

MUNICIPALITY OF NORTH MIDDLESEX
Infrastructure Design Guidelines
and Construction Standards



Revision #	Revision Date	Notes
0	Feb.2013	Initial issue of Document
1	May.2019	Section: 2.7 Lot Servicing - update

INTRODUCTION

The following Infrastructure Design Guidelines and Construction Standards provide a means of standardization for the design and construction of sanitary and storm sewers, watermains and roads in the Municipality of North Middlesex.

These standards have been developed with the intention of identifying which items should be considered in the design and construction of the various services to be provided in the development. However, reference should also be made to existing standard methods of design outlined in the Municipal Engineers Association Design Manual, Ministry of Environment Manuals and Guidelines, Ministry of the Environment Stormwater Management Planning and Design Manual, Ministry of Transportation Geometric Design Standards (roads) and the Ontario Provincial Standard Specification and Drawing Manuals.

The following guidelines and standards should be applied wherever possible in the design and construction of the various services outlined herein. Where deviations in the standards are warranted, the necessary approvals outlining the changes must be obtained from the Municipality of North Middlesex.

Periodic revisions or additions to these guidelines and standards may occur. All users are required to keep their copy of the guidelines and standards current by obtaining all revisions and additions from the municipality as they become available.

All aspects of this document are under the sole control of the municipality.

TABLE OF CONTENTS

	Page
INTRODUCTION	ii
1.0 GENERAL	1
1.1 Purpose	1
1.2 Design Guides	1
1.3 Development Processes and Approvals	2
1.4 Engineering and Geotechnical Reports	3
1.5 Utilities	4
2.0 SUBMISSION OF PLANS, REPORTS AND STUDIES	4
2.1 Submission Procedure	4
2.2 General Plan Requirements	5
2.3 Drawings to be Submitted	5
2.4 Municipal Review	6
2.5 Final Approval/Submission	7
2.6 “As-Constructed Record” Drawings	7
2.7 Lot Servicing	8
3.0 STORM SEWERS.....	9
3.1 General	9
3.2 Storm Water Management.....	10
3.2.1 Design Guidelines	10
3.3 Design Flows.....	11
3.3.1 Runoff Computations.....	11
3.3.2 Drainage Area	11
3.3.3 Rainfall Intensity.....	11
3.3.4 Design Storm Frequency.....	11
3.3.5 Runoff Coefficients.....	12
3.3.6 Time of Concentration	12
3.4 Storm Sewer Design.....	13
3.4.1 Flow Formula and Roughness Coefficient	13
3.4.2 Allowable Flow Velocities	13
3.4.3 Minimum Pipe Sizes	13
3.4.4 Minimum Grades for Pipes.....	14
3.4.5 Depth of Cover.....	14
3.4.6 Manhole Spacing	14
3.4.7 Manhole Design.....	15
3.4.8 Separation of Sewers from Potable Water Lines	15
3.4.9 Catch Basins	16
3.4.10 Storm Sewer Gratings, Manhole Frames and Covers.....	17
3.4.11 Sewer Separation at Crossings.....	17
3.4.12 Sewer Easements	17
3.4.13 Storm Sewer Outlets	17
3.5 Materials for Construction	18
3.5.1 Storm Sewers	18
3.5.2 Manholes.....	18

		Page
	3.5.3 Catch Basins	18
	3.5.4 Pipe Bedding, Cover Materials and Trench Backfill Materials.....	18
4.0	SANITARY SEWERS	18
4.1	General	18
4.2	Hydraulic Design.....	19
	4.2.1 Residential Flow	19
	4.2.2 Commercial and Institutional.....	20
	4.2.3 Industrial Flow	20
	4.2.4 Infiltration	21
4.3	Sanitary Sewer Design	21
	4.3.1 Flow Formula and Roughness Coefficient	21
	4.3.2 Allowable Flow Velocities	21
	4.3.3 Minimum Pipe Sizes	21
	4.3.4 Minimum Slopes for Pipes.....	22
	4.3.5 Depth of Cover and Alignment.....	22
	4.3.6 Manhole Spacing	22
	4.3.7 Manhole Design.....	23
	4.3.8 Separation of Sewers from Potable Water Lines	23
	4.3.9 Sewer Easements	24
	4.3.10 Sewer Connection Cleanouts	24
	4.3.11 Sewer Connection Types	24
4.4	Materials for Construction	24
	4.4.1 Sanitary Sewers.....	24
	4.4.2 Manholes.....	24
	4.4.3 Pipe Bedding, Cover Materials and Trench Backfill Materials.....	24
4.5	Sewer Testing For Leakage.....	25
	4.5.1 Exfiltration	25
5.0	WATER DISTRIBUTION SYSTEMS	26
5.1	General	26
5.2	Hydraulic Design.....	26
	5.2.1 Design Water Demand.....	26
	5.2.2 Unit Consumption Rates	27
5.3	System Pressure.....	28
	5.3.1 Minimum Operating Pressures	28
	5.3.2 Transient Pressures	28
5.4	Friction Factors.....	28
5.5	Minimum Pipe Sizes	29
	5.5.1 Watermains	29
	5.5.2 Water Services	29
5.6	System Layout.....	29
	5.6.1 Grid Design.....	29
	5.6.2 Valve Placement	29
	5.6.3 Hydrant Requirements	30
	5.6.4 Depth of Cover.....	30

	Page
5.6.5 Cross-Connection Control	30
5.7 Pipe Design.....	30
5.7.1 Pipe Materials	30
5.7.2 Restraints	31
5.7.3 Bedding and Backfill	31
5.8 Appurtenances	31
5.8.1 Hydrants.....	31
5.8.2 Valves and Valve Chambers.....	32
5.8.3 Water Services	32
5.9 Water Sampling Stations	32
5.10 Acceptance of Work.....	32
5.10.1 Pressure and Leakage Test.....	32
5.10.2 Valve Boxes and Curb Boxes	33
5.10.3 Hydrants.....	33
6.0 ROADS	33
6.1 General	33
6.2 Design.....	34
6.2.1 Pavement Widths and Right-of-Way Widths	34
6.2.2 Minimum Road Gradients.....	34
6.2.3 Standard Geometrics.....	35
6.2.4 Standard Road Structure	35
6.2.5 Intersection Radii.....	36
6.2.7 Curb and Gutter	36
6.3 Materials for Construction	36
6.3.1 Concrete.....	36
6.3.2 Asphalt.....	37
6.3.3 Granular "A"	37
6.3.4 Granular "B"	37
6.4 Construction	37
6.4.1 Trench Compaction and Subgrade Compaction	37
6.4.2 Boulevard Grading.....	38
6.5 Street Name Signs	38
6.6 Sidewalks.....	39
6.7 Acceptance of Work.....	40
6.7.1 Concrete.....	40
6.7.2 Pavements - Evaluation of Pavements.....	40
7.0 DEVELOPMENT GRADING	42
7.1 General	42
7.2 Lot Grading Details.....	42
7.3 Area Grading	43
8.0 PARKLAND/LANDSCAPING	43
8.1 General	43
8.2 Passive and Active Recreational Uses	44
8.3 Site Clearing and Security	44

	Page
8.4 Site Grading/Drainage	44
8.4.1 Drainage	45
8.4.2 Grading	45
8.5 Seeding	46
8.6 Walkways	46
8.7 Fencing	46
8.8 Tree Planting	47
9.0 STREET LIGHTING	48
9.1 General	48
9.2 General Lighting Requirements	48
9.3 Design Criteria	49
9.4 Pedestrian and Bikeway Design Criteria.....	49
9.5 Decorative Street Lighting	50
9.6 Local Residential Street Lighting.....	51
9.7 Collector, Commercial and Industrial Lighting	51
9.8 Design Criteria - Street Lighting.....	52
9.8.1 Source Type	52
9.8.2 Lamp Wattages	52
9.8.3 Illumination Design Levels.....	52
9.8.4 Pole Locations.....	53
9.8.5 Wiring	53
9.8.6 Power Supply Control Cabinet Assembly	53
9.8.7 Inspection.....	54
9.8.8 Standard Design (Nostalgia Type).....	54
9.9 Decorative Design	55
9.9.1 Roadway Lighting.....	55

LIST OF TABLES

Table 1:	Time of Concentration	12
Table 2:	Catch Basins	16
Table 3:	Commercial and Institutional Flows.....	20
Table 4:	Commercial and Institutional Water Demands.....	27
Table 5:	Friction Factors	29
Table 6:	Restraints	31
Table 7:	Pavement Widths and Right-of-Way Widths	34
Table 8:	Standard Geometrics	35
Table 9:	Standard Road Structure	35
Table 10:	Intersection Radii	36
Table 11:	Pedestrian and Bikeway Design Criteria	50
Table 12:	Illumination Design Levels.....	53

LIST OF APPENDICES

Appendix A General Procedural Guidelines for Subdivision and Condominium Development
Plan of Subdivision/Condominium and Lot Requirements Checklist
Site Plan Development Control - Proponents Mandatory Requirements during
Construction

Appendix B Drawings

No.	Title
3.2	SWM Pond
3.3	Stormwater Management Facility Sections and Details
3.4	Stormwater Management Facility Sections and Details
4.1	Sanitary Sewage Pumping Station/Plans and Sections
4.2	Sanitary Sewage Pumping Station//Electrical Details
4.3	Sanitary Sewage Pumping Station/Typical Site Plan and Details
4.4	Sanitary PDC
5.1	Typical Water Sampling Station
6.1	Standard Road C/S – Urban
6.2	Standard Road C/S – Semi-Urban
6.3	Standard Road C/S – Rural
6.4	Turning Basins for Terminated Streets
6.5	Community Mail Boxes with Parking Bay
SP1	Typical Site Plan Drawing
7.2	Typical Lot Grading Plan
7.3	Typical Lot Grading Plan Title Block and Border

Appendix C General Construction Notes
Erosion Control Notes
Shop Drawing Submission Procedures

1.0 GENERAL

1.1 Purpose

The purpose of these guidelines and standards is to aid in the standardization of the design and construction of municipal services for residential, commercial, institutional and industrial developments in the Municipality of North Middlesex. This document is also to be used as a general guideline for reconstruction or new development in urban and community settlement areas and is intended as a guide for developers, builders and the general public in the development process for subdivision, severance and individual site developments. It should be noted that this document is to be used as a reference for municipal rehabilitation projects but shall be required for full reconstruction projects.

1.2 Design Guides

These guidelines and standards should be followed wherever possible. Should special or unique conditions occur, minor deviations from these guidelines and standards may be considered and are subject to the written approval of the municipality's engineer. In addition, the municipality reserves the right to require compliance with one or more of the standards and processes included herein, to require variations from these standards at the municipality's discretion and to require additional information, standards, services, etc. further to those included herein. For example, the municipality may require higher standards to accommodate higher density developments, collector and arterial roads, heavy industry, etc.

These guidelines and standards are to be used in conjunction with standard engineering practices and design tests as well as the standards, regulations, design manuals and guidelines of the Municipal Engineers' Association (MEA), Municipal Electrical Association, Ontario Hydro Distribution Standards, Ministry of Environment (MOE), Ministry of Transportation (MTO), Ontario Provincial Standard Drawings and Specifications (OPSD, OPSS), various other government ministries and other regulatory agencies.

1.3 Development Processes and Approvals

Depending on the location and nature of the development, the developer may be required to obtain approvals from various other regulatory agencies including (but not limited to) one or more of the following and in addition to and/or prior to obtaining approval from the municipality's engineer:

- The Department of Fisheries and Oceans (DFO)
- The Ministry of Environment (MOE)
- The Ministry of Natural Resources (MNR)
- The Ministry of Transportation (MTO)
- The Ministry of Municipal Affairs and Housing (MMAH)
- The Ministry of Tourism, Culture and Sport (MTC)
- The County of Middlesex
- Middlesex-London Health Unit
- The Ausable Bayfield Conservation Authority (ABCA)
- The Municipality of North Middlesex
- The Municipality of North Middlesex Chief Building Official (CBO)
- The Municipality of North Middlesex Drainage Superintendent
- The Municipality of North Middlesex Fire Chief.

It is the responsibility of the developer to provide the municipality with suitable written documentation of the approval from the regulatory agencies.

