "B"

7.3 Curb and Gutter

Concrete Curb and Gutter shall be constructed on both sides of all streets in accordance with Table 1 and Std Dwg D1 & D2.

7.4 Sidewalks

Concrete sidewalks 1.5 m wide shall be provided on both sides of residential collector and arterial streets and one side on residential local streets. Hand railings shall be provided where 3 or more steps are required. Ramps shall be provided at all intersections with curb. Minimum 100 mm Granular "A" base. Expansion joint material is to be bituminous impregnated fibreboard.

7.5 Walkways

Pedestrian walkways shall be concrete, 1.8 m wide with 1.5 m minimum height galvanized chain link fence on each side within property limits. Minimum R.O.W width is to be 6.0 m. Bollards are to be installed 1.1 m either side of centre of sidewalk, at both ends of the walkway. Bollards are to be 150 x 150 mm x 2.4 m pressure treated wood exposed and buried 1.2 m. Bollards are to be removable as approved by the Township of Cavan Monaghan.

Minimum R.O.W. to be increased to minimum 9.0 m where servicing and walkway exist through corridor.

7.6 Boulevards

All boulevards shall be graded, topsoiled with a minimum depth of 200 mm, and sodded from the property line to the back of curb.

7.7 Street Signs and Pavement Markings

Traffic control signs will be provided at locations designated by the Township and shall be in accordance with the "Manual of Uniform Traffic Control Devices" published by the MTO. Street name signs should be 16 cm high with a green background and white lettering (both sides), reflectorized and mounted on galvanized steel 60 mm dia x 3.2 m posts in accordance with the Township of Cavan Monaghan specifications.

Pavement markings shall be provided on surface asphalt in accordance with OTM, MUTCD and OPSS.

7.8 Daylighting Triangle

Minimum 9.0 m by 9.0 m daylighting triangle required on all intersection corners for arterial

and collector streets. Minimum 7.5 m by 7.5 m daylighting triangle required on all intersection corners for local streets. Additional area may be required for special circumstances. Daylighting triangles are to be part of Municipal ROW.

7.9 Easements

Minimum 6.0 m easements required for single municipal services, minimum 9.0 m easements required for two municipal services. Where more than two services are to be accommodated by an easement consult with the Township for specific easement requirements.

For rear yard storm sewers 300 mm diameter or less, and catchbasins, minimum easement width to be 3.0 m, with centre offset 0.5 m from property line. For storm sewers larger than 300 mm diameter consult with Township for specific easement requirements.

The Township of Cavan Monaghan Standard Drawings which apply to road construction are included and/or referenced in this Manual.

8.0 UTILITY DESIGN REQUIREMENTS

All hydro, telephone and other utilities shall be underground and placed in accordance with current local utility company regulations and standards. A Composite Utility Plan shall be prepared and submitted documenting the location of all above and below ground utility infrastructure. The plan must be reviewed by all utility companies.

Satisfactory evidence that the Developer has entered into an agreement providing for the installation of underground hydro and street lighting must be submitted to the Township of Cavan Monaghan prior to the execution of a Subdivision Agreement.

All developments shall be provided with street lighting in accordance with the current requirements of the local utility companies and the Township of Cavan Monaghan. Streetlighting shall be dark sky compliant.

All materials and installation shall meet or exceed current O.P.S.S. standards and the requirements of the local utility supplier. The materials and supplier shall be reviewed with the Township prior to approval and samples shall be supplied if requested.

Poles: Poles shall be 1 piece Concrete, Aluminum or Steel. Concrete poles shall be direct burial. Aluminum and steel poles shall be installed with an adjustable frangible base (direct burial shall not be permitted). All poles shall be supplied so that the minimum distance between the shoulder of the road and the bottom of the luminaire is 8 m.

Brackets: All brackets shall be tapered Elliptical Aluminum with a minimum length of 2.4 metres.

Luminaires and Lamps: Luminaires shall be supplied with an individual photo cell and 150 w clear LED lamp. The luminaire shall be supplied with a clear lens. Luminaire style shall be determined and approved by Township staff, depending on location of development.

Spacing: The poles will be installed in the location specified on the Urban, Suburban or Rural Road Section Detail. In general, the spacing for estate lot developments shall not exceed 100 m and in urban areas shall not exceed 50 m.

A street light will be required at all intersections, turning circles, the crest of vertical curves and outside radius of horizontal curves.

Note:

The Township will consider the use of architectural lighting subject to submission and approval of detailed Shop Drawings of the proposed standard and luminaires.

9.0 LANDSCAPING

9.1 Topsoil and Sod

Boulevards: All boulevards shall have a minimum depth of 200 mm topsoil plus sod.
Topsoil and Sod to be placed and watered as per OPSS 802 and 803.

Parks: All parks shall have a minimum depth of 200 mm topsoil, seed and mulch.

Seed mix shall be as follows:

Type	Amount
Nu Blue Kentucky Bluegrass	25%
Baren Kentucky Bluegrass	25%
Herald Creeping Red Fescue	15%
Wilma Chewing Fescue	10%
Pinnacle Turf Type Per Rye	25%

Seed shall be applied at a rate of 1.5-1.7 Kg/100 square metres.
All topsoil shall be in conformance with OPSS 570.

9.2 Trees

9.2.1 Planting Requirements

- a) Trees shall be planted in front of every lot on the Municipal Right-Of-Way at a location 300 mm from the street property line.
- b) On corner lots a tree shall be planted every 15 m on the adjacent sideyard on the flanking street.
- c) Trees are to be planted so as not to interfere with other street functions or services when the tree matures. Where it is not possible to conform with the foregoing, the trees shall be planted at locations approved by the Township.
- d) Planting of trees shall be detailed in the Standard Drawings. They shall be watered at time of planting and every two weeks thereafter up to the expiration of the guarantee period. The guarantee period shall be one year from the date of planting and the period for planting shall be Spring and Fall only.

- e) All trees shall be No. 1 nursery stock, 2.5 m minimum height with a minimum caliper of 60 mm measured 300 mm above ground level.

All areas for planting shall be stabilized with sod or seed as required, prior to planting of trees.

9.2.2 Species:

Alternate species shall be provided on all streets. A species list shall be provided and approved for each street, prior to any planting.

The species that are approved for planting on Municipal property shall include the following:

Acer Nigrum	Black Maple
Acer Platanoides (not to be used in proximity of natural areas)	Norway Maple
Acer Saccharum	Sugar Maple
Aesculus Hippocastanum	Common Horse Chestnut
Fraxinus Americana	White Ash
Fraxinus Pennsylvania Var. Subintegerrima	Green Ash
Gleditsia Triacanthos Var. Inermis "Halica" Honeylocust	Honey Locust
Gleditsia Triacanthos Var. Inermis Sunburst Locust	Sunburst Locust
Pyrus Calleryana	Redspire Pear
Tilia Cordata	Glenleven Linden

9.3 Park and Recreational Areas:

The Township may request that the Park or Recreational Areas dedicated for the development be provided with a suitable entrance, sanitary and water services, parking lot and be graded and seeded so that they are suitable for recreational use.

The area to be dedicated for park use shall be reviewed with the Township on submission of the Preliminary Draft Plan. Requirements for entrances, grading and seeding will be finalized at time of engineering drawing review. The Township may also request that a different area than that proposed by the Developer be set aside for a park due to the physical features of site.

10.0 LOT GRADING REQUIREMENTS

10.1 General

This section covers the requirements for lot grading within new developments in the Township. New subdivisions are required to have an Overall Lot Grading Plan for the entire development and Individual Lot Grading Plans for each individual lot. The Overall Plan depicts all the grading and surface drainage features for the entire development and shows how they tie together. The Individual Plans show specific grades and drainage features at each lot.

10.2 Overall Grading Plans

These plans are required as part of the subdivision approval process. Overall Lot Grading Plans show all site grading and drainage features for the entire development. The plans must include lot corner, lot line, breakpoint and building elevations as well as slope arrows depicting overall drainage patterns for the site.

10.3 Individual Lot Grading Plans

These plans are required at the building permit stage. These plans are prepared by a professional engineer and reflect the specific house style and dimensions to be constructed. The plan is prepared to demonstrate conformance with grading requirements and zoning by-laws. These plans must show detailed lot grades at all lot corners, lot lines, building corners, entrance points, basement floor elevation, garage floor elevation. Drainage patterns on the lot must be shown with slope arrows and all swales must be depicted with inverts and slopes.

10.4 Lot Grading Design Requirements

The following parameters shall be used in the design of lot grading plans:

Minimum surface slope for lots	2%
Maximum surface slope for lots	3:1
Minimum driveway slope	2%
Maximum Driveway Slope	7%
Minimum swale slope	2%
Minimum swale depth	0.15m

The maximum allowable length of rear-yard swale without a catchbasin is 100m. The maximum rear yard contributing area is 0.5 Ha.

11.0 APPROVED MATERIAL LIST

Table 2: Approved Materials and Product List		
Service	Item	Approved Products
Sanitary	Sewer Pipe	PVC DR 35 Concrete CSA#A257.1/A257.2
	Service Pipe	PVC DR 28
	Connections	Kor-N-Seal (manholes)prefab tees or Kor-N-Tee (services)
Storm	Sewer Pipe	375 mm diameter or less: PVC DR 35 <ul style="list-style-type: none"> - IPEX "Ultra Rib" - Loc Pipe "Loc PVC" - Concrete-CSA A257.1 (non-reinforced) and A257.2 (reinforced). - HDPE Big 'O' Boss Polytite - Royal Rib AKorflo® 450 mm diameter or greater: s Concrete-CSA A257.1 (non-reinforced) and A257.2 (reinforced). Leads to rear yard catchbasins are to be concrete. All culverts shall be galvanized CSP, (minimum 1.6 mm thickness) or HDPE Boss 2000, 320 k Pa stiffness c/w Ultra Stab 75 Joint
	Service Pipe	PVC DR 28
	Connections	Kor-N-Seal (PVC) Adaptor with sand (ribbed) prefab tee or Kor-N-Tee (services)
Water	Watermain	C900 PVC Class 150 (DR 18), B 137.3 with Ring-Tite joints and Tracer Wire
	Valves	Mueller Resilient Wedge Gate Valve AWWA C-509, mechanical joint with: <ul style="list-style-type: none"> - fusion-bonded epoxy coating - bronze stem - open counter clockwise Clow Resilient Wedge Valve AWWA C-509,F-6100 mechanical joint with: <ul style="list-style-type: none"> - fusion-bonded epoxy coating - bronze stem - open counter clockwise American AVK Co., Series 25 Resilient Seated Gate Valve AWWA C-509, mechanical joint with: <ul style="list-style-type: none"> - fusion-bonded epoxy resincoating, AWWA C550 - standard stainless steel stem - open counter clockwise
	Hydrants	Canada Valve New Century Type Compression, or McAvity M59M, both with "Storz" pumper connection.

Main Stop	Cambridge Brass, Series 102, Compression Joint "Successor".
Curb Stop	Cambridge Brass, Century Ball Valve, Compression Joint "Successor", Stainless steel rod and pin.
Saddle	Cambridge Brass, Series 403 Stainless Steel Saddle Type 304 Double Bolt, AWWA Thread
Mechanical Joint Restraints	<ul style="list-style-type: none"> - Uni-Flange Series 1300 manufactured by Ford Meter Box Company, Inc. - Grip Ring pipe restrainer manufactured by Romac Industries. - MJ Field Lok manufactured by Clow Canada - Series 350 Restrainers manufactured by Clow Canada -Sigma One-Lok restrainer manufactured by Sigma Corporation -Sigma PV-Lok restrainer manufactured by Sigma Corporation
Tracer Wire	12 gauge, 7 strand copper with plastic coating attached to underside of bottom flange of Fire Hydrant (Std. Dwg. No. W3).
Water Service Material	Copper Seamless Type K

12.0 STANDARD DRAWINGS AND DETAILS

Where the Ontario Provincial Standard Drawing No. has been indicated, this Standard shall apply. Where a Township of Cavan Monaghan Standard Drawing No. has been indicated in addition to the Ontario Provincial Standard Drawing No. the latter shall be read in conjunction with the Township of Cavan Monaghan Standard. Should there be an inconsistency between the Standards, the Township of Cavan Monaghan Standard shall take precedence.

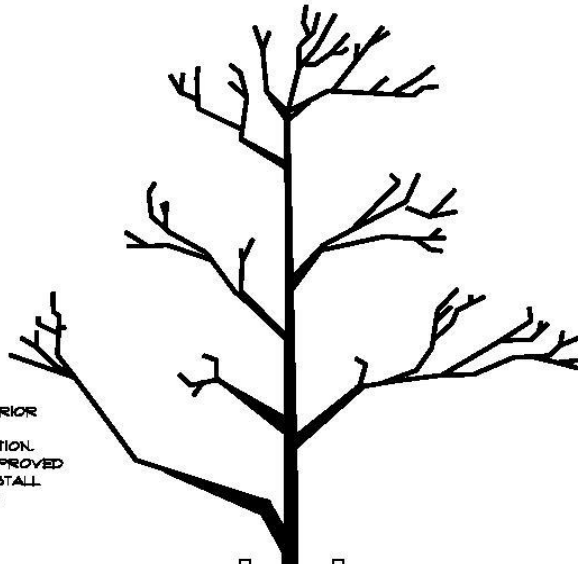
The Township of Cavan Monaghan reserves the right to update its Standards from time to time and any person using them should ensure they have a copy of the current listing prior to proceeding with a project.

In all cases, the latest revisions of the Standard Drawings as of the date the design is completed shall be used. For the Township of Cavan Monaghan Standards, the Standard number includes the month and year of the latest revision of the Standard.

Table 1: Standard Drawings

Title		Ontario Provincial Standard Drawing	Township of Cavan Monaghan Standard
Pipe Bedding-Gran.'A' Cover Material-Gran.'A' or sand		802.010,802.013, 802.030,802.033.	
M.H. Frame and Cover			
a) Standard-Sanitary	401.01 (Type "A")	-	
b) Standard-Storm	401.01 (Type "B")	-	
c) Watertight-Sanitary	401.03	-	
Catchbasin Frame and Grate	400.11	-	
Ditch Inlet Catchbasin Frame and Grate	403.01	Special where required	
M.H. Steps	405.010 (Hollow Aluminium)	-	
Safety Platform Aluminum	404.20		
Sewer Service Connections	1006.010, 1006.020	-	
M.H. (precast)	Section 700 & 1000	-	
Catchbasins (precast)	Section 700	-	
Catchbasin M.H. (precast)	Section 700	-	
M.H. Benching	701.021	-	
Water Service	1104.010, 1104.020	-	
25 mm Blow Off Installation	1104.030	-	
Valve and Box	1101.020	W1	
Hydrant Setting	1105.010	W2	
Connection of new Watermain to existing Watermain		W3,W4	
Spacer for Water Meter		W5	
Sample Station Installation Detail		W6	
Thrust Blocks	1103.010, 1103.020	-	
20 m Right-Of-Way	-	D1	
26 m Right-Of-Way	-	D2	
Typical Rural Section (20 m Right- Of-Way)	-	D3	
Concrete Sidewalk (125 mm Concrete) (100 mm Granular "A" minimum)	310.010	-	
Sidewalk Ramps	310.030	-	
Barrier Curb and Gutter	600.040	-	
Asphalt Gutter	601.010	-	
Servicing Layout	-	S1	
Sump Pump / Storm Connection	-	S2	
Sanitary Service Connection with Clean-out	-	S3	

Title		Ontario Provincial Standard Drawing	Township of Cavan Monaghan Standard
Pipe Bedding-Gran.'A' Cover Material-Gran.'A' or sand		802.010,802.013, 802.030,802.033.	
Storm Service Connection		S4	
Typical Service Layout		S5	
As-Built Service Record		S6	
Water Meter Installation		S7	
Boulevard Tree Detail	-	L1	
Sanitary Sewer – Cast in Place Maintenance Hole Drop structure Tee	1003.010		
Sanitary Sewer – Cast in Place Maintenance Hole Drop Structure Wye	1003.020		
Temporary Mud Mat		R-1	
Traffic Sign Installation		TS1	
Ornamental Sign Installation		TS2	



TRUNK PROTECTION:

- TRUNK WRAPPING IN PLACE PRIOR TO PLANTING TO BE TOTALLY REMOVED FOR TRUNK INSPECTION.
- WHEN REQUIRED USE ONLY APPROVED TREE WRAP MATERIAL AND INSTALL FROM THE GROUND UP TO THE LOWEST BRANCHES.

WATERING:

- ENSURE TREES ARE THOROUGHLY WATERED AT PLANTING

MULCHING:

- MULCH WITH SHREDDED BARK OR COMPOSTED HARDWOOD CHIPS TO A MAXIMUM DEPTH OF 75mm, OVER AN AREA OF THE ROOTBALL.
- KEEP MULCH 150mm AWAY FROM TRUNK
- FOR OTHER TYPES OF MULCHING, REFER TO SPECIFICATIONS.

PLANTING AREA:

- ACTUAL HOLE TO BE 300mm WIDER AROUND PERIMETER OF ROOTBALL.
- SOIL PREPARATION AREA TO BE 5 TIMES THE DIAMETER OF THE ROOTBALL DIAMETER.
- SCARIFY SOIL PREPARATION TO A DEPTH OF 300mm FOR AERATION.