The development will be subject to the requirements of one or more municipal by-laws such as:

- The Official Plan
- Policies and By-laws
- The Building By-law
- The Site Plan Control By-law
- Sewage By-laws
- Grading By-laws
- Occupancy Permit By-law
- North Middlesex Building By-law.

The developer shall be required to enter into a Development or Subdivision Site Plan Agreement with the municipality and pay fees to the municipality such as application fees for zoning and

Official Plan amendments, severances and development agreements, cash in lieu of park land, cash in lieu of parking, development charges and such other fees as may be required.

1.4 Engineering and Geotechnical Reports

The developer shall retain a professional engineer licensed in the province of Ontario for the design of all services, the preparation of plans and specifications. The professional engineer, or designate, would also be responsible for the full time supervision and inspection of all construction of the works.

The developer may be required to submit a hydrogeological study and/or geotechnical report prepared by a geotechnical engineer. Elevations of ground surface at bore holes and test pits shall relate to a geodetic datum. The geotechnical report may be required to address the suitability of the soils at the site and shall make recommendations pertaining to the use of native soils for trench backfill, roadway pavement design, earthworks for site grading, and comments on foundation design.

Where such reports are required, a minimum of three hard copies, plus one digital copy, shall be submitted to the municipality.

The developer's engineer and planner must consider the overall servicing and development of adjacent lands in the watershed which may be affected by the development, when submitting the development proposal. Where applicable, such considerations and recommendations concerning existing sanitary sewage treatment plants, sewage collection systems, storm water management, water supply/storage and distribution facilities, pumping stations, and oversizing of mains, as well as traffic studies may be required to be submitted by the developer. The layout of internal roads should also consider the future development of abutting lands. The developer may be required to enter into agreements with the municipality concerning such items as (but not limited to) development charges, cost sharing for oversizing and front-end financing to allow for proper and orderly future development of the neighboring lands as well as the proposed site.

For all developments, the developer's engineer shall submit sufficient copies of the preliminary design brief, outlining the proposed design criteria as well as commenting on and making recommendations on any previous reports or studies completed for the area of proposed development. In addition the pre-design brief should address all necessary preliminary investigations and explorations, include an analysis of existing conditions and of all possible

alternatives, including financial considerations and of all preliminary estimates of cost, as a basis for conclusions and recommendations to be included in the report to the municipality, for review. The minimum requirements of the applicable statutes, by-laws, ministries and regulatory agencies must be satisfied.

The developer's engineer shall provide evidence of professional liability insurance from their engineer's professional liability insurance insurer, in the amount of \$1,000,000 (minimum), prior to the review of any reports/briefs by the Municipality of North Middlesex.

1.5 Utilities

The developer shall coordinate the installation of utilities including (but not limited to) Execulink, Hay Communication, Hydro One, Entegrus Inc., Bell Canada, Enbridge and Union Gas. This list is not necessarily complete for all developments. It is the developer's responsibility to meet all requirements of utility organizations and provide all necessary documents of such organizations to the municipality prior to final approval of development drawings. These utilities shall be installed in accordance with the "Typical Cross-Sections", as noted in **Appendix B**.

2.0 SUBMISSION OF PLANS, REPORTS AND STUDIES

2.1 Submission Procedure

All submissions of plans, specifications, documents, reports, studies, preliminary design criteria proposals, etc. shall be made to the clerk of the municipality in sufficient quantities as may be required for distribution, to persons such as the Public Works Superintendent, Building Official, Planner, municipality's consulting engineer, Fire Department, Hydro etc. A detailed flow chart 'General Procedural Guidelines for Subdivision and Condominium Developments' is included in **Appendix A**. The document 'Site Plan Development Control – Proponent's Mandatory Requirements during Construction' is also included in **Appendix A**.

2.2 General Plan Requirements

All drawings shall be standard ANSI D (22" x 34") drawing size. All drawings are to be signed and sealed by a professional engineer. General plan layout shall be in accordance with standard engineering practice. All elevations on grading plans, site plans, servicing plans, and profiles, etc. shall relate to Geodetic Survey of Canada Datum with NAD83 co-ordinates and three monuments per site.

2.3 Drawings to be Submitted

In general, the following drawings are required for subdivision developments. Some of the following may also be required for individual site plan developments:

- A key plan, to scale of not less than 1: 10,000 showing the general location of the development to be serviced
- One or more general servicing plans, to a scale of not less than 1: 2,000 showing all services to be constructed, including storm sewers, sanitary sewers, the water distribution system, roads, street lighting systems and sidewalk
- A lot grading plan, to a scale of not less than 1: 1,000 and including sufficient areas of adjacent land with contours where applicable to illustrate total drainage patterns
- Plan and profile drawings for each street to be constructed, reconstructed, widened, etc. and for each service easement to a scale of 1: 250 horizontally and 1: 50 vertically
- A storm drainage area plan to a scale of not less than 1: 2,000 and including all interior and exterior tributary areas which contribute to the storm sewer and/or storm water management plan. Storm sewer design charts shall be included on the storm drainage plan. The design charts should include criteria used for design
- A sanitary drainage area plan, to a scale of not less than 1: 2,000 and including all interior and exterior tributary areas. Sanitary sewer design charts shall be included on the sanitary drainage plan. The design charts should include criteria used for design
- Such other drawings showing notes, details, typical sections, etc. as may be necessary for the proper construction of the works, such as (but not limited to):
 - Typical road cross-section
 - Typical lot grading plan
 - Typical swale details
 - Geotechnical report information
 - Legend

- Storm sewer outfall structures, erosion protection and sedimentation controls
- Materials
- Trench details
- Sanitary sewage pumping facilities, forcemain details and related appurtenances
- Storm water management systems and facilities
- Water pumping facilities; pressure, metering, and back flow facilities including related appurtenances; design data including domestic and fire design flows used
- Details of other items not covered by the OPSD, etc.
- Connection details
- Privacy and sound attenuation barrier details.

The above drawings shall include sufficient legal survey monumentation, dimensions, etc. to enable the contractor and/or engineer to locate and/or layout the road rights-of-way, easements, and/or lot corners, as may be required. All elevations on plans shall relate to Geodetic Survey of Canada Datum with NAD83 UTM co-ordinates and three monuments per site.

Appendix A lists items in the form of a checklist which may be required on subdivision and/or individual site development plans.

2.4 Municipal Review

Of the two sets submitted, the municipality's engineer will review and make comments on one set of plans and/or documents.

The developer's engineer will make the number of copies as needed by the developer and return the original to the municipality's engineer.

Each subsequent submission will follow the same process until municipal approval. A meeting can be arranged to review the municipality's comments. All municipal review costs are the responsibility of the developer. Separate written comments/letters will not be provided.

2.5 Final Approval/Submission

After final approval has been given by the municipality and all other regulatory agencies, and after all plan/documentation revisions have been made by the developer's engineer, a final (full and complete) submission of plans and documentation shall be made to the municipality in sufficient quantities as the municipality may require for distribution as noted in **Section 2.1**. No construction shall proceed until such submission is made by the developer and has been accepted as satisfactory by the municipality.

Such final submission shall include the latest revision of all plans, storm sewer design charts, sanitary sewer design charts, water distribution system analysis, copies of Environmental Compliance Approvals (e.g., for sewage and water works) from the Ontario Ministry of the Environment, structural approval from the Ministry of Transportation where required, Conservation Authority approvals etc.

The plans shall contain the detail such that the municipality does not have to refer to the developer's/contractor's contract documents. For purposes of approval by the municipality, information shown on the plans shall be deemed to take precedent over conflicting or alternate information listed in the developer's/contractor's contract documents.

Any changes to approved plans, which are proposed by the developer or his agents, must be resubmitted to the municipality for review and approval prior to such changes being made in the field.

2.6 “As-Constructed Record” Drawings

“As-constructed record” drawings are to be submitted to the municipality to show the services and works as they were actually constructed. The developer shall provide the municipality with three complete sets of full size and one set of half size “as-constructed record” white prints of all drawings applicable to the project. “As-constructed record” drawings shall include water service locations with ties, and chainages of private drain connections measured from the nearest downstream manhole.

As well as the submission of “as-constructed record” white print drawings, the municipality requires “as-constructed record” drawings to be submitted in a satisfactory digitized form (AutoCAD and pdf). In general, CDs shall satisfy the following requirements:

- Recordable CDs (CD-R) of acceptable quality
- Pdf file
- AutoCAD (latest version) file format to be .dwg
- A written summary of the CD contents in standard Microsoft Word file format shall be entered on each CD
- A paper copy summary of the CD contents including index of file names and a summary of each file shall be submitted with each CD
- CDs shall be labeled as to project name and date completed.

If a file size exceeds the CD capacity and a utility program was used to reduce the file size, the person who submitted the drawings shall make available to the municipality for a one time restoration, the utility program used to reduce file size, to enable the municipality to enter the drawings on the municipality's computer system. If drawings were created in a program other than AutoCAD, it is the responsibility of the person submitting the drawings to ensure that the conversion to the suitable format readable by AutoCAD is free from error.

2.7 Lot Servicing

Services for individual residential lots shall be as follows:

- Water services shall be installed on the centreline of single lots and 1.0 m (3.0') to the right and left of centreline for semi-detached lots
- Sanitary private drain connections (PDC) shall be installed 2.5 m (8.0') right of centreline for single lots and 3.5 m (11.5') right and left of centreline for semi-detached lots complete with clean-out
- Telephone, Cable TV and electric services are to be installed in a common trench as noted in **Appendix B**
- Driveways shall be located on the opposite side of the lot to that of a pad mounted transformer, hydrant, cable utility pedestal or street light pole where possible and shall be perpendicular to the road
- Each property shall be provided with a sanitary PDC of a minimum diameter of 125 mm (5") having a minimum slope of 2% with a minimum 125 mm clean-out at property line
- Roof water leaders and foundation weeping tile shall **NOT** be connected to the sanitary sewer

- Roof water leaders shall not be connected to the storm sewers. Foundation weeping tile shall not be connected directly to the storm sewers. Foundation weeping tile shall be tied into a sump. All residential and multiuse dwellings shall have a sump pump installed and shall discharge via a Private Drain Connection (PDC) to the fronting storm sewer(s); or as determined by the Municipality of North Middlesex, to the satisfaction of the municipality. Furthermore, all PDC's shall have a backflow preventing device installed.
- No part of the driveway shall encroach upon the property boundaries when extended from the edge of the right-of-way to the roadway
- If a concrete driveway is installed, expansion joints are to be installed at both sides of the sidewalk and at the curb. A construction joint is also required at the property line
- Trees shall be installed 1.5 m behind the property line, a minimum of 4 m from all other services.

3.0 STORM SEWERS

3.1 General

Storm sewers shall be provided to service all of the lands in the Plan of Subdivision or Site Plan and shall be located in the street right-of-way or in an approved easement. The storm sewer outlet must be carried to a sufficient outlet so that no damage is done to lands or roads. All lots and blocks in the plan must be connected to the storm sewer. Storm sewers shall be designed to accept all drainage from the contributing area, including upstream areas which shall be determined by the developer's engineer and be subject to the approval of the municipality's engineer.

Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD) and Municipal Engineer's Association (MEA) guidelines shall govern, where applicable.

3.2 Storm Water Management

3.2.1 Design Guidelines

Current storm water management practices require restricting storm water flows outletting from a development to existing values. The impact of future flow on downstream facilities should be no greater than at present for quantity and quality.

However, current inadequate outlet facilities may have an impact on future upstream flooding. Any outlet deficiency should be corrected at or before the time of upstream development. Additional costs would be assessed to the development subject to any cost sharing agreement negotiated with the municipality.