IMPORTANT:

SOME OR ALL NOTES MAY NOT APPLY TO THE SPECIAL REQUIREMENTS OF A SPECIES OR A PLANTING ENVIRONMENT

SOIL AMENDMENT:

- EXISTING TOPSOIL TO BE AMENDED WITH TRIPLE-MIX WHERE REQUIRED

PLANTING SOIL:

- HOLE TO BE BACKFILLED AND CONCURRENTLY TAMPERED AND WATERED TO ELIMINATE AIR POCKETS

PLANTING DEPTH:

- IN HEAVY CLAY OR POORLY DRAINED SOIL, ALL WOODY PLANTS TO BE PLACED SO THAT THE ROOT COLLAR IS POSITIONED 75 - 100mm HIGHER THAN SURROUNDING GRADE

CROWN PRUNING:

- PRUNE AT PLANTING TO CAREFULLY REMOVE DEAD, BROKEN, DAMAGED & INTERFERING BRANCHES, DOUBLE LEADERS & NARROW ANGLE BRANCH UNIONS. THIN HEAD WHEN & WHERE APPLICABLE

STAKES AND TIES:

- STAKE IMMEDIATELY
- TIE USING BIODEGRADABLE MATERIAL SUCH AS FOLDED BURLAP, ETC
- STAKES TO BE PLACED TO PREVENT DAMAGE TO ADJACENT BRANCHES
- USE 50mm X 50mm X 2m WOOD STAKES OR METAL T-BARS DRIVEN SECURELY INTO GROUND. ALIGN STAKES WITH PREVAILING WINDS.
- APPLY RODENT PROTECTION WHERE REQUIRED

ROOTBALL, BURLAP, TWINE:

- CUT AND REMOVE ALL WIRE, ROPE BURLAP AND TWINE FROM AROUND TRUNK AND THE TOP 1/3 OF THE ROOTBALL

BACKGROUND INFORMATION PROVIDED FROM LANDSCAPE ONTARIO

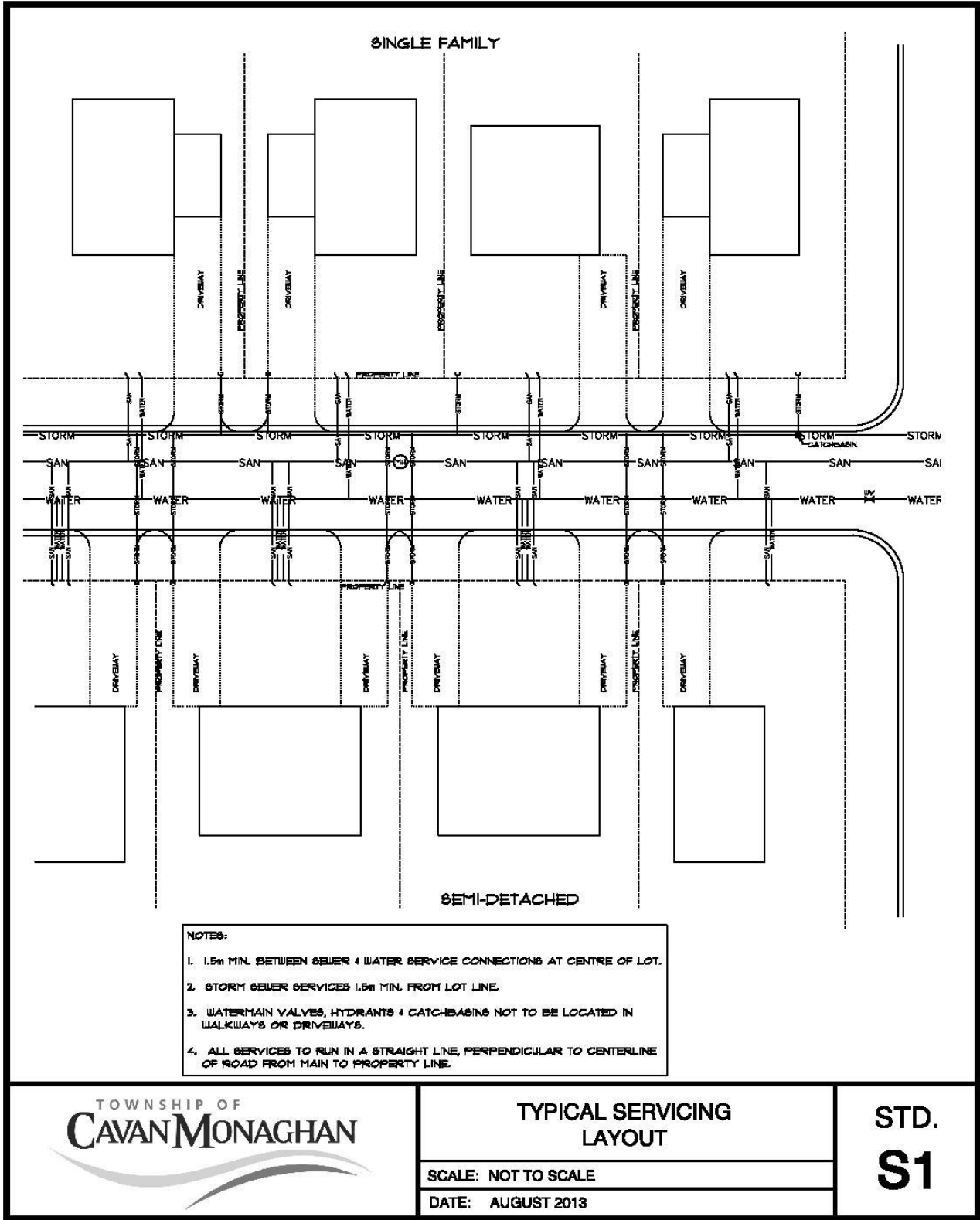
TOWNSHIP OF
CAVAN MONAGHAN

**DECIDUOUS TREE
PLANTING DETAIL**

**STD.
L1**

SCALE: NOT TO SCALE

DATE: AUGUST 2013



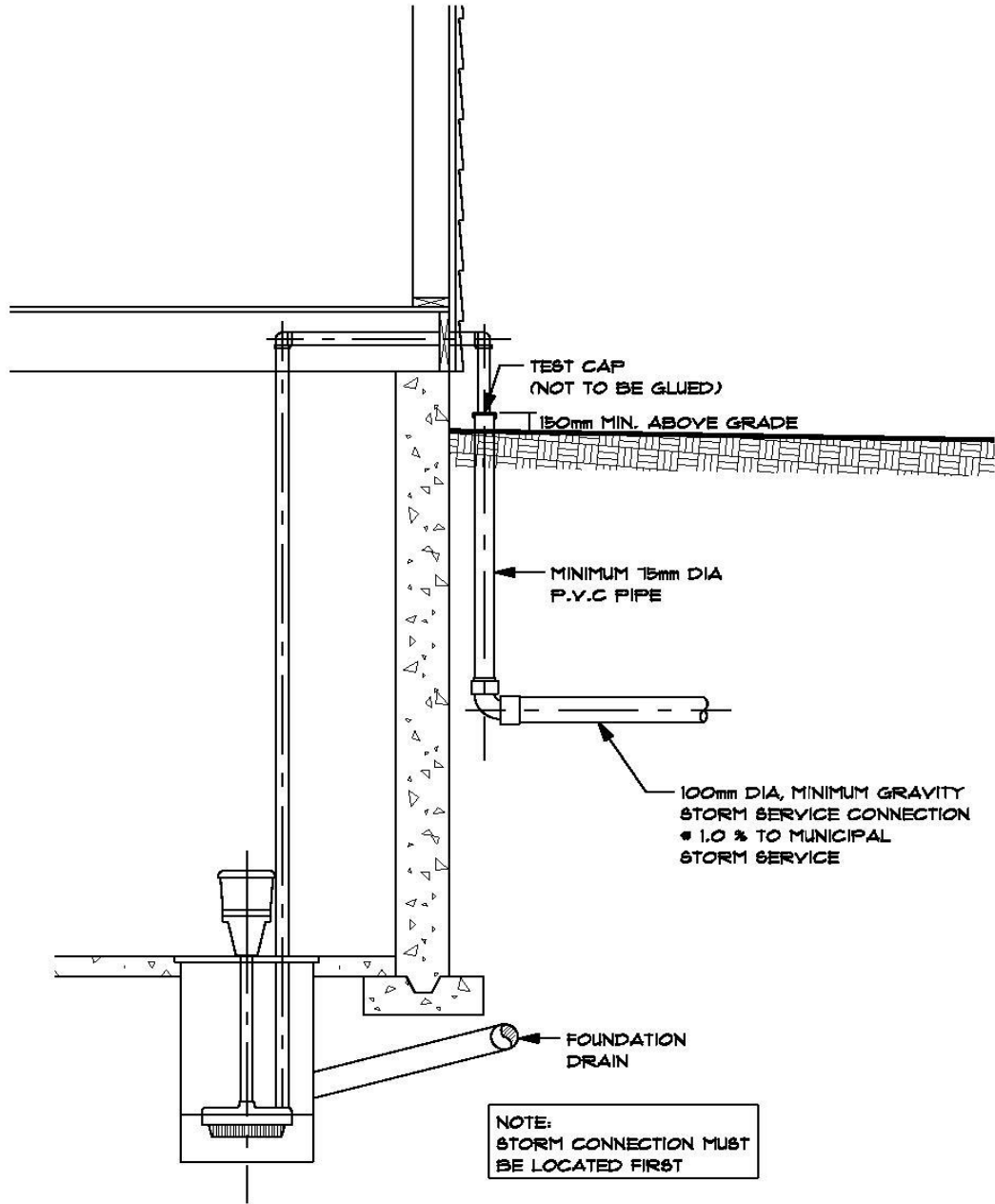
- NOTES:**
1. 1.5m MIN. BETWEEN SEWER & WATER SERVICE CONNECTIONS AT CENTRE OF LOT.
 2. STORM SEWER SERVICES 1.5m MIN. FROM LOT LINE.
 3. WATERMAIN VALVES, HYDRANTS & CATCHBASINS NOT TO BE LOCATED IN WALKWAYS OR DRIVEWAYS.
 4. ALL SERVICES TO RUN IN A STRAIGHT LINE, PERPENDICULAR TO CENTERLINE OF ROAD FROM MAIN TO PROPERTY LINE.