Subject to the requirements of the Ausable Bayfield Conservation Authority and the MOE, it is recommended that any submission of a proposed plan of subdivision or site plan development include detailed storm water management plans complying with the following design guidelines:

- Design storm sewer pipe system to 5-year storm return period for pipe flow condition
- Keep development maximum outlet flows to pre-development values for the 2 to 100-year return period
- Detain the first 13 mm or 24 mm as applicable, of rainfall generated runoff from all new development for a period of 24 to 48 hours for quality control
- For large developments, utilize approximately 5% of the proposed development lands for storm water ponding (retention and storage requirements). This will be located in the lower areas. Areas utilized for temporary storm water storage should possibly be utilized as ‘passive park’ or low use recreational land
- Design development to maximize the travel time of storm water over pervious, rough and/or fairly flat surfaces. (i.e., maximizing the use of rear lot drainage)
- Use of shallow grassy lined swales for storm water conveyance is recommended. They can be used beside roadways in conjunction with curbs, as well as for rear lot drainage. Subject to geotechnical engineer’s review and approval
- Utilizing inlets for temporary ponding and buried perforated pipe covered with porous material (granular or topsoil material) for infiltration may also be considered
- Ponds shall be terraced. Terrace shall be approximately 1.2 m deep
- Further design details and guidelines are available within the current version of the Stormwater Management Planning and Design Manual produced by the MOE.

3.3 Design Flows

3.3.1 Runoff Computations

The Rational Formula is to be used to determine the quantity of storm runoff. The use of other empirical runoff formulae must be approved by the municipality's engineer. The Rational Formula is:

$$Q = 2.78CiA$$

Where:

Q	=	Peak flow in L/s
A	=	Area in hectares
i	=	Average rainfall intensity in mm per hour for a duration equal to the time of concentration for a particular storm frequency
C	=	Runoff coefficient (see Section 3.3.5)

3.3.2 Drainage Area

The drainage area to be used in the design of a storm sewer system must include all those external areas which will reasonably or naturally drain to the development area.

The area term in the Rational Formula represents the total area tributary to the point on the storm sewer under consideration.

3.3.3 Rainfall Intensity

The rainfall intensity 'i', shall be determined from current applicable Environment Canada rainfall intensity duration frequency curves, applicable for the municipality (Prospect Hill, ON ID 6146745).

3.3.4 Design Storm Frequency

The design storm frequency shall be a 5-year storm for residential lands and a 5-year storm for industrial or commercial lands.

3.3.5 Runoff Coefficients

The value of runoff coefficient C, is to be taken from the following:

Asphalt or Concrete Surfaces	0.9
Roof Areas	0.9
Single Family Residential	0.40 to 0.45
Semi-Detached Residential	0.45 to 0.60
Apartments	0.60 to 0.75
Industrial	0.65 to 0.75
Neighbourhood Commercial	0.75 to 0.85
Playgrounds	0.2
Parks	0.2
Unimproved	0.2

3.3.6 Time of Concentration

The time of concentration is the time required for flow to reach a particular point in the sewer system from the most remote part of the drainage area. It includes not only the travel time in the sewers, but also the inlet time, or time required to flow overland into the sewer system. The inlet time shall be based on the table below, unless calculations indicate a shorter or longer time is applicable. Supporting calculations shall be submitted to the municipality's engineer for review.

Table 1: Time of Concentration

Average Runoff Coefficient (C)	Time of Concentration (min)
0.4	23
0.5	17.5
0.6	14.5
0.7	12.5
0.8	11.5
0.9	10.5

3.4 Storm Sewer Design

3.4.1 Flow Formula and Roughness Coefficient

The Manning Formula is to be used for calculating sewer capacity and selecting pipe sizes, and is as follows:

$$Q = 1/n \times A \times R^{2/3} \times S^{1/2}$$

Where:

Q	=	Flow capacity of sewer (m ³ /s)
A	=	Cross Sectional Area of Pipe m ²
R	=	Hydraulic radius of pipe
S	=	Sewer Slope m/m
n	=	Manning roughness coefficient

The Manning roughness coefficient (n) shall be as follows:

Smooth walled pipe	0.013
Corrugated metal pipe	0.024
Corrugated metal pipe with 25% paved inverts	0.020

3.4.2 Allowable Flow Velocities

Minimum velocity	0.90 m/s
Maximum velocity	6.0 m/s.

3.4.3 Minimum Pipe Sizes

- Storm sewers 250 mm
- Catch basin leads
 - Single 200 mm
 - Double 250 mm
- Connections 150 mm.

A decrease in pipe size from a large size upstream to a small size downstream will not be allowed regardless of grade increases.

3.4.4 Minimum Grades for Pipes

The minimum grades for storm sewers, flowing fully, based on "n" = 0.013 are as follows:

250 mm	0.56%
300 mm	0.44%
375 mm	0.32%
450 mm	0.26%
525 mm	0.21%
600 mm	0.18%
675 mm	0.15%
750 mm	0.13%
825 mm	0.11%
900 mm and larger	0.10%
150 mm connections	2.0%
200 mm catchbasin leads	1.0%

3.4.5 Depth of Cover

The minimum cover over catch basin leads shall be 1.2 m based on proposed finished grade. Main storm sewers shall be installed with a minimum of 1.5 m of cover. Shallower depths shall be analyzed on an individual project basis. All manhole frame and covers shall not be under wheel tracks.

3.4.6 Manhole Spacing

Manholes shall be placed at all changes in grade, changes in alignment (except for curvilinear sewers) and on straight runs at the following intervals:

- Sewers 375 mm in diameter or less 120 m
- Sewers greater than 450 mm 150 m.

3.4.7 Manhole Design

Manholes are to be designed in accordance with Ontario Provincial Standard Drawings and specifications. All sizing of precast manholes is to be based on incoming and outgoing pipe sizes and should be sized based on manufacturer's recommendations. Manhole frames and covers shall conform with OPSD 401.010.

Drop structures are required when the difference in invert elevations between the upstream and outlet sewers in the manhole is equal to or greater than 1.20 m. Drop structure to be as per OPSD 1003.020.

Manhole safety landings are required at the mid-point depth of the manhole, when the depth of the manhole is between 5.0 m and 10.0 m. Additional safety landings are required at third-point depths, when the manhole is equal to or greater than 10.0 m to 15.0 m deep. Safety landings to be as per OPSD 404.020.

A 150 mm minimum, 300 mm maximum (top of cap to bottom of frame and cover) of pre-cast adjustment units (OPSD 704.010) are to be installed on all manholes and catchbasins. The difference in grade between the manhole lid and the first ladder rung cannot exceed 450 mm. Ladder rungs/steps to be as per OPSD 401.010 or 401.020.

An appropriate "energy drop" is required at all manholes at which a change in direction of the sewer occurs. For bends of 45 degrees and 90 degrees, the minimum allowances for hydraulic losses incurred at a sewer manhole shall be 0.03 m and 0.06 m respectively.

All manholes require benching at the bottom of the manhole as per OPSD 701.021. Benching height to be either to springline or obvert based on headloss calculations to be provided by designer.

3.4.8 Separation of Sewers from Potable Water Lines

Storm sewers and watermains constructed parallel to each other should be constructed in separate trenches maintaining a minimum clear horizontal distance of 2.5 m. Separation requirements to conform with MOE Procedure 'F-6-1'.

3.4.9 Catch Basins

Catch basins shall be installed with 600 mm sumps.

Catch basins to be 1.5 m clear of any driveway curb depression.

With a normal 2% road crossfall either side of the centreline, the following maximum catch basin spacings will apply.

Table 2: Catch Basins

Road Gradient	Road Width	Maximum Spacing
0.35% to 0.5 % *	8.5 m	45 m
	15.0 m	40 m
0.6% to 3.0 %	8.5 m	90 m
	15.0 m	70 m
3.1% to 5 %	8.5 m	75 m
	15.0 m	55 m
5.1% to 6 %	8.5 m	60 m
	15.0 m	45 m

* 0.50% road gradient is the recommended minimum.

Where changes in gradient occur, the average gradient should determine the maximum spacing.

Double catch basins at all low points and/or curb inlet catch basins with overflow plates (OPSD 400.090). Overflow plates require a modified catch basin precast unit (600 mm x 840 mm). Engineer shall verify inlet capacity of grate inlet and adjust catch basin spacing accordingly. Adjustment units to conform with OPSD 704.010.

Catch basin types (DICB, TICB, CICB etc.) will be evaluated on an individual basis.

Catch basin frame and grates for 600 mm x 600 mm catch basins to conform with OPSD 400.020. Curb inlets in drive over curb locations should be recessed into the curb with a curb setback formed as a barrier curb transition section to accommodate the overflow plate.

3.4.10 Storm Sewer Gratings, Manhole Frames and Covers

Inlets and outlets of storm sewers which are accessible to the public shall be provided with protective gratings, for pipe sizes 450 mm or greater.

Metal lift rings to adjust manhole covers to finished grade are not permitted.

Manhole frame and covers are required for all manholes and shall conform with OPSD 401.010. Lockable or watertight manhole covers to be considered on a site specific basis.

3.4.11 Sewer Separation at Crossings

A minimum 150 mm clearance is required between outside pipe barrels at all pipe crossings. Where storm sewers cross sanitary sewers or watermains, separation requirements as per MOE procedure 'F-6-1' shall apply.

3.4.12 Sewer Easements

Standard sewer easements must be a minimum of 6.0 m wide for one sewer, 7.60 m wide for two sewers in the same trench and 9.0 m wide for two sewers in separate trenches.

3.4.13 Storm Sewer Outlets

Storm sewer outlets to existing or proposed trunk sewers, municipal drains or natural watercourses inside or outside the development will be installed by the developer. In no case will an outlet be allowed to discharge to a natural watercourse or municipal drain which does not have sufficient capacity for the proposed discharge. The developer will be required to ensure that development does not cause interference with the riparian rights of properties upstream or downstream from the development.

3.5 Materials for Construction

3.5.1 Storm Sewers

Pipe materials for storm sewers, catch basin leads and sewer connections shall be reinforced concrete or PVC and shall conform with OPSS standards. Alternative materials must be approved by the municipality. All catch basin leads shall be SDR35 PVC.

3.5.2 Manholes

Manholes are to be precast or cast-in-place concrete structures with cast iron frames and covers and shall be designed in accordance with OPSD and OPSS.

3.5.3 Catch Basins

Catch basins are to be precast or cast-in-place concrete structures with cast iron grates and shall be designed in accordance with OPSD and OPSS and shall have sumps.

3.5.4 Pipe Bedding, Cover Materials and Trench Backfill Materials

These materials shall be designed by the developer's geotechnical engineer and material type and composition requirements indicated on the plans.

4.0 SANITARY SEWERS

4.1 General

Where sanitary sewer outlets are available to service the development lands, sanitary sewers shall be provided for all of the lands in the development, and shall be located in the street right-of-way or in an approved easement. All lots and blocks in the development must be connected to the sanitary sewers.

Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) and MOE guidelines shall govern where applicable.

4.2 Hydraulic Design

4.2.1 Residential Flow

The following criteria shall be used in determining peak flows for sanitary sewer design for residential areas, including single and multiple housing etc.

Design Population

For purposes of estimating future sewage flow rates, reference should be made to the Official Plan. The Official Plan will contain future population densities and land uses.

Unless otherwise stated, a population density of at least 3.5 people per unit is to be used.

Average Daily Domestic Flow

Average daily domestic flow, exclusive of extraneous flows, shall be 400 L/cap.d.

Peak Rate of Flow

Peak domestic sewage flows to be calculated by the following equation:

$$Q(d) = PqM + I$$

Where:

$$Q(d) = \text{Peak domestic flow L/s}$$

$$P = \text{Design population}$$

$$q = \text{Average daily per capita domestic flow in L/cap.d.}$$

$$M = \text{Peaking factor derived from Harmon Formula}$$

$$I = \text{Unit peak extraneous flow in L/s/ha}$$

$$A = \text{Gross tributary area in hectares}$$

Harmon Formula:

$$M = 1 + \frac{14}{4 + P^{1/2}}$$

Where:

$$M = \text{Ratio of peak flow to average flow}$$

$$P = \text{Tributary population in thousands}$$

The minimum peaking factor is three.

4.2.2 Commercial and Institutional

Commercial and institutional flows should be based on historical records when available. Where no records are available, the preliminary unit values below should be used, exclusive of extraneous flows. For tourist and commercial establishments, a minimum flow of 28 m³/ha.d should be used in the absence of reliable flow data. Final unit flows will be negotiated with the municipality on a project by project basis.

Table 3: Commercial and Institutional Flows

Facility	Sewage Flow
Shopping Centres based on total floor area	2500 to 5000 L/1000 m ² day
Hospitals	900 to 1800 L/bed day
Schools	70 to 140 L/student day
Travel Trailer Park Minimum without water hook-ups Minimum with individual water hook-ups	340 L/space day 800 L/space day
Campgrounds	225 to 570 L/campsite day
Motels	150 to 200 L/bed space day
Hotels	225 L/bed space day

4.2.3 Industrial Flow

Peak sewage flow rates from industrial areas vary greatly with the extent, the type of industry, the provision of in-plant treatment or regulation of flows, and the presence of cooling waters in the discharge etc. In the absence of accurate flow data, the following preliminary sewage flow allowances may be used. Final unit flows will be negotiated with the municipality on a project by project basis.

- Light industry 35 m³/ha day
- Heavy industry 55 m³/ha day.

4.2.4 Infiltration

The infiltration rate into the sewers shall be taken as 0.20 L/sec/hectare for residential, commercial and industrial lands.

4.3 Sanitary Sewer Design

4.3.1 Flow Formula and Roughness Coefficient

The Manning Formula is to be used for calculating sewer capacity and selecting pipe sizes, and the roughness coefficient (n) of not less than 0.013 is to be used for smooth-wall pipe materials.

The Manning formula is as follows:

$$Q = 1/n \times A \times R^{2/3} \times S^{1/2}$$

Where:

- Q = Flow capacity of sewer (L/s)
- A = Cross Sectional Area of Pipe m²
- R = Hydraulic radius of pipe (D/4) (m)
- S = Sewer Slope m/m
- n = Manning roughness coefficient (unitless)

4.3.2 Allowable Flow Velocities

- Minimum velocity = 0.6 m/s
- Maximum velocity = 3.0 m/s

4.3.3 Minimum Pipe Sizes

- Sanitary sewers – 200 mm
- Private Drain Connections (PDC) – 125 mm

4.3.4 Minimum Slopes for Pipes

The minimum slopes for sewers, flowing fully, are as follows:

200 mm	0.40 %
250 mm	0.28 %
300 mm	0.22 %
375 mm	0.15 %
450 mm	0.12 %
525 mm	0.10 %
600 mm	0.08 %
675 mm	0.067 %
750 mm	0.058 %
125 mm Connections	2.0 %

* All sewers shall have self-cleansing velocities in accordance with the hydraulic elements graph referenced in the WPCF MOP #9.

4.3.5 Depth of Cover and Alignment

Sanitary sewers are to be located 1.5 m off centreline of street (i.e., 3 m offset from storm sewer) and are to be installed with a minimum depth of cover to the top of the sewer from the road surface of 2.5 m. Shallower depths shall be analyzed on an individual project basis. To allow for gravity drainage from basements, sewer inverts should normally be at least 0.9 m to 1.5 m below basements floor levels. All manhole frame and covers not under wheel tracks.

4.3.6 Manhole Spacing

Manholes shall be placed at all changes in grade, changes in alignment (except for curvilinear sewers) and on straight runs at the following intervals:

- Sewers 375 mm in diameter or less 120 m
- Sewers 525 mm or greater 150 m

4.3.7 Manhole Design

Manholes are to be designed in accordance with Ontario Provincial Standard Drawings and specifications. All sizing of precast manholes is to be based on incoming and outgoing pipe sizes and should be sized based on manufacturer's recommendations. Manhole frames and covers shall conform with OPSD 401.010.

Drop structures are required when the difference in invert elevations between the upstream and outlet sewers in the manhole is equal to or greater than 1.20 m. Drop structure to be as per OPSD 1003.020.

Manhole safety landings are required at the mid-point depth of the manhole, when the depth of the manhole is between 5.0 m and 10.0 m. Additional safety landings are required at third-point depths, when the manhole is equal to or greater than 10.0 m to 15.0 m deep. Safety landings to be as per OPSD 404.020.

A 150 mm minimum, 300 mm maximum (top of cap to bottom of frame and cover) of pre-cast adjustment units are to be installed on all manholes and catchbasins. The difference in grade between the manhole lid and the first ladder rung cannot exceed 450 mm. Ladder rungs/steps to be as per OPSD 401.010 or 401.020.

All manholes require benching as per OPSD 701.021. Benching height to be either to springline or obvert based on headloss calculations to be provided by designer.

The following minimum allowances shall be made for hydraulic losses incurred at sewer manholes:

- Straight run grade of sewer
- 45 deg. turn 0.03 m
- 90 deg. turn 0.06 m

4.3.8 Separation of Sewers from Potable Water Lines

Sanitary sewers and watermains constructed parallel to each other should be constructed in separate trenches maintaining a minimum clear horizontal distance of 2.5 m. Separation requirements to conform with MOE procedure 'F-6-1.'

4.3.9 Sewer Easements

All sewer easements must be a minimum of 6.0 m wide for one sewer, 7.60 m wide for two sewers in the same trench and 9.0 m wide for two sewers in separate trenches.

4.3.10 Sewer Connection Cleanouts

Municipal cleanouts (125 mm dia.) at property line are required on private drain connections (PDC's). Clean outs shall have metal caps 100 mm below finished grade.

4.3.11 Sewer Connection Types

Sewer connections shall be type I, II or III based on depth, see **Appendix B, 4.4** for detail. Connection of PDC's directly into manholes is not permitted.

4.4 Materials for Construction

4.4.1 Sanitary Sewers

Pipe materials for sanitary sewers and sewer connections shall be PVC or reinforced concrete and shall conform with OPSS standards. Alternative materials must be approved by the municipality.

4.4.2 Manholes

Manholes are to be precast or cast-in-place concrete structures with cast iron frames and covers and shall be designed in accordance with OPSD and OPSS. Metal lift rings to adjust manhole covers to finished grade are not permitted.

4.4.3 Pipe Bedding, Cover Materials and Trench Backfill Materials

These materials shall be designed by the developer's geotechnical engineer and material type and composition requirements indicated on the plans.

4.5 Sewer Testing For Leakage

Sanitary sewers shall not exceed the following permissible infiltration and exfiltration rates.

4.5.1 Exfiltration

Up to and including 900 mm diameter pipe

1.4 L per 25 mm of conduit barrel internal diameter, per 30 m of line length, per hour with a 0.6 m head of water above the highest pipe. The above rate is to be increased by 10% for every additional 0.6 m head.

Greater than 900 mm diameter pipe

2.3 L per 25 mm of conduit barrel internal diameter, per 30 m of line length per hour with a 0.6 m head of water above the highest pipe. The above rate is to be increased by 10% for every additional 0.6 m head.

Infiltration

(a) Up to and including 900 mm diameter pipe

1.1 L per 25 mm of conduit barrel internal diameter, per 30 m of line length, per hour.

(b) Greater than 900 mm diameter pipe

2.3 L per 25 mm of conduit barrel internal diameter, per 30 m of line length, per hour.

The above requirements for pipe sizes up to and including 900 mm in diameter conform to the minimum requirements as set by the Ontario MOE. The requirements for pipe sizes larger than 900 mm in diameter conform to the requirements of A.S.T.M. Designation C-443, latest edition.

5.0 WATER DISTRIBUTION SYSTEMS

5.1 General

Where a water supply is available to lands to be developed, the developer shall construct a water distribution system as part of the servicing requirements.

Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD), American Water Works Association (AWWA) and MOE shall govern where applicable.

5.2 Hydraulic Design

5.2.1 Design Water Demand

The water requirements in the design of the distribution system shall be based on the following four basic needs:

- Residential water demand
- Commercial and Institutional water demands
- Industrial water demands
- Fire demands.

Water systems shall be designed to satisfy the greater of either of the following demands:

- Maximum day plus fire flow (max day = 3.5 x avg. day)
- Peak rate (maximum hourly demand) (max hour = 7.8 x avg. day).

The maximum day demand is the average usage rate on the maximum day. The fire flow demand will vary with the size of the area and density of development and shall comply with: “Water Supply for Public Fire Protection - A Guide to Recommended Practice (latest edition)” as issued by Fire Underwriters Survey and Insurance Bureau of Canada (c/o Insurers’ Advisory Organization - Toronto). The peak rate demand is the short-term demand placed upon the system by usage other than firefighting. The peak rate demand is usually taken as the average water usage over the maximum hour.

5.2.2 Unit Consumption Rates

Residential Water Demands

For the purposes of design, the average daily per capita water demand shall be 400 L/cap.d. Peak usage rates for residential purposes will vary in accordance with the guidelines published by the MOE.

Commercial and Institutional Water Demands

Commercial and institutional flows shall be based on historical records when available. Where no records are available, the preliminary unit values below shall be used. For tourist and commercial establishments, a minimum flow of 28 m³/ha.d. shall be used in the absence of reliable flow data. Final unit values will be negotiated with the municipality on a project by project basis.

Table 4: Commercial and Institutional Water Demands

Facility	Water Usage (avg. daily)
Shopping Centres based on total floor area	2000 to 4500 L/1000 m ² day
Hospitals	800 to 1600 L/bed day
Schools	60 to 130 L/student day
Travel Trailer Parks Minimum without water hookups Minimum with individual water hookups	320 L/space day 750 L/space day
Campgrounds	220 to 565 L/space day
Motels	125 to 175 L/bed space day
Hotels	200 L/bed space day

For estimation of peak demand rates, an assessment of the water using fixtures is generally necessary and a fixture-unit approach is required. A peak rate factor of four will apply to campground areas.

Industrial Water Demands

Peak water demand, from industrial areas, varies generally with the extent and type of industry. In the absence of accurate flow data, the following preliminary flow allowances shall be used. Peak

usage rates will generally be two to seven times the average usage rate. Final unit rates will be negotiated with the municipality on a project by project basis.

- Light industry 35 m³/ha. day
- Heavy industry 55 m³/ha.day.

Fire Demands

The minimum fire flow shall be determined on a project by project basis. The system must be simultaneously capable of satisfying the maximum day demand.

5.3 System Pressure

5.3.1 Minimum Operating Pressures

The distribution system shall be sized so that under maximum hourly demand, the pressures are not less than 275 kPa. Under conditions of simultaneous maximum day and fire flow demands, the pressure shall not be less than 140 kPa.

5.3.2 Transient Pressures

The distribution piping system shall be designed to withstand the maximum operating pressure plus the transient pressures to which it will be subjected. Transient pressures are caused by rapid valve operation, pump start-up and shut-down, power failures, etc.

As a minimum allowance in the distribution system, the pipe and joint strength shall be such that it can withstand the maximum operating pressure plus the pressure surge that would be created by instantaneous stoppage of a water column moving at 0.6 m/s.

5.4 Friction Factors

The Hazen-Williams Formula shall be used in the design of water distribution systems. The following Hazen-Williams "C" values shall be used for the design of water distribution systems, regardless of materials.

Table 5: Friction Factors

Diameter	C-Factor
150 mm	100
200 mm/250 mm	110
300 mm/600 mm	120
Over 600 mm	130

5.5 Minimum Pipe Sizes

5.5.1 Watermains

The minimum size of watermain shall be 150 mm except for the following cases:

- Beyond the last hydrant on cul-de-sacs (50 mm min)
- Extension of dead-ends in rural areas (50mm min).

5.5.2 Water Services

The minimum pipe size for water service connections is 20 mm.

5.6 System Layout

5.6.1 Grid Design

The water distribution system shall be designed to eliminate dead-end sections. Where dead-end mains cannot be avoided, the section shall be provided with a fire hydrant or blow-off.

5.6.2 Valve Placement

In residential developments, valves shall be located so that any section of watermain serving up to a maximum of sixty residential water services can be isolated by operating not more than four valves. Phasing of developments should be considered and valving should be logical (i.e., at intersections). In residential areas, valves shall be spaced no more than 250 m apart.

All valves are to open clockwise.

5.6.3 Hydrant Requirements

In residential areas, the line spacing for hydrants shall be not greater than 150 m. For areas other than residential, spacing will be determined on a project by project basis.

Fire hydrants must be installed only on watermains capable of supplying fire flow requirements. The hydrant leads shall be 150 mm diameter pipe. Location and number of hydrants is subject to the approval of the engineer/water manager.

5.6.4 Depth of Cover

The minimum depth of cover over watermains and service connections shall be 1.7 m.

5.6.5 Cross-Connection Control

No connection shall be made between a municipal water system and any well or private water system.