TYPICAL SERVICING LAYOUT

SCALE: NOT TO SCALE
 DATE: AUGUST 2013

STD. S1



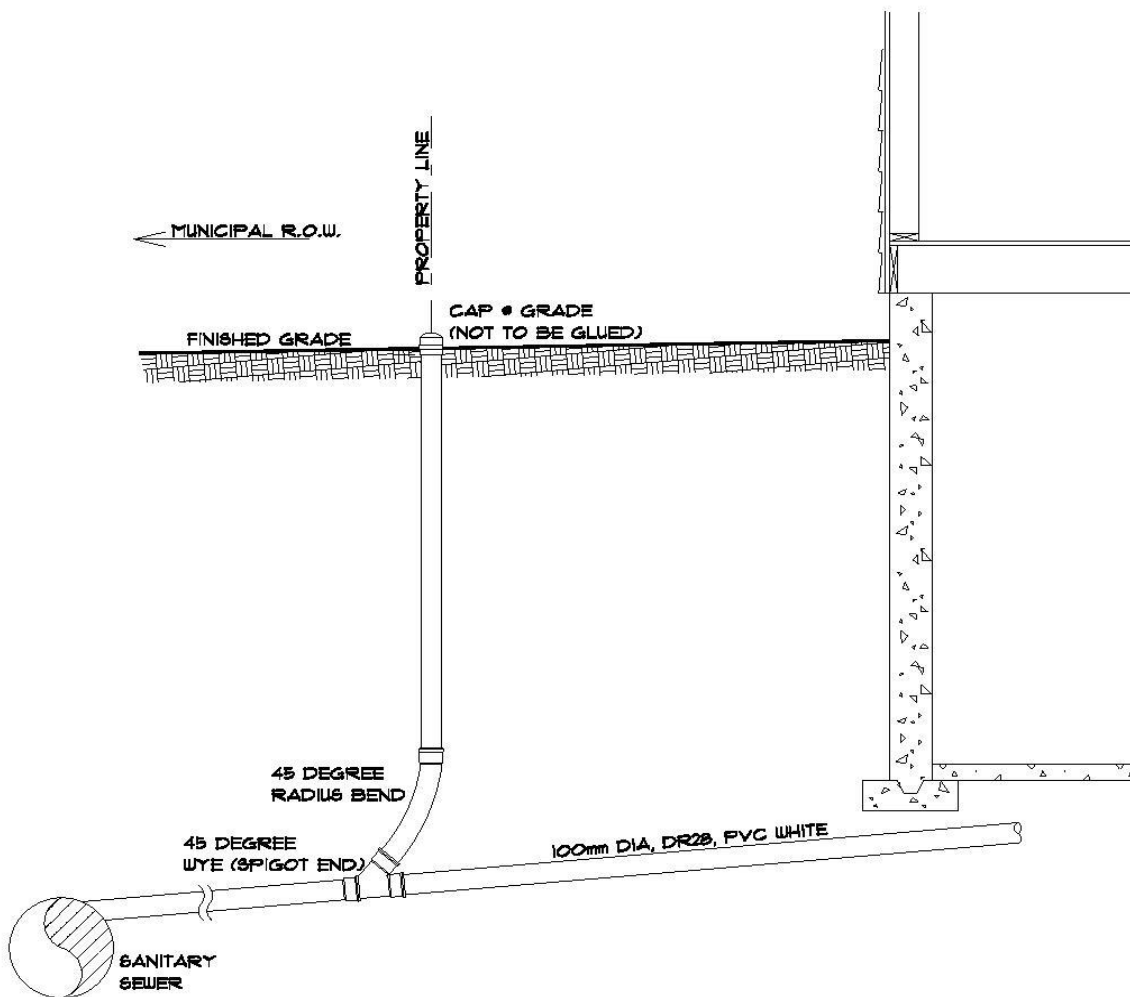
TOWNSHIP OF
CAVAN MONAGHAN

**SUMP PUMP TO
STORM SEWER CONNECTION**

SCALE: NOT TO SCALE

DATE: AUGUST 2013

**STD.
S2**



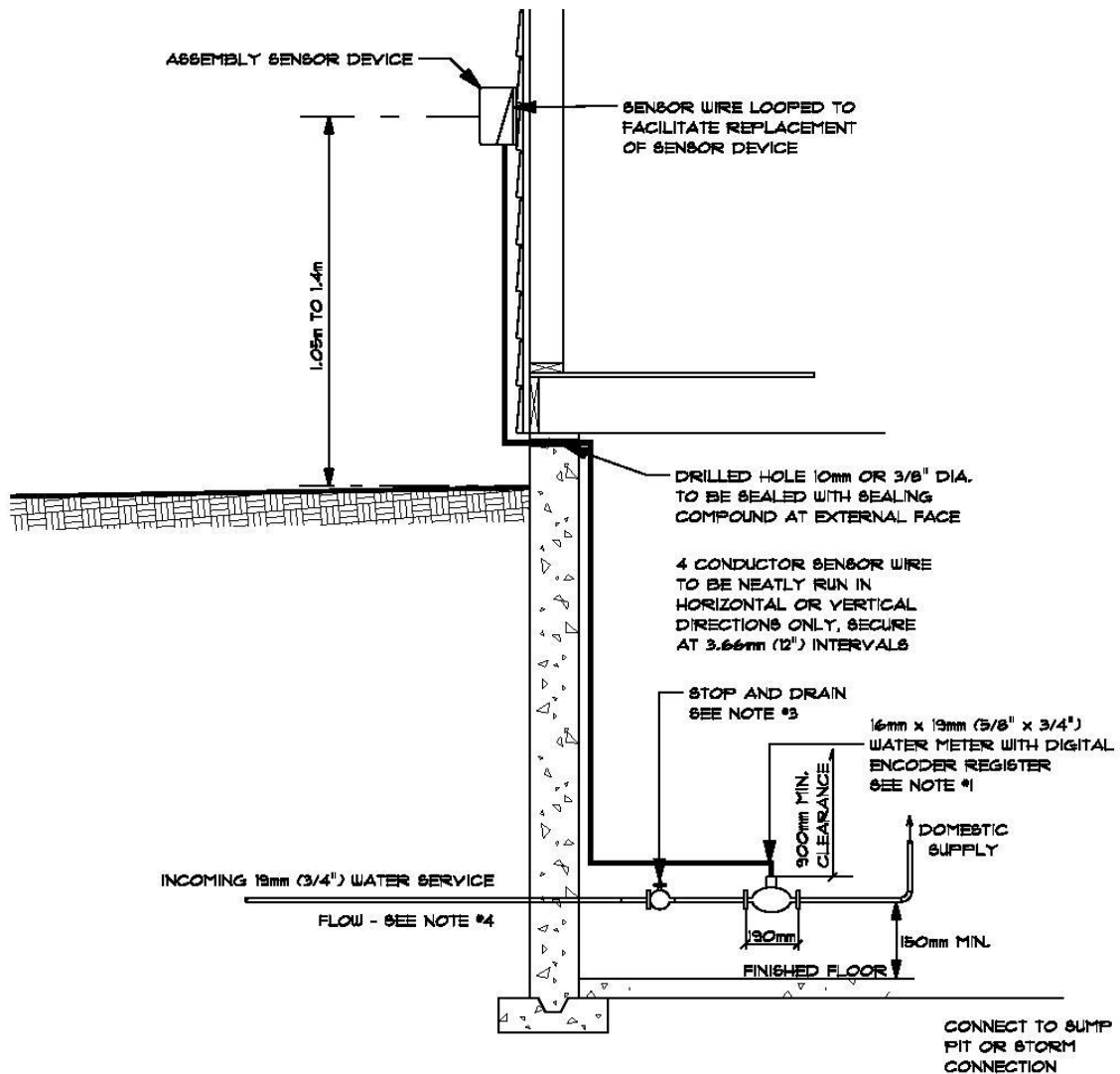
TOWNSHIP OF
CAVAN MONAGHAN

**SANITARY SERVICE CONNECTION
 WITH CLEAN-OUT**

**STD.
 S3**

SCALE: NOT TO SCALE

DATE: AUGUST 2013



- NOTES:**
- 1 - METER SHALL BE 16mm (5/8") METER. REGISTRATION IN CUBIC METERS. 19mm (3/4") THREADED CONNECTIONS
 - 2 - SUPPLY AND INSTALL REMOTE READOUT DEVICE ON OUTSIDE WALL WITHIN 2.0m OF THE FROST WALL AND IN THE SAME SIDE AS THE HYDRO METER. REMOTE READOUT DEVICE SHALL BE SUITABLE FOR TOUCH READ AUTOMATED READING AND BILLING SYSTEM.