All water services shall have a backflow preventor, a pressure reducing valve (PRV), water service and meter installed by a licensed plumber. These materials are to be provided by the municipality as part of municipal requirements at the cost of the owner.

5.7 Pipe Design

5.7.1 Pipe Materials

The following is acceptable material for new watermains:

- Polyvinyl Chloride AWWA C900
- High Density Polyethylene in some instances i.e., rural areas, river crossings.

Additional pipe materials may be submitted by the developer for review by the municipality's engineer.

Pipe class and type of material shall be submitted to the municipality for approval. A solid 12 gauge two copper tracerwire must accompany the full length of the watermain for locating purposes. Cathodic protection shall be provided.

5.7.2 Restraints

Adequate restraint shall be provided to prevent pipe movement and to prevent joint failure by jointing methods or thrust blocking capable of resisting the forces involved. Restrain lengths for watermains 100 mm to 300 mm shall be in accordance with the requirements outlined below. Restrained length calculations for watermains 400 mm and greater shall be supplied by the pipe manufacturer.

Table 6: Restraints

Diameter of Main (mm)	Minimum No. of Steel Rods	Minimum Length to be Restrained on Each Side of Fittings (m)				
		11 ^{1/4} °	22 ^{1/2} °	45°	90°	Dead End
100	2	4.0	4.0	4.0	4.0	20
150	2	4.0	4.0	4.0	5.5	20
200	2	4.0	4.0	4.0	7.0	20
250	4	4.0	4.0	4.0	8.5	30
300	4	4.0	4.0	4.0	10.0	30

5.7.3 Bedding and Backfill

Bedding and backfill requirements shall be consistent with the pipe material, class and soil conditions in the installation location.

5.8 Appurtenances

5.8.1 Hydrants

All hydrants shall be the dry barrel type manufactured in accordance with the latest requirements of AWWA C502. Hydrant directional operation will be to open clockwise and be three-way with steamer port STORZ connection.

The following is acceptable for new hydrants:

- Canada valve – century or approved equivalent.

5.8.2 Valves and Valve Chambers

All valves to be used on the water distribution system and secondary valve on fire hydrants shall be as follows:

- Gate valves shall be manufactured in accordance with the latest provisions of AWWA C509, suitable for direct burial with resilient seats and stainless steel nuts and bolts
- Gate valves 300 mm in diameter or larger shall be installed in precast valve chambers with features as directed by the municipality. All smaller valves shall have suitable valve boxes
- Valve directional operation will be to open clockwise.

5.8.3 Water Services

Water services shall be a minimum of 20 mm (3/4”) internal diameter and shall be equipped with approved corporation stop and curb stop with stainless steel rod and pin and 20 mm hexagonal brass cap plug. Service pipe shall be polyethylene Series 160 complete with 12 gauge tracer wire. All services shall be connected to PVC watermains using stainless steel broad band saddles. Hydro services shall not be grounded to water services.

5.9 Water Sampling Stations

Required location of water sampling stations will be determined by the municipality. Water sampling stations shall be installed according to detail W-7 located in **Appendix B, 5.1**.

5.10 Acceptance of Work

5.10.1 Pressure and Leakage Test

The distribution system and services shall be back flow protected and pressure-tested to 1050 kPa for a period not less than two hours. All leaking joints, fittings or appurtenances shall be tightened and all defective materials shall be removed and replaced. The maximum allowable leakage is

1.85 L per day per mm of diameter, per km of length and all necessary steps to reduce the leakage to the allowable amount shall be taken.

When the installation is completed and the leakage test and pressure test results are satisfactory, the system shall be thoroughly swabbed and flushed to remove all debris and unwanted material. The system shall be disinfected using a chlorine solution maintained at a minimum concentration of 50 mg/l throughout the length of the pipeline. The residual concentration at the end of 24 hours shall be at least 25 mg/l. If tests of the solution are satisfactory, the contents of the pipeline shall be flushed out completely and recharged by municipal water. Samples of the recharge water in the system shall be analysed for contamination and the system shall not be put into operation until test results indicate no contamination. Disinfection procedures shall be repeated as necessary.

All testing and disinfection shall be carried out by the developer in the presence of the municipality's representative and in accordance with current provincial regulations.

5.10.2 Valve Boxes and Curb Boxes

The top of all valve boxes and curb boxes must be set to finished grade. Curb boxes must be set plumb and be 150 mm to 300 mm from the street line toward the centreline of the road.

5.10.3 Hydrants

Hydrants are to be set plumb, with nozzles parallel to edge of pavement or curb line, and pump connection facing pavement.

Flange at base of hydrant is to be set 50 mm to 100 mm above finished grade.

6.0 ROADS

6.1 General

Paved roads and concrete curbs and gutters shall be provided in the development. Existing street allowances, which provide access to the development shall be constructed or improved as determined by the municipality's engineer.

Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD), Municipal Engineer’s Association (MEA) guidelines, Transportation Association of Canada and Ministry of Transportation guidelines shall govern where applicable.

6.2 Design

In general, the following design criteria shall be used unless otherwise approved by the municipality’s engineer.

6.2.1 Pavement Widths and Right-of-Way Widths

The following outlines right-of-way widths, pavement widths (edge of pavement to edge of pavement) for the various street classifications.

Table 7: Pavement Widths and Right-of-Way Widths

Lane Type	Driving Lane	Parking Width	Min. Total Width	Right-Of-Way
Local Residential	3.0 m	2.5 m	8.5 m	20 m
Industrial Commercial	3.5 m	2.5 m	9.5 m	20 m to 26 m

The street classification will be determined by the municipality’s engineer.

6.2.2 Minimum Road Gradients

The minimum allowable road gradient is 0.5% and maximum is 5% (8% absolute). In the case of curves, the minimum gradient applies to the longest gutter (minimum grade at intersection curb radii 0.8%). Vertical curves are required where the algebraic difference in grades is greater than 1.0%. Minimum length of vertical curve shall not be less than 45 m.

6.2.3 Standard Geometrics

Table 8: Standard Geometrics

	Minor Local	Local
No. of Units	<25	<100
Traffic Volume (AADT)	<200	<1000
Minimum Boulevard Width	3.15 m	3.15 m
Minimum Cul-de-Sac Pavement Radius (residential)	15.0 m	15.0 m
Minimum Cul-de-Sac Radius at property line (residential)	19.0 m	19.0 m
Minimum Stopping Sight Distance	60.0 m	60.0 m
Pavement Crossfall	2.0 %	2.0 %
Subgrade Crossfall	3.0%	3.0%

6.2.4 Standard Road Structure

Table 9: Standard Road Structure

	Minor Local	Local
Pavement Thickness*		
Hot Mix Asphalt	75 mm	90 mm
Granular "A"	150 mm	150 mm
Granular "B"	250 mm	300 mm
Maximum allowable beam deflection (Benkleman)	2.5 mm	1.8 mm

* Minimum requirements in the absence of a Geotechnical Engineer's report.

Off-site road improvements (existing street widenings, turning lanes, tapers, traffic island, signals, sidewalks etc. including traffic studies etc.) will be determined on a project by project basis.

6.2.5 Intersection Radii

The minimum radii at edge of pavement required at intersections are:

Table 10: Intersection Radii

Street Classification	R.O.W. Widths	Minimum Radius
Local to Local	20 m 20 m	9.0 m residential 11.0 m industrial
Local to collector Collector to local	20 m 20 m	9.0 m residential 11.0 m industrial

6.2.6 Street Patterns

Where possible:

- Intersecting streets at right angles
- No jogged intersections
- Intersections not closer than 60 m (200 ft)
- Avoid long cul-de-sacs
- Minimize through traffic.

6.2.7 Curb and Gutter

Barrier concrete curb and gutter on major streets (OPSD 600.010), mountable on minor streets (OPSD 600.100). Alternative curb types will be considered by the municipality. All curbs shall be in accordance with OPSS and OPSD Specifications. All curb cuts shall be installed at the time of construction and locations shall be in accordance with driveway location standards.

6.3 Materials for Construction

6.3.1 Concrete

Concrete curb and gutter is to be placed on a Granular "A" base of not less than 50 mm thick. Concrete is to be 25 MPa at 28 days and air entrainment capabilities of 6% +/- 1%. Contraction joints are to be provided every 3 m. Expansion joints every 9 m, on both sides of catch basins and at the

beginning and end of circular curves. The use of asphaltic concrete curb will not be permitted. General specifications for concrete shall be according to OPSS. A mix design shall be submitted to the municipality's engineer for approval.

6.3.2 Asphalt

General specifications for asphalt shall be to OPSS 310 and 1150. Granulars used in asphalt shall conform to OPSS. Tack coat required between base and surface courses to OPSS and OPSD.

6.3.3 Granular "A"

Granular "A" shall conform to OPSS 314 and 1010. Granular "A" shall be compacted in roadways to 100% standard proctor maximum dry density. Sieve analysis shall be performed on the proposed material to ensure conformance with the specification before the material is placed on the roadway.

6.3.4 Granular "B"

Granular "B" shall conform to OPSS 314 and 1010. Granular "B" shall be compacted in roadways to 100% standard proctor dry density. Sieve analysis shall be performed on the proposed material to ensure conformance with the specification before the material is placed on the roadway.

6.4 Construction

6.4.1 Trench Compaction and Subgrade Compaction

All sewer water and utility trenches within the roadway shall be compacted to at least 95% standard proctor dry density up to 1 m below finished road grade and 98% up to subgrade level.

The subgrade shall be proof rolled and compacted to at least 98% standard proctor dry density. Imported materials for subgrade shall be compacted to at least 98% standard proctor dry density.

All topsoil shall be removed under roadways and curb and gutters. All subgrade to be approved by a geotechnical engineer.

Provide sub-grade drainage (sub-drains) at all catch basins (3 m both side at sumps and 3 m upstream side all others).

6.4.2 Boulevard Grading

All boulevards between the curb and street line shall be fine graded. The slopes on boulevards shall be not less than 3% and not greater than 8%. All debris, rubbish and junk shall be removed from the street right-of-way before final acceptance of the subdivision.

6.5 Street Name Signs

Street name signs are to be located on the southwest corner of all street intersections unless otherwise specified. Street signs shall be mounted on separate poles from regulatory signs. The street sign poles shall generally be on the opposite side of the street from regulatory signs. At “tee” intersections, where it is not possible to locate a street sign on the southwest corner, the street sign poles shall generally be located across the intersection opposite the centreline of the intersecting street.

Regulatory sign posts shall be hot dipped galvanized steel or 100 mm x 100 mm pressure treated sign posts. Street sign posts shall be 60 mm (2 3/8”) diameter minimum, galvanized steel posts approximately 3.4 m (11’) long or longer if required. Posts shall be embedded in concrete (wood) or driven into the ground (steel) to a depth of at least 1.0 m (3.3’). Regulatory signs, post locations and sign mounting heights shall be in accordance with the Highway Traffic Act and Regulations (latest version). Metal posts, regulatory traffic signs and street signs shall be as supplied by Owl Light Trillium, Clemmer Industries Ltd., Fortran Traffic Systems Limited or approved equal. In general, street signs shall be centre-mounted on top of posts. However, at major intersections the Municipality shall require street signs to be mounted on street light poles (see below). In general, the mounting height of street signs (from ground to bottom of sign) shall be 2.3 m to 3.3 m (7.5’ to 10.8’).

Except as noted below, street name plates shall be extruded aluminum blades with heat activated application of “engineering grade” reflective vinyl to the blank. Lettering shall be reflective white on a reflective blue background with lettering on both sides of the sign.

At intersections with traffic islands and/or signalized intersections, the municipality may require street signs to be installed at more than one corner of the intersection and/or at traffic islands/medians. In these situations, the municipality may require street signs to be mounted on street light poles. These signs shall be fabricated from flat, heavy gauge (0.8”) aluminum sign blanks with reflective white lettering on a reflective green background on one side of the sign, and

shall be mounted to light poles with two centre hole brackets and 3/4” x 0.02” thick stainless steel strapping.

Lettering shall be done by the heat application of die cut letters or by the heat-fixed screening process where the quantity of signs having the same name exceeds five, subject to the approval of the municipality. Lettering shall be upper case standard block condensed style. Lettering size and sign blank height shall be as follows:

- Local/collector streets
- 150 mm (6”) high sign blank
- 75 mm (3”) high street name
- 50 mm (2”) high ST., AVE., etc.

Street name signs and traffic signs satisfying the requirements of the municipality, county and MTO shall be located in accordance with MTO criteria.

In most cases, all new signage is to be provided by the municipality at the developer’s expense.

6.6 Sidewalks

The municipality will determine where sidewalks are required to be installed at the developer’s expense.

Sidewalk shall be:

- On both sides of all collector streets
- On both sides of any street on which a school property fronts
- On one side of local residential streets, except culs-de-sac and crescents which contain less than twenty residential units
- On both sides of streets abutting parkland (each situation to be considered on a case by case basis)
- Have a thickness of 100 mm, 125 mm in driveways, 150 mm with reinforcing in industrial entrances
- 30 MPA concrete
- Such that the profile carries through driveways.

Sidewalks and curbs shall be depressed at street intersections to meet barrier free requirements. Sidewalks shall be installed in conjunction with curb installation and prior to driveway construction, final lot grading and boulevard restoration.

6.7 Acceptance of Work

6.7.1 Concrete

The developer shall provide compressive cylinder test results from a geotechnical engineer for concrete used in the work. Such testing shall be performed by a recognized testing company. Visual inspection and impact hammer tests may be made on the concrete by the geotechnical engineer.

The municipality's engineer may also require tests by coring and taking compressive, petrographic and entrained air tests on the cores obtained. Provided that no defective work is indicated by such inspections, the whole cost of coring and testing shall be borne by the developer.

6.7.2 Pavements - Evaluation of Pavements

Specifications for asphalt shall adhere to the following:

The developer shall provide test results from a geotechnical engineer for asphalt used in the works. The testing shall be performed by a recognized CSA certified testing company. The testing required should include compaction testing and sampling and testing to ensure the marshall mix design conforms to the limits specified in the approved mix design.

Mix designs are the responsibility of the developer and must be approved by the municipality and conform to OPSS.

The applicable OPS Specifications are 310 and 1150.

Indicate the intended year for placing base and surface asphalt for the project.

Proposed mix designs submitted for review by the contractor/supplier should include the relevant backup information including recent quality control test data confirming that this production mixture is conforming to the mix design.

Sampling during paving should be carried out by or under the direction of the municipality. Testing for asphalt cement content and aggregate gradation would then be carried out by a recognized designated laboratory which should be certified by the Canadian Council of Independent Laboratories for bituminous testing, Type B category. All costs associated with initial testing, and successful testing on the second representative sample is borne by the owner. All costs associated with the failed second sample re-testing, further investigation (testing and subsequent testing), and remedial measures to correct outstanding deficiencies, will be charged to the contractor.

Asphalt Cement Payment Adjustment

The contract administrator shall make an Asphalt Cement Payment Adjustment to reflect OHMPA formula which states:

The payment adjustment per tonne will apply to the quantity of asphalt cement in the hot mix accepted into the work during the month for which it is established. The payment adjustment for the month will be calculated by the following:

- **When asphalt cement prices are rising** by more than a \$15.00/tonne difference: The payment adjustment to be paid to the contractor is the result of subtracting the price index when the tender closed from the price index when paving took place, minus the \$15.00 float, multiplied by the number of tones of PGAC incorporated in the mix(s) as determined by the job mix formula. If the answer is negative, no adjustment is made
- **When asphalt cement prices are falling** by more than a \$15.00/tonne difference: the payment adjustment made in favour of the owner is the result of subtracting the price index when paving took place, plus \$15.00 from the price index when the tender closed, multiplied by the number of tonnes PGAC incorporated in the mix(s) as determined by the job mix formula.

Link to MTO asphalt cement price index:

<http://www.ohmpa.org/acpi/acpiView.asp>

A mark up on the payment adjustment will not apply to the asphalt Cement Payment Adjustment. The municipality may, at their cost, require the contractor to obtain nominal 100 mm dia. cores of the compacted hot mix to verify the thickness of the layer(s). Holes made by the removal of such samples shall be filled with the specified hot mix and compacted.

7.0 DEVELOPMENT GRADING

7.1 General

All development shall be graded in accordance with the following specifications. General and individual lot grading plans shall be prepared by the developer's engineer and approved by the municipality along with the subdivision servicing drawings.

7.2 Lot Grading Details

- Yard surfaces shall have a minimum of 2%
- Drainage flows shall be directed away from houses
- Drainage flows which are carried around houses are to be confined in defined swales located as far from the house as possible
- Desirable swale depth to be 300 mm. Minimum swale depth to be 200 mm. Maximum swale depth to be variable, but dependent on location and safety considerations
- Swale width: 1.8m (2.0m from property line)
- Grades:
 - Minor swales (providing drainage for up to four lots) minimum grade shall be 2% (in special cases, 1%) with underdrainage
 - Major swales (providing drainage for more than four lots) minimum grade shall be 1.5%.
- The maximum flow allowable in a side yard swale shall be that from four backyards
- The maximum flow in rear yard swales shall be that from ten to fifteen backyards depending on lot size and grade. The maximum length of a rear yard swale without outlet shall be 90 m. The maximum area contributing to the rear yard swale shall be 0.5 hectare. No rear yard swales may be discharged onto the road allowance
- No front yard catch basins shall be allowed
- Driveways: Optimum grade: 3% to 4%
Maximum grade: 10% (optimum max. 8%)
Walks: Optimum cross slope: 2%
- Maximum slope ratio for all terraces and banks shall be 3:1 (3 horizontally to 1 vertically)
All other site areas: Optimum gradient: 4%
Minimum gradient: 1%
- Where retaining walls are required, they shall be placed on private property unless otherwise approved by the municipality

- The minimum height of basement openings (i.e., basement window sills) shall be 300 mm minimum above finished road centreline elevation unless otherwise approved by the municipality (such as with rear yard “walk-out” basements).

7.3 Area Grading

The development area grading shall have a self-contained grading design and a major:minor overland flow direction to a maximum depth of 300 mm on the road and 450 mm off the roadway, and acceptable public outlet.

As a condition of obtaining building permits, builders shall be required to submit site plans with sufficient detail and elevations in accordance with the requirements of “Subdivision Requirements Checklist” (**Appendix A**) and in accordance with the approved development grading plan. Further, builders will be required to submit to the municipality lot grading certificates, signed and sealed by a professional engineer/Ontario Land Surveyor at two stages of construction:

- Top of footing or top of foundation
- Finished grading.

Each certificate shall provide certification that the appropriate stage has been constructed in accordance with the approved plans, prior to construction proceeding to the next stage.

Lot grading plans on infill lots may be prepared by a professional engineer or an Ontario land surveyor.

See “Typical Lot Layout Data”, in **Appendix B, 7.2 and 7.3**, plus checklist in **Appendix A**. Lot Grading Plans must be certified by an Ontario Land Surveyor (OLS) or engineer and submitted to municipality prior to occupancy.

8.0 PARKLAND/LANDSCAPING

8.1 General

When open space or parkland dedication is required pursuant to the Planning Act or the Development Agreement, the areas so designated shall be identified on the development plans with

sufficient details, notes and typical sections as may be required to identify lot grading, drainage, landscaping, access and other details as may be required. The developer shall grade, topsoil, seed, landscape and otherwise prepare the parkland and open space areas to a condition which is acceptable to the municipality for assumption. Access for maintenance must be incorporated into the layout.

8.2 Passive and Active Recreational Uses

The design and site preparation of the parkland and open space shall take into account the intended and future passive and/or active recreational uses in accordance with the municipality's requirements. Where possible, natural features including topography, vegetation, trees, soil conditions, watercourses, drainage and orientation to sun and wind, should be carefully considered in the design/layout of the parkland areas. The shape of the site must be suitable for the future layout of official sized sports fields if active usage is required. Narrow strips and triangular pieces of land are generally not acceptable. Natural wooded areas, stream and creeks may be considered on an individual basis and may be desirable where organized recreation uses are not suitable. Boggy lands are generally not acceptable for park purposes except where the area can be defined as a conservation type park area subject to the approval of the municipality. Open water courses are generally not acceptable for proposed active playground areas.

8.3 Site Clearing and Security

No topsoil shall be removed from the site. The parkland and open space areas shall be fenced or otherwise made secure during land development and house construction activities to prohibit the removal of topsoil and the dumping of debris and unauthorized fill.

All rubbish, rocks, boulders, tree stumps and other debris shall be removed from the site. The burning or burying of such materials on the site shall be permitted only if approved by the municipality. Dead trees shall be cut and stumps removed. Trees which are to remain shall be adequately protected during land development.

8.4 Site Grading/Drainage

Park drainage and grading plans shall be submitted to the municipality at the same time as the servicing drawings and shall meet the following minimum standards.

8.4.1 Drainage

- Drainage of parkland dedications shall be self-contained such that areas drain to channels or swales which outlet to catch basins and storm sewers or other suitable outlet, so that park drainage does not adversely affect other properties
- Swales should have gently sloping sides and should be used wherever possible rather than steep sided ditches. The minimum slope of channel and swale inverts shall be 1%. Maximum sideslope permitted is 4:1
- Maximum depth to bottom of channel shall be 1 m. Minimum depth of swale shall be 200 mm
- Except for natural watercourses, in general, catch basins shall be provided in open channels and swales at maximum intervals of 100 m
- Swales or open ditching shall not cross the entrance way into the park area
- Natural wetland areas may require special attention and preservation.

8.4.2 Grading

- In general, the minimum grade for grassed areas shall be 1%. However, areas to be developed for future soccer or baseball facilities may have grades less than 1%. Subsurface drainage may be required
- Grassed slopes shall not have gradients steeper than 4:1 so as to allow safe use of moving equipment
- All lands must be satisfactorily graded before the lands will be accepted by the municipality for park purposes
- Grading or natural contours which result in undrained areas are not acceptable. If overland drainage cannot be modified, catch basins and pipe will be required
- The developer shall do all rough grading and filling where required, under all landscaped areas, to establish the sub-grade parallel to the finished grades indicated on the grading plans, to allow sufficient topsoil depth. All soft and unstable areas below sub-grade, shall be excavated and filled with compacted select fill material
- All areas shall have uniform slopes between points for which finished grades are indicated on the plans or between such points and existing grades. Grades shall be smoothly rounded at top and toe of slopes
- Sub-grade shall be scarified to minimum depth of 75 mm to produce an even, loose textured surface free of all stones, roots, branches, etc. larger than 50 mm in diameter

- Topsoil shall be loose textured and free of all stones, roots, branches, etc. larger than 50 mm in diameter
- The minimum depth of topsoil under seeded areas shall be 150 mm. When additional topsoil exists on site, it shall not be removed from site, but shall be used to increase overall finished topsoil depth, or to construct other landscaping features proposed.

8.5 Seeding

Prior to seeding, an approved formulation of appropriate fertilizer shall be applied at the approved manufacturer's recommended rate to initiate leaf growth and root development. Grass seed shall be a certified seed, meeting the requirements of The Seeds Act for Canada No. 1 Seed. It shall be a mixture which is suitable for the soil conditions, etc. of the site. The seeding periods, in order of preference are:

- August 15 to September 15
- Early spring to May 30.

At the time of inspection for acceptance, grass shall be well established and in vigorous growing condition. Unacceptable areas shall be reseeded by the developer. The developer shall regularly mow the grass after good growth has been established and shall control weeds as required, prior to assumption of the site by the municipality.

8.6 Walkways

Where walkways are required through parklands, they shall be 1.5 m wide and constructed of a 150 mm depth of well-compacted chip and dust over geotextile fabric.

8.7 Fencing

Where permanent fencing is required within or along parkland boundaries, it shall be 1.8 m high and shall meet material specifications as approved by municipality on a project by project basis.

8.8 Tree Planting

Where possible, mature healthy trees should be preserved. The subdivision plans and park land plans should clearly indicate existing wooded areas and/or single trees where appropriate, and shall indicate those trees/areas to be preserved.

If required by the development agreement, the developer shall plant trees at the standard location 1.5 m behind property line, on private property, at an approximate spacing of 20 m (one tree per residential lot). Species of trees are subject to the approval of the municipality.