 - 3 - STOP AND DRAIN VALVE TO BE THE SAME SIZE AS INCOMING PIPE
 - 4 - IF HOT WATER TANK IS WITHIN 3.0m OF THE METER, A CHECK VALVE IS REQUIRED BETWEEN THE METER AND THE HOT WATER TANK.
 - 5 - METER SHALL BE INSTALLED USING THREADED CONNECTIONS ONLY

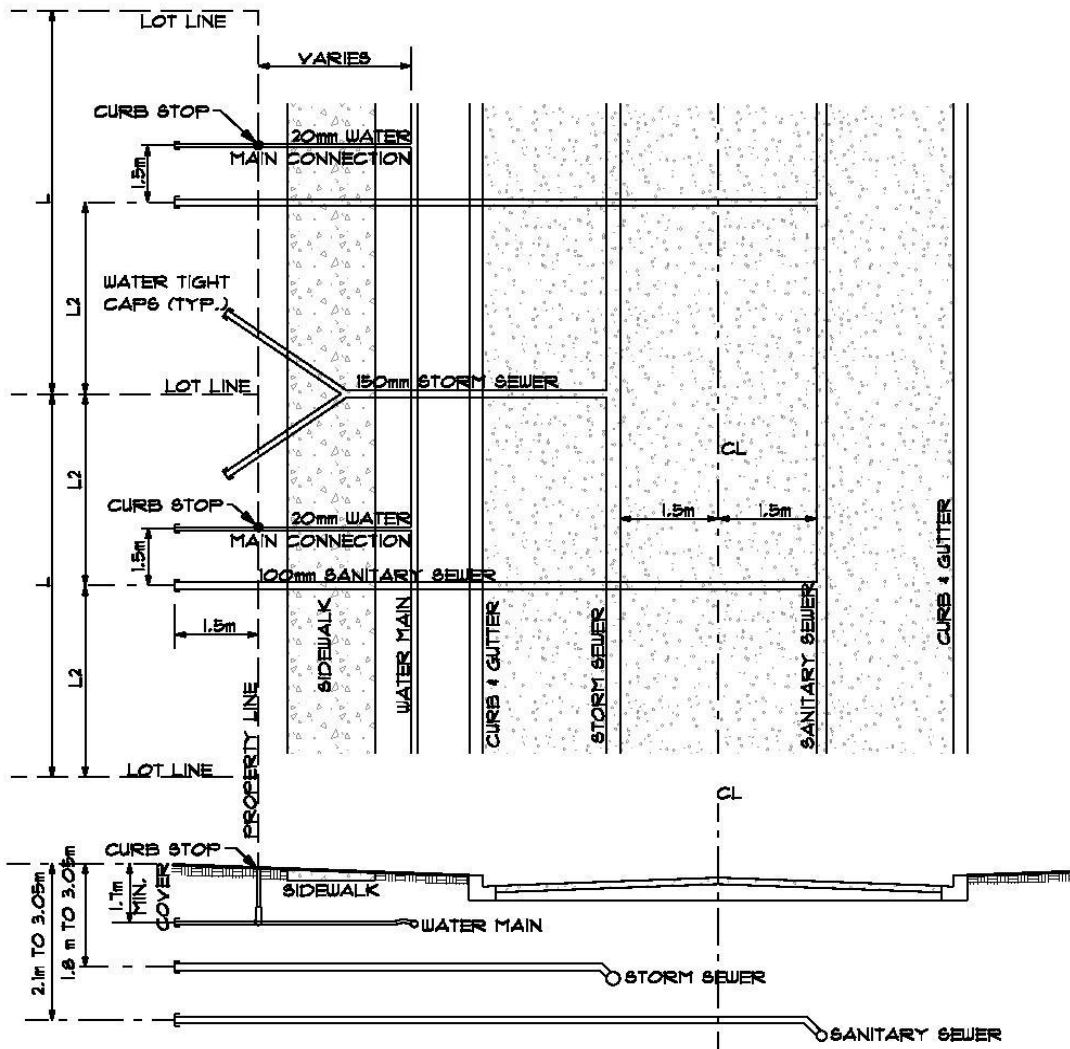
TOWNSHIP OF
CAVAN MONAGHAN

**TYPICAL WATER
METER INSTALLATION**

SCALE: NOT TO SCALE

DATE: AUGUST 2013

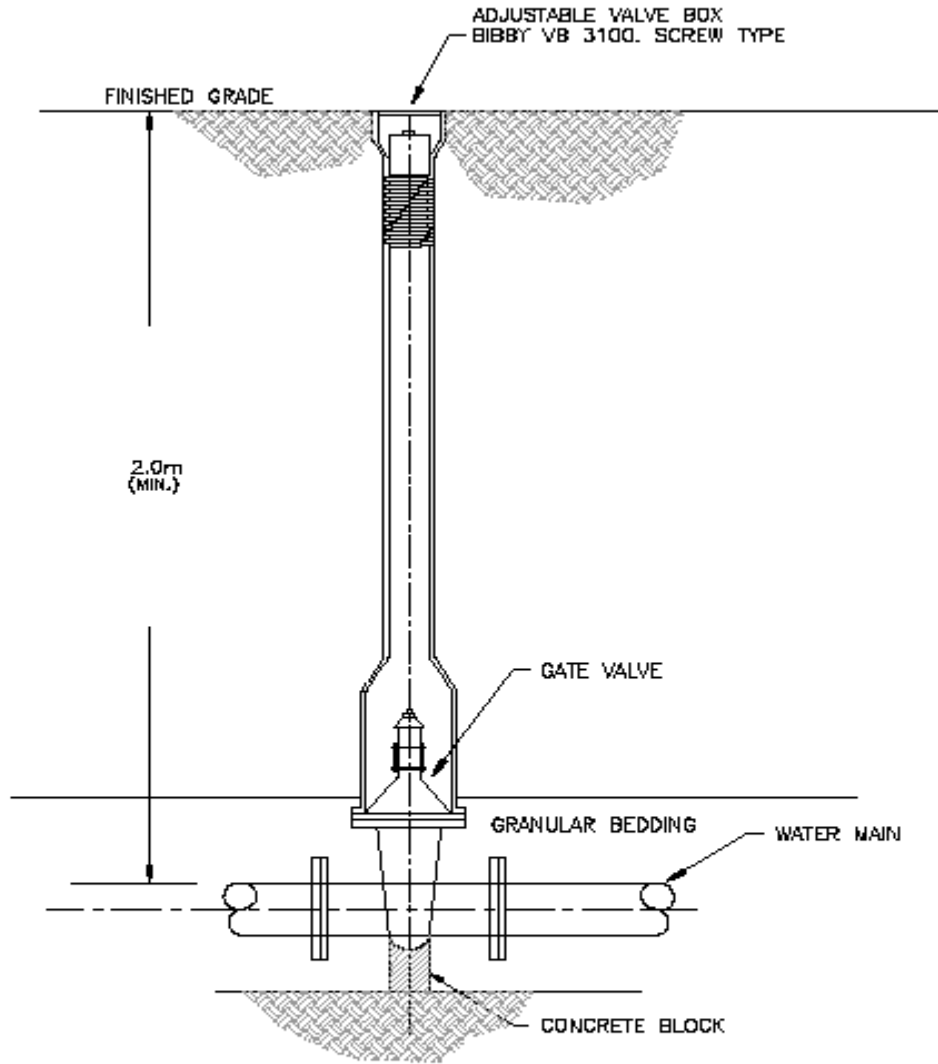
**STD.
S7**



- NOTES:
1. WATERTIGHT CAPS ON ALL SERVICES.
 2. ALL DIMENSIONS SHOWN ARE CENTRE TO CENTRE.
 3. STORM PIPE MATERIALS IS TO BE PYE SDR 26 AND WHITE IN COLOUR
 4. L = FRONTAGE OF ONE UNIT