If required by the development agreement, the developer shall establish a buffer zone of trees to abut a road allowance to separate and screen non-compatible land uses. Such buffer zones in road allowances shall consist of a continuous row of trees in a location specified by the municipality. In all cases where tree planting is required, the development plans shall clearly indicate on the park land plans or separate landscaping plans, the tree type, size, spacing, location etc.

Planting, staking, watering, pruning and maintenance of new plant stock shall be the responsibility of the developer until such time as the development is assumed by the municipality.

New plant stock shall satisfy the following minimum standards:

- Deciduous trees:
 - 2.5 to 3.0 m (8 ft to 10 ft) in height
 - 50 mm in calliper (measured at 300 mm above the ground)
 - Well branched.
- Coniferous trees:
 - 1.0 to 1.5 m (3ft to 5 ft) in height.
- Shrubs:
 - 1.0 m at time of planting
 - Closely spaced (when used for screening).

Plant stock shall be carefully planted in accordance with standard nursery practice and the detail and drawings included with the approved development plans. Plantings shall be done during periods suitable with respect to local weather conditions and established horticultural practice.

9.0 STREET LIGHTING

9.1 General

All subdivisions shall be provided with streetlights as required by this section. Lighting systems shall be designed in accordance with the “Guide for the Design of Roadway Lighting” as published by the Roads and Transportation Association of Canada and the “Electrical Engineering Manual, Electrical Design – Volume 1” as published by the MTO.

9.2 General Lighting Requirements

In general, street lighting shall be high pressure sodium luminaries with posts located opposite the lot lines perpendicular to the street, where possible. The first light poles should be installed to a maximum of 10 m (33’) from the curb of the intersecting streets.

Poles may be base mounted or direct burial type. The developer’s engineer shall be required to provide details, specifications of the proposed lighting system and materials including engineer’s detail drawings of concrete bases and/or pole embedment. Where direct buried poles are approved for use, the municipality may require concrete embedment to ensure that poles are securely installed. See OPSD 2200.01, 2225.01, and 2230.01 for concrete footing and “direct buried” details.

Underground wiring for street lighting shall be used.

The following are recommended general lighting requirements and are to be read in conjunction with the Typical Cross-Sections in **Appendix B** for road width and pole location:

- Residential:
 - Mounting height: 5.5 m (18.0’)
 - Lamp: 100 Watt LED Lamps
 - Pole spacing: 30 m (100’)
- Commercial:
 - Mounting height: 8 to 10 m (25’ to 33’)
 - Lamp: 100 Watt LED Lamps
- Industrial:
 - Mounting height: 12 m (40’)

- Lamp: 150 Watt LED Lamps
- Pole spacing: 50 m (165')

9.3 Design Criteria

The following are recommended standards. Pole spacing, mounting height, etc. may vary with such conditions as staggered pole arrangements, intersections, cross walks, turning lanes and median mounting.

The following illumination criteria should also be considered in conjunction with averaging factors, extent of lighting coverage, luminance levels, glare, etc. The developer's engineer may be required to submit photometric data for lighting system design, particularly for collector and arterial streets.

9.4 Pedestrian and Bikeway Design Criteria

The lighting of streets with pedestrian sidewalks and/or bikeways included as part of the right of way, particularly in urban and suburban areas, differs from that of limited access high speed roadways. The driver's tasks include seeing objects in the roadway as well as pedestrians, parked cars and other elements. The purpose and benefits of the lighting system also include pedestrian lighting, security lighting, building façade lighting, and overall aesthetic impact on the community.

Design efforts must include the integration of the lighting system into the surrounding areas as well as consideration for its impact on buildings and pedestrians. Other specialized equipment is often required to interface with the street furniture.

This section addresses the lighting needs of adjacent pedestrian and bikeway areas only when the roadway is continuously illuminated. Roadway system with various elements often included within the right of way. Both the recommendations included in this section as well as those for the roadway included in prior sections should be evaluated. Refer to the ANSI/IESNA manual Page 8 Roadway Lighting Section 3.5.

Table 11: Pedestrian and Bikeway Design Criteria

Road and Pedestrian Conflict Area		Pavement Classifications (Minimum Maintained Average Values)			Uniformity Ratio	Veiling Luminance
Road	Pedestrian Conflict Area	R1 lux/ftc	R2 & R3 lux/ftc	R4 lux/ftc	E_{avg}/E_{min}	L_{vmax}/L_{avg}
Freeway Class A		6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Freeway Class B		4.0/0.4	6.0/0.6	5.0/0.5	3.0	0.3
Expressway	High	10.0/1.0	14.0/1.4	13.0/1.3	3.0	0.3
	Medium	8.0/0.8	12.0/1.2	10.0/1.0	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Major	High	12.0/1.2	17.0/1.7	15.0/1.5	3.0	0.3
	Medium	9.0/0.9	13.0/1.3	11.0/1.1	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Collector	High	8.0/0.8	12.0/1.2	10.0/1.0	4.0	0.4
	Medium	6.0/0.6	9.0/0.9	8.0/0.8	4.0	0.4
	Low	4.0/0.4	6.0/0.6	5.0/0.5	4.0	0.4
Local	High	6.0/0.6	9.0/0.9	8.0/0.8	6.0	0.4
	Medium	5.0/0.5	7.0/0.7	6.0/0.6	6.0	0.4
	Low	3.0/0.3	4.0/0.4	4.0/0.4	6.0	0.4

9.5 Decorative Street Lighting

For subdivision areas exceeding 20 ha (50 ac), decorative street lights and poles may be used. Where decorative street lighting is used, the developer shall provide the municipality with additional fixtures and poles for stockpiling purposes, at the rate of 5% of the number used in the subdivision.

Decorative street lights shall have 100 Watt HPS bulbs for local residential and commercial applications. Luminaire housings and poles shall be finished black or nostalgia bronze. Mounting height shall be 5.5 m for local residential applications.

- Luminaires shall be post top mounted:
 - King Luminaire K601, LED Post Top
 - Philips Lumec LED Post Top
 - Or approved equivalent.
- Poles shall be:
 - Powco Steel Products Limited octagonal steel Series 7000 (direct burial or base mounted)

- PoleCo SRSM4 or SRSM5 for straight round steel 4” or 5” base mounted poles
- Or approved equivalent.

9.6 Local Residential Street Lighting

For local residential street lighting where nostalgia type street lights are not used, street lighting shall be as follows or approved equal:

- Post top luminaries shall be:
 - King Luminaire LED – Type 100 Watt LED Lamps, Type III, Type V
 - Philips Lumec – Type 100 Watt LED Lamps, Type III, Type V.
- Poles shall be:
 - Pole-Lite Ltd., Tapered (4x6) Aluminum Lighting Pole PRT-64-18-188 (direct buried on base mounted)
 - PoleCo Limited round tapered aluminum poles, direct buried or base mounted, 18’ 0” mounting height.

9.7 Collector, Commercial and Industrial Lighting

All street lighting other than local residential and nostalgia style commercial street lighting, shall be cobra-head style luminaries mounted on tapered elliptical arms with 1.8 m (6’) reach for local and 2.4 m (8’) reach for collector streets and arterial streets.

- Luminaires shall be as follows or approved equal:
 - Philip-Lumec Series RVS
 - LED Roadway Lighting Series SAT.
- Pole types for all other 8 m, 10 m, 12 m mounting heights shall be as follows or approved equal, and shall satisfy OPSS/OPSD requirements:
 - Aluminum poles (round tapered aluminum, aluminum finish, direct buried or basemounted):
 - PoleC Limited tapered elliptical arm poles, series AE
 - Pole-Lite Ltd: tapered elliptical arm pole Series TEA
 - Steel poles (solid shaft, round or octagonal, tapered, galvanized steel, base mounted):
 - Pole-Lite Ltd.: (round) Type 700-RTS
 - Powco Steel Products Ltd.: (octagonal) Series 1600

- Spun concrete (round cross-section with natural smooth concrete finish, direct buried):
 - Stress/Crete Limited: Style 120
 - USI – Hampton Series.

9.8 Design Criteria - Street Lighting

9.8.1 Source Type

All light sources shall be of the high pressure sodium type.

9.8.2 Lamp Wattages

70, 100, 150, or 250 LED Lamps, having a minimum life of 24,000 hours may be used. The lamp shall be designed to operate a maximum ballast voltage of 55 volts. (Note: 70 and 100 Watt fixtures are recommended for walkways not for roadways)

9.8.3 Illumination Design Levels

All design criteria shall be in accordance with current I.E.S. standards.

Lighting levels are measured in Average Maintained Footcandles.

The metric equivalent of (A.M.F.C.) is measured in Lux. The conversion from Footcandles to Lux is $(\text{Lux}/10.76) = \text{Footcandles}$.

The A.M.F.C. (Average Maintained Footcandles) and uniformly ratios for Township roads shall be:

Table 12: Illumination Design Levels

Type of Road	A.M.F.C.	Average to Minimum Ratio
Arterial	0.8	3:1
Collector	0.6	4:1
Local	0.4	4:1
Rural Local	0.2	8:1
Walkways	0.2	8:1

A.M.F.C. to be within 0.05 of requirements.

Intersections shall have an illumination equal to the sum of values of the intersecting roadways and shall show stopped cars in silhouette.

9.8.4 Pole Locations

Both one sided and staggered pole arrangements will be permitted.

Poles shall be installed as per the Municipality of North Middlesex standards.

9.8.5 Wiring

All wiring in new subdivisions to be underground and the lighting completed prior to occupancy.

9.8.6 Power Supply Control Cabinet Assembly

Contractor shall supply and install a 120 volt 22kA, CSA approved service entranced street or roadway lighting panel.

Unit shall be:

- Cutler-hammer CAT. # 1SL500PC in pole compact street lighting panel. 120 or 240 volt (CAT. No. as required)
- Cutler-hammer CAT. # 1SL502 rain tight, lockable street lighting panel mounted on pole. 120 or 240 volt. (CAT. No. as required)
- Or approved equivalent.

9.8.7 Inspection

Final installation shall be inspected by and subject to the Municipality of North Middlesex and/or E.S.A. inspection/approval.

9.8.8 Standard Design (Nostalgia Type)

9.8.8.1 Roadway Lighting

Luminaire: Shall be of the "Cobra Head" type, distribution type II or III medium cut off, individually photo controlled and internally ballasted.

Photometrics: Shall equal or exceed ANSI/IESNA RP-8-00 Horizontal cutoff, Type II ANSI/IESNA RP-8-00 or Type III ANSI/IESNA RP-8-00.

Mounting Height: Luminaires shall be mounted at a 32 ft +/- 4 ft height.

Bracket/Davit: Shall be tapered elliptical aluminum.
Brackets shall be bolted directly to the pole (banding is prohibited). Bracket lengths shall be as required to position the luminaire with 2 ft + over the near edge of the travelled portion of the road. In no case shall the bracket exceed 10 ft.

Poles: Shall be spun concrete tapered/galvanized steel and of sufficient size and structural capability to support the type of fixture as required and at the heights required.

Cross Section: Tapered round

Finish: Smooth concrete/galvanized steel

Colour: Natural concrete grey

All materials shall be of the best quality and shall be vandal resistant with polycarbonate or glass lens or equivalent approved by the roads superintendent.

9.9 Decorative Design

9.9.1 Roadway Lighting

Luminaire: Shall be of the marine style type, distribution type II or III medium cutoff, internally shielded with flat lens, individually photo controlled and internally ballasted.

Photometrics: Shall be equal to or exceed ANSI/IESNA RP-8-00 150 cutoff, Type II.

Colour: Shall be black.

Mounting Height: Luminaires shall be mounted at a 22 ft +/- 2 ft height.

Bracket/Davit: Shall be 5 ft in length and shall be compatible in construction with both the luminaire and pole. Brackets shall be bolted directly to the pole (banding is prohibited). The colour of the bracket shall match the luminaire.

Poles: Shall be spun concrete tapered and of sufficient size and structural capability to support the type of fixture as required and at the heights required.

Cross Section: Tapered Round

Finish: Smooth Concrete

Colour: Natural Black

All materials shall be of the best quality and shall be vandal resistant with polycarbonate lens or equivalent.

APPENDIX A

GENERAL PROCEDURAL GUIDELINES FOR SUBDIVISION AND CONDOMINIUM DEVELOPMENTS



1.) Developer contacts Municipality to arrange a pre-consultation meeting and receives information package e.g., Zoning By-Law/ or applicable sections Official Plan/ or applicable sections Sample Subdivision Agreement Design Guidelines & Construction Standards

Developer presents concept, ideally prior to pre-consultation meeting, to members of staff for PRELIMINARY CONCEPTUAL REVIEW only Re: general street pattern, zoning, official plan (no comments or approvals given)

2.) Developer submits application form to Municipality and applicable fee.

Developer/his Engineer present feasibility report, proposed draft Plan of Subdivision (By Ontario Land Surveyor) and preliminary design criteria to Municipality, and Municipality Engineer for review e.g., Street layout/amenities sanitary sewage/treatment storm drainage/outlet water supply/treatment geotechnical report hydrogeological report traffic study street light/hydro servicing

3.) Staff review recommendations and comments of Planning Consultant, Municipality's Engineer and prepares/compiles staff comments, to be forwarded to Subdivider

4.) Council considers all information received and recommendation of planning report including applicable conditions

5.) If draft plan approval is recommended by Council, Developer makes formal application to County of Middlesex for DRAFT PLAN OF SUBDIVISION/CONDOMINIUM APPROVAL and submits PLANNING ACT APPLICATION, PROPOSED DRAFT PLAN, APPLICATION FEE and any required background studies (see note A)

6.) County of Middlesex circulates application and reviews comments by Municipality and regulatory agencies

7.) County Council considers county staff report and recommendations on draft plan approval

8.) County of Middlesex grants DRAFT PLAN OF SUBDIVISION APPROVAL with conditions

9.) Developer enters into SUBDIVISION AGREEMENT with Municipality/Council. Developer satisfies conditions and provides written documentation of all approvals to Municipality

10.) County of Middlesex grants FINAL PLAN OF SUBDIVISION APPROVAL

11.) Developer REGISTERS Plan of Subdivision Agreement on title

12.) Developer submits detailed ENGINEERING PLANS to Municipality for approval (see note B)

13.) Developer obtains Municipality approval of ENGINEERING PLANS (see note B)

14.) Developer obtains Municipality approval to proceed with CONSTRUCTION (see note C)

DEVELOPER SUBMITS ALTERNATIVE PROPOSAL

IF NOT ACCEPTABLE

DEVELOPER SUBMITS ALTERNATIVE PROPOSALS

IF NOT ACCEPTABLE

DEVELOPER SUBMITS ALTERNATIVE PROPOSAL

DEVELOPER SUBMITS ALTERNATIVE PROPOSAL

DEVELOPER, MUNICIPALITY, PUBLIC MAY REQUEST REFERRAL TO ONTARIO MUNICIPAL BOARD (OMB)

IF COUNTY OF MIDDLESEX REFUSES DRAFT PLAN DEVELOPER MAY REQUEST REFERRAL TO OMB

DEVELOPER OF MUNICIPALITY MAY REQUEST REFERRAL OF CONDITIONS TO OMB

ISSUE RESOLVED AS DETERMINED BY ONTARIO MUNICIPAL BOARD

PROCEEDINGS STOP

PROCEEDINGS STOP

PROCEEDINGS STOP

NOTES:

- A. Zoning or Official Plan amendments are to be submitted to the Municipality concurrently.
- B. Preparation of Engineering Plans sometimes proceeds concurrently with Items 5 to 11.
- C. The Municipality may agree to allow the Developer to proceed with construction prior to the Final Plan of Subdivision Approval and registration of the Plan
 - i. Subject to the Developer entering into the Subdivision Agreement with the Municipality, obtaining all other approvals as required, satisfying the conditions of the Agreement which are prerequisite to construction including insurance and security; and
 - ii. Subject to a written undertaking from the Developer's solicitor that the Developer is proceeding with construction at his own risk and that the Developer will proceed as soon as practicable to obtain Final Plan of Subdivision Approval and to register the Plan
- D. The Planning Act stipulates that an Approval Authority must provide a decision on draft plan of submission and condominium applications within 180 days of submission; otherwise, applications can be appealed to the OMB for a decision.
- E. A fee may apply if additional consultation meetings are required beyond the initial pre-consultation meeting payable to the Municipality of North Middlesex.

MUNICIPALITY OF NORTH MIDDLESEX

**PLAN OF SUBDIVISION/CONDOMINIUM AND LOT
REQUIREMENTS CHECKLIST**

This checklist of reports and items to be shown on the plans for subdivisions/condominiums and/or individual site developments is intended as a guide only. The degree of detail and exclusion of one or more items from the list will vary with the nature and complexity of each development and at the discretion of the municipality. The municipality also reserves the right to add additional requirements.

Reports	Required	Submitted	Accepted	Reviewer Comments
Project Specifications				
Environmental Impact/Environmental Assessment				
Geotechnical Study				
Noise Study				
Stormwater Management				
Traffic Studies				
Design Report				

Drawing and Calculation Review

Drawings General and Format	Required	Submitted	Accepted	Reviewer Comments
Legend				
North Arrow				
P.Eng. Stamp				
Scale Bars/Scale				
Revision Number and Details				
Street Names				
Match Lines				
Stations				
Sewer Dimensioning				
Watermain Dimensioning				

Drawings Property/Legal	Required	Submitted	Accepted	Reviewer Comments
Legal description of Property				
Property limits/SIBs				
Easements				
Municipal/lot/plan numbers/street names				
Widenings/Dedications				
Lot Dimensions, lot line bearings				
Road Allowance Widths				
Day lighting				

Drawings Lot Grading	Required	Submitted	Accepted	Reviewer Comments
Building Footprints/envelopes				
Parking (where applicable)				
Existing Ground Elevations				
Grading at Building and Lot Corners				
Minimum Grading Requirements				
External Areas – match				
Overland Flow Routes				
Swales/Minimum Grades/Collection Areas				
Centreline Road Elevations				
Tree Preservation				
Sediment and Erosion Control				
Fill and Floodline Identification				
Openspace Setbacks				
Pathways				
Contours				

Drawings Miscellaneous	Required	Submitted	Accepted	Reviewer Comments
Location of Municipal services abutting property				
Location of all existing trees on road allowance abutting property				
Access ramps, d/w locations, widths, proposed surfacing, curbing				
On-site vehicular loading and parking facilities				
Retaining walls, walls, fences, hedges, trees, shrubs or other landscaping areas				
Collection areas and enclosures for storage of garbage				
Sign locations and details				
Erosion and sedimentation control details				

Roadworks	Required	Submitted	Accepted	Reviewer Comments
Pavement Width and Structure				
Sidewalk Width and Structure				
Horizontal and Vertical Control				
Curb Type				
Minimum Radial				
Saw cutting/milling at adjacent works				

Storm Sewer Design	Required	Submitted	Accepted	Reviewer Comments
Identification of external drainage areas				
Criteria – areas/population/unit rates				
Stormwater Management				
Minimum grades/Velocities				
Pipe size/classification/grade/bedding				
Drop Structures				
Safety Landings				
Manhole Sizing, Head losses				
PDC's				
Roof Water Leaders				
Catchbasin Type				
Catchbasin Leads				
Catchbasin Sub-drains				

Sanitary Sewer Design	Required	Submitted	Accepted	Reviewer Comments
Identification of external drainage areas				
Criteria – Areas/Population/Unit rates				
Minimum Grades/Velocities				
Pipe Size/Classification/Grade/Bedding				
Drop Structures				
Safety Landings				
Manhole Sizing and Spacing				
Consideration of Outlet Sewer				

Utilities	Required	Submitted	Accepted	Reviewer Comments
Street lighting Location				
Street lighting Spacing				
Utility Locations				

Miscellaneous	Required	Submitted	Accepted	Reviewer Comments
Other Required Information				

Reviewer Signature _____

Reviewer Date _____

**MUNICIPALITY NORTH MIDDLESEX
SITE PLAN DEVELOPMENT CONTROL**

PROPONENT'S MANDATORY REQUIREMENTS DURING CONSTRUCTION

1. All party pre-construction meeting. Agenda must be pre-approved. An example agenda is attached.
2. Submit minutes of the regular construction meetings.
3. On-site Works
 - 3.1 The Developer's Engineer must submit end of work certification that all work has been completed in accordance with approved engineering plans.
 - 3.2 The Developer's Engineer must submit end of work clearances with all parties involved in the project including, but not limited to, utilities, conservation authority, Chief Building Official (CBO), fire chief, drainage superintendent, road authority/authorities.
 - 3.3 The Developer must submit a certified plan from an Ontario Land Surveyor (OLS) that all register plan bars are in place at the end of all work.
4. Off-site Works
 - 4.1 Underground including but not limited to water, sanitary, storm, and drainage.
 - 4.1.1 The Developer's Engineer will provide full-time construction administration and observation.
 - 4.1.2 The Municipality's Engineer will make random checks of 4.1.1.
 - 4.1.3 The Developer's Engineer will submit copies of all material certification in advance of installation and their QA/QC programs.
 - 4.1.4 The Developer's Engineer must submit copies of all testing during construction including but not limited to gradation, compaction, hydraulic, structural and disinfection (including lab work).
 - 4.1.5 The Municipality's Engineer must witness all testing and connections to existing infrastructure. Only municipal staff can operate existing infrastructure.
 - 4.1.6 The Developer's contractor must submit confirmation of critical project grade work, reviewed by his Engineer.
 - 4.2 Road Works and All Other Related Surface Works
 - 4.21 The Developer's Engineer will provide full-time contract administration and a minimum of select part-time construction observation.

- 4.2.2 The Municipality's Engineer will make random checks of 4.2.1.
- 4.2.3 The Developer's Engineer will submit copies of all material certification in advance of installation and their QA/QC programs.
- 4.2.4 The Municipality's Engineer must witness all roadwork's sub-grade work/preparation in conjunction with the proponent's geotechnical Engineer and construction grade control.
- 4.2.5 The Developer's Engineer must submit copies of all testing during construction including, but not limited to, gradation, compaction, concrete and asphalt.
- 4.2.6 The Municipality's Engineer must witness final preparation of granular surfaces (A, B, or C).
- 4.2.7 The Municipality's Engineer must witness the start of all asphalt operations; in conjunction with the proponent's geotechnical Engineer.
- 4.2.8 The Municipality's Engineer must receive confirmation of all gradework including "stringlines" before any concrete work.
- 4.3 The Developer's Engineer must submit the contractor's Health and Safety plan, comply with North Middlesex's plan, provide proof of insurance, and workers compensation, traffic control plan, clearances from remote disposal sites, designated haul roads, emergency vehicle access, security, permits and approvals.
- 4.4 Upon completion of work, the Municipality's Engineer must complete a deficiency inspection.
- 4.5 Upon completion of deficiencies, the Municipality's Engineer will complete an assumption inspection and operations staff orientation.
- 4.6 The Municipality's Engineer must attend the start of next season surface asphalt work with all applicable submissions completed in advance.
- 4.7 The Municipality's Engineer must complete an end of 2-year warranty inspection.
- 4.8 The Developer's must comply with 3.1 to 3.3 of on-site works for off-site works.
- 4.9 The Developer's Engineer must submit sealed project record drawings in an electronic format suitable to North Middlesex's reproduction abilities and the site plan development agreement.
- 4.10 The Developer must demonstrate satisfaction of all construction related requirements in the site plan development agreement.

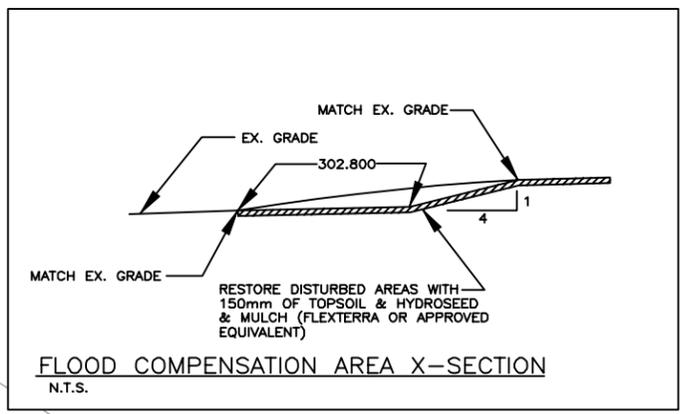