	STORM SERVICE RESIDENTIAL SERVICE CONNECTION	
	SCALE: NOT TO SCALE	
	DATE: AUGUST 2013	

ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE



VALVE AND VALVE BOX

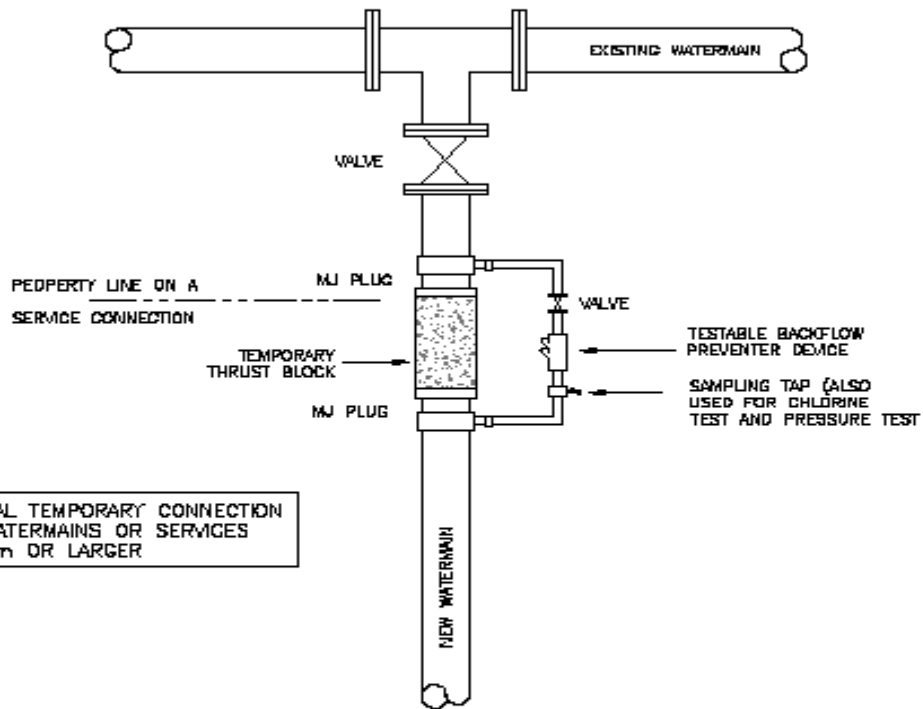
DATE: **SEPT 28, 2014**

REVISION: **0**

SCALE:
NOT TO SCALE

STANDARD No.
W1

ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE



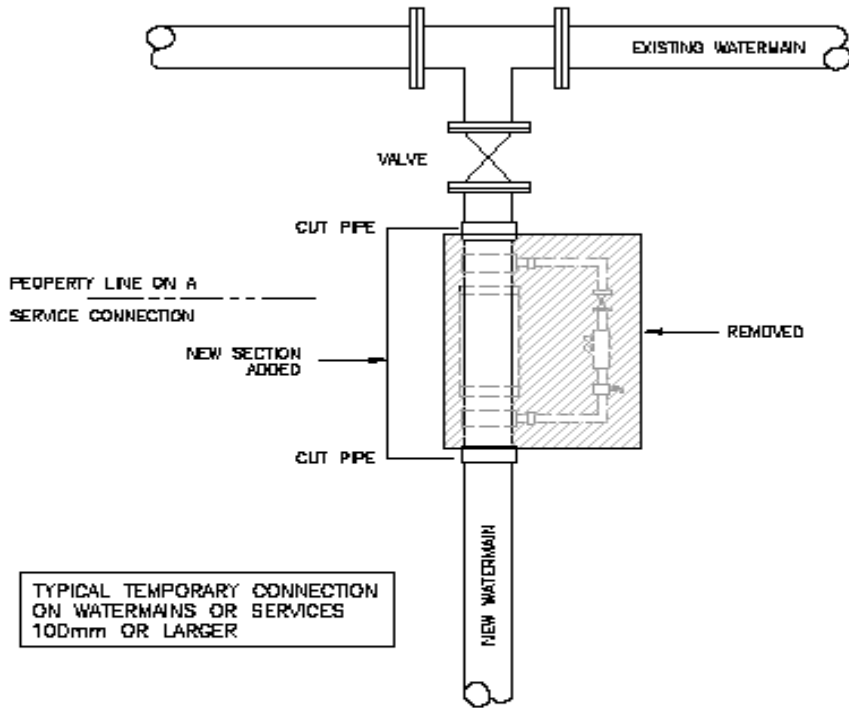
TYPICAL TEMPORARY CONNECTION ON WATERMAINS OR SERVICES 100mm OR LARGER



CONNECTION OF NEW WATERMAIN TO EXISTING WATERMAIN


DATE: SEPT 28, 2018	REVISION: 0
SCALE: NOT TO SCALE	STANDARD No. W3

ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE

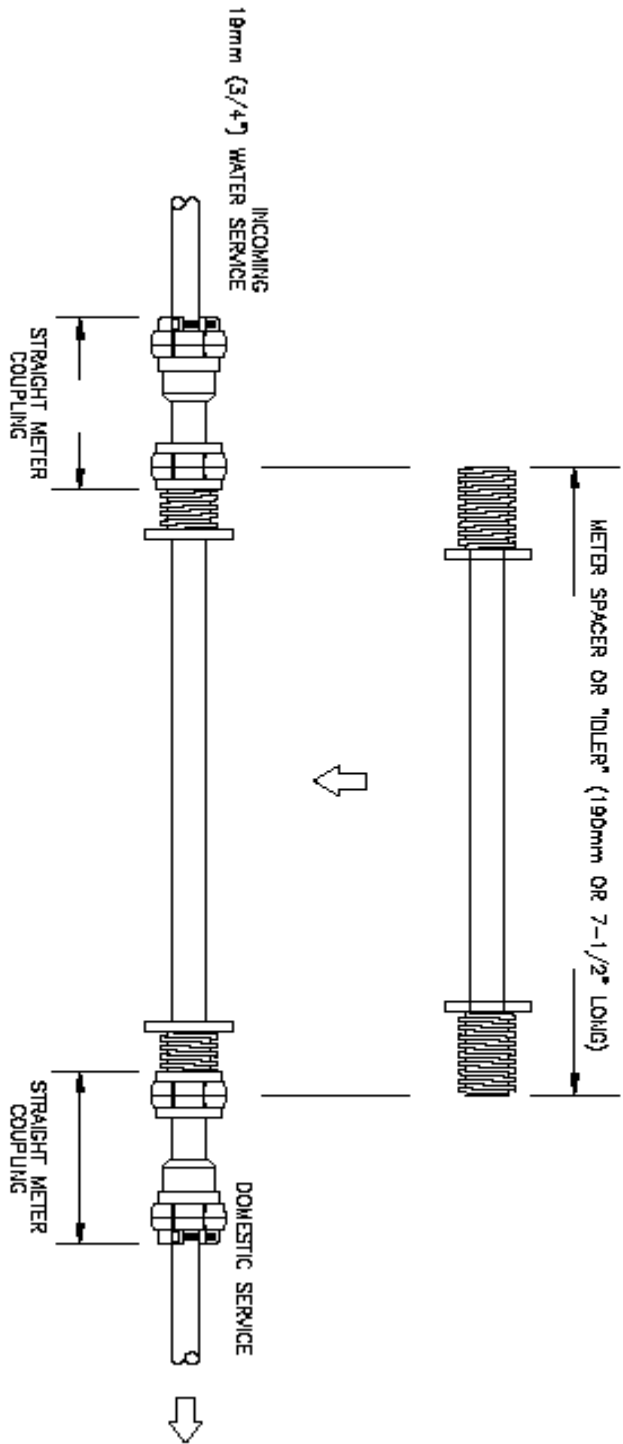


TYPICAL TEMPORARY CONNECTION ON WATERMANS OR SERVICES 100mm OR LARGER

NOTE: ONCE THE MUNICIPALITY AUTHORIZES FOR THE CONNECTION OF THE NEW WATERMAIN TO THE EXISTING WATERWORKS SYSTEM, THE PERFORATED SECTIONS OF THE MAIN FOR THE JUMPER LINE MAY BE CUT OFF AT THE INDICATED LOCATIONS, THE JUMPER LINE REMOVED AND A NEW SECTION OF MAIN ADDED.

	<p>CONNECTION OF NEW WATERMAIN TO EXISTING WATERMAIN</p>	DATE: SEPT 28, 2018	REVISION: 0
		SCALE: NOT TO SCALE	STANDARD No. W4

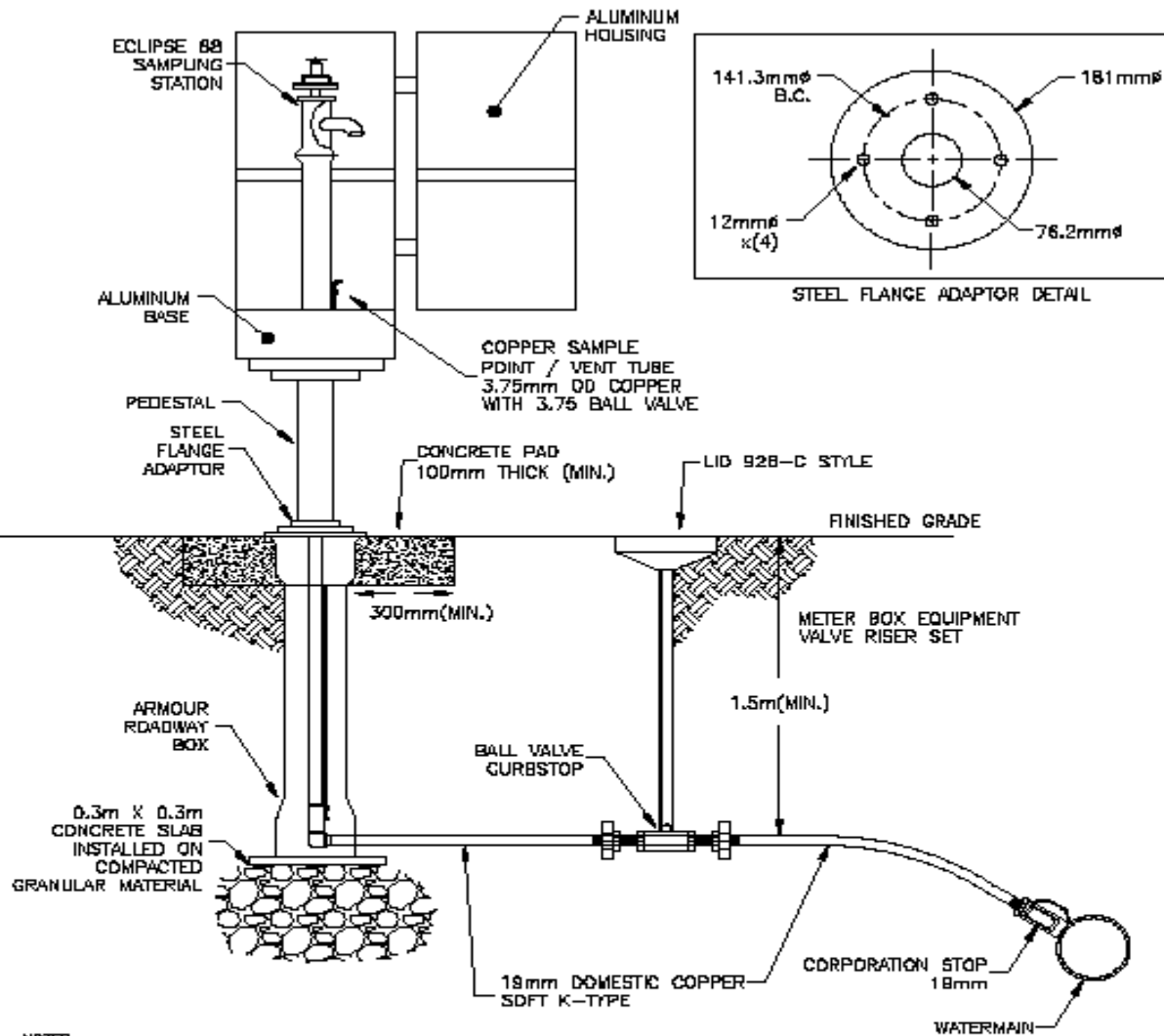
ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE



- NOTES:
1. METER SPACER 190mm LONG WITH THREADED ENDS, DESIGNED TO REPLACE 5/8" x 3/4" WATER METER, SHALL BE INSTALLED ON DOMESTIC WATER SERVICES AFTER THE STOP AND DRAIN TO ACCOMMODATE FUTURE WATER METER.
 2. METER SPACER SHALL BE INSTALLED HORIZONTALLY (PARALLEL TO FLOOR).
 3. METER SPACER SHALL BE INSTALLED AT LEAST 75mm FROM EXISTING WALLS AND AT LEAST 150mm FROM THE FLOOR.
 4. NO FLUJETS OR TEES SHALL BE INSTALLED BEFORE THE WATER SPACER.
 5. STRAIGHT METER COUPLINGS WITH PACK JOINTS AND THREADED METER CONNECTIONS SHALL BE USED TO INSTALL THE METER SPACER.

	SPACER FOR WATER METER	
	DATE: SEPT 24, 2018 SCALE: NOT TO SCALE	REVISION: 0 STANDARD No. WS

ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE



NOTES:

1. SAMPLE STATION SHALL BE KUPFERLE #88 ECLIPSE, OR APPROVED EQUIVALENT.
2. SAMPLING STATIONS SHALL BE 1.5m BELOW GROUND LEVEL, WITH A 25mm MIP INLET AND A 25mm FIP DISCHARGE.
3. A 6.35mm BENT-NOSE SAMPLING ENDB SHALL BE LOCKED BEFORE TH DISCHARGE.
4. ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, NON-REMOVABLE ALUMINUM CAST HOUSING HOUSING SHALL BE ON A 76.2mm PEDESTAL WITH A 2.1m MOUNTING FLANGE.
5. WHEN OPENED, THE STATION SHALL REQUIRE NO KEY FOR OPERATION AND THE WATER WILL FLOW IN AN ALL BRASS WATERWAY AND BE SERVICEABLE FROM ABOVE GROUND WITH NO DIGGING.
6. A 25mm BALL VALVE WILL CONTROL THE WATER FLOW AND SHALL BE LOCATED BEFORE OR AFTER THE SAMPLING BIRD.



**SAMPLE STATION
INSTALLATION DETAIL
(TYPICAL INSTALLATION USING SLEEVE KIT)**

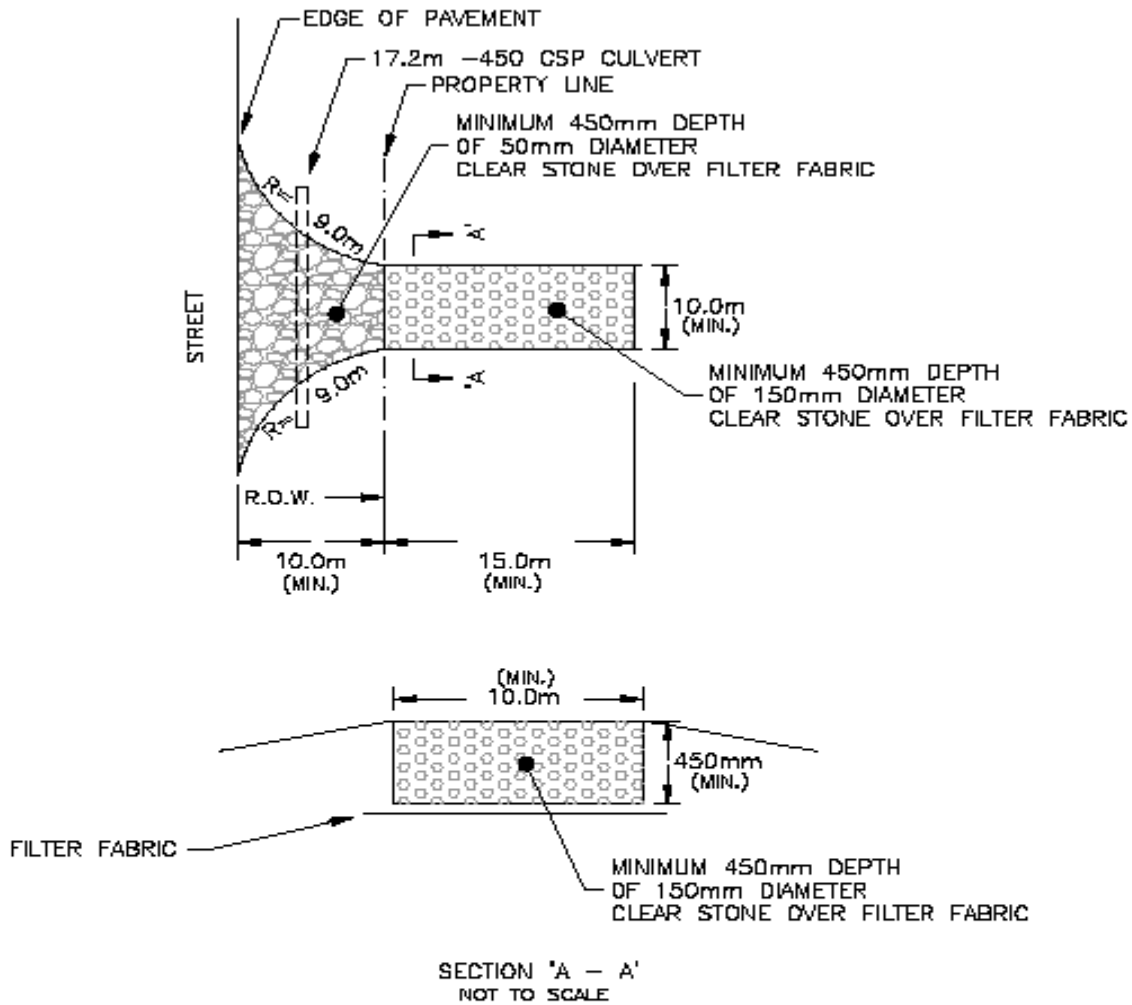
DATE: **SEPT. 24, 2018**

REVISION: **0**

SCALE:
NOT TO SCALE

STANDARD No.
W6

ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE



NOTES:

1. MUD MAT IS TO BE INSTALLED, MAINTAINED AND STONE REPLACED WHEN NECESSARY AT ACCESS TO CONSTRUCTION SITE.
2. MUD MAT TO BE A MINIMUM OF 15.0m LONG OR GREATER FROM THE PROPERTY LINE, A MINIMUM OF 10.0m WIDE OR GREATER AND 0.45m IN DEPTH WITH 15mm CLEAR STONE, PLACED OVER FILTER FABRIC.
3. MUD MAT TO ABUT EDGE OF PAVEMENT / BACK OF CURB.
4. ANY DISTURBANCE / DAMAGE TO THE BOULEVARD IS TO BE RE-INSTATED TO THE SATISFACTION OF THE TOWNSHIP OF CAVAN MONAGHAN.



**TEMPORARY
MUD MAT**

DATE: SEPT 28, 2018

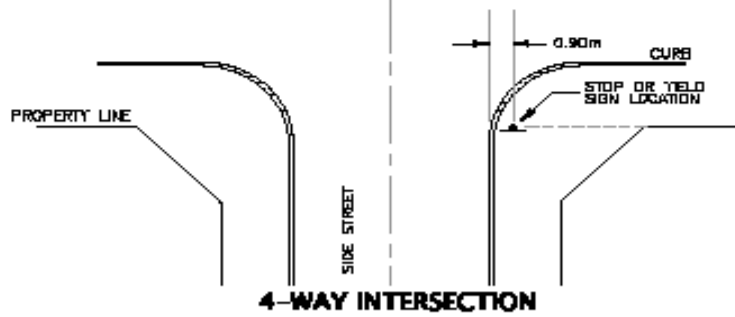
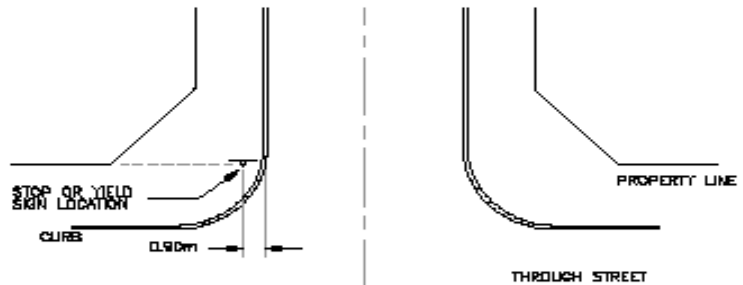
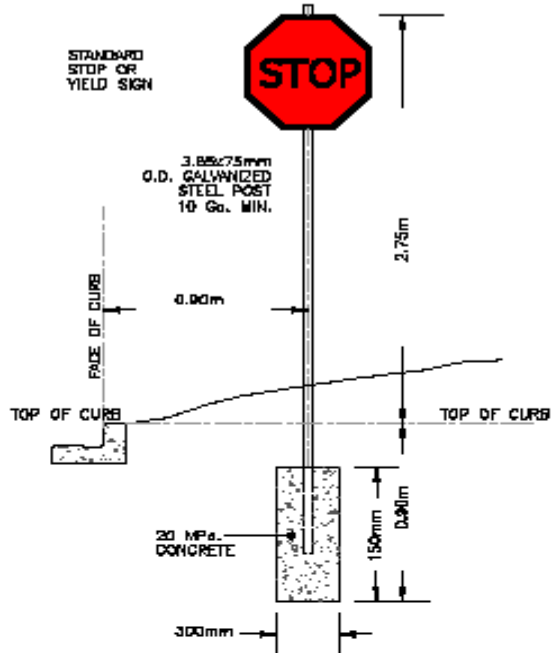
REVISION: 0

SCALE:
NOT TO SCALE

STANDARD No.
R1

ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE

SIGN DETAIL



NOTES:

1. LOCATION OF STOP AND YIELD SIGN TO BE SHOWN ON THE GENERAL PLAN OF SERVICES
2. SEE "ONTARIO TRAFFIC MANUAL, BOOK 5 FOR SIGN SPECIFICATIONS
Rc-1 - STOP SIGN
Rc-2 - YIELD SIGN



**TRAFFIC SIGN
INSTALLATION
DETAIL**

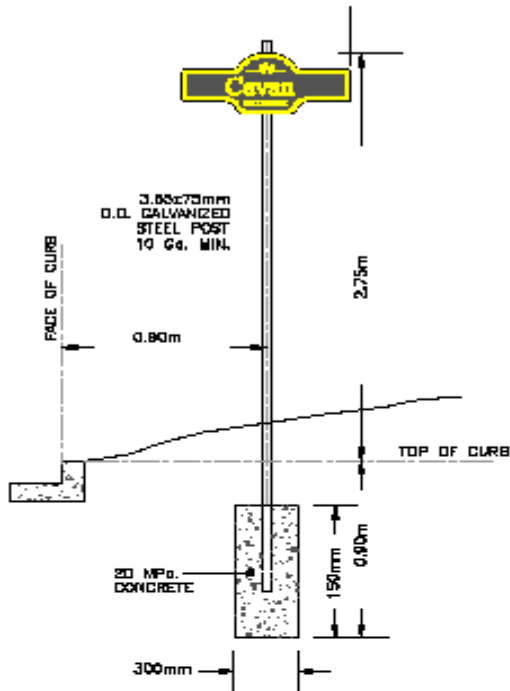
DATE: SEPT 28, 2018 REVISION: 0

SCALE:
NOT TO SCALE

STANDARD No.
TS 1

ALL DIMENSIONS IN METRES / MILLIMETRES, DRAWING NOT TO SCALE

ORNAMENTAL SIGN DETAIL



NOTES:

SIGNS TO BE DOUBLE SIDED ON STANDARD EXTRUDED NAME BLANKS OR ORNAMENTAL DESIGN CUSTOM CUT ALUMINUM BLANKS

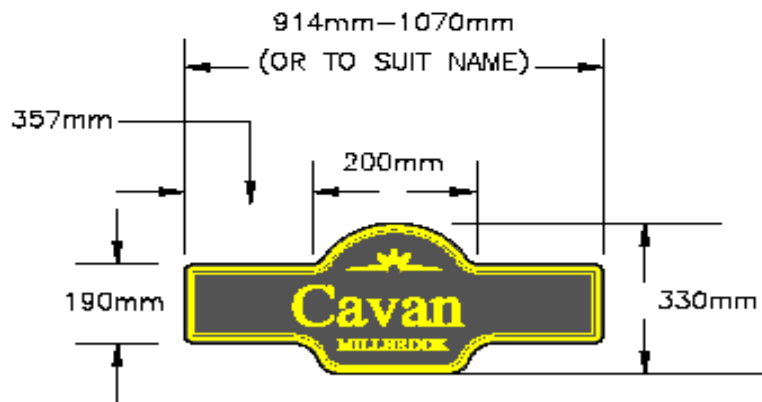
STANDARD BLANKS TO BE 8063-T6 ALODINE TREATED ALUMINUM ALLOY STREET NAME EXTRUSIONS

ORNAMENTAL CUSTOM BLANKS TO BE AS PER DETAIL USING 4.5mm (3/16 INCH) THICK 3052-H32 ALODINE TREATED ALUMINUM.

TEXT FONT FOR ORNAMENTAL SIGN - TIMES NEW ROMAN
100mm FOR MAIN TEXT AND 60mm FOR SUFFIX
COLOURS FOR ORNAMENTAL SIGN WILL BE BASE OR BACKGROUND BLACK (3M 7723-12) AND FOR TEXT AND LINE WORK 3M 3271 FOR YELLOW

SIGN TO FIT STANDARD CAST ALUMINUM STREET NAME INSTALLATION CLAMPS WITH ALLEN KEY BOLTS ONLY.

SIGNS TO BE INSTALLED ON 76mm DIA. POLE (UNLESS OTHERWISE APPROVED).



ORNAMENTAL SIGN DETAIL



**ORNAMENTAL SIGN
INSTALLATION
DETAIL**

DATE: **SEPT 28, 2014**

REVISION: **0**

SCALE:
NOT TO SCALE

STANDARD No.
TS 2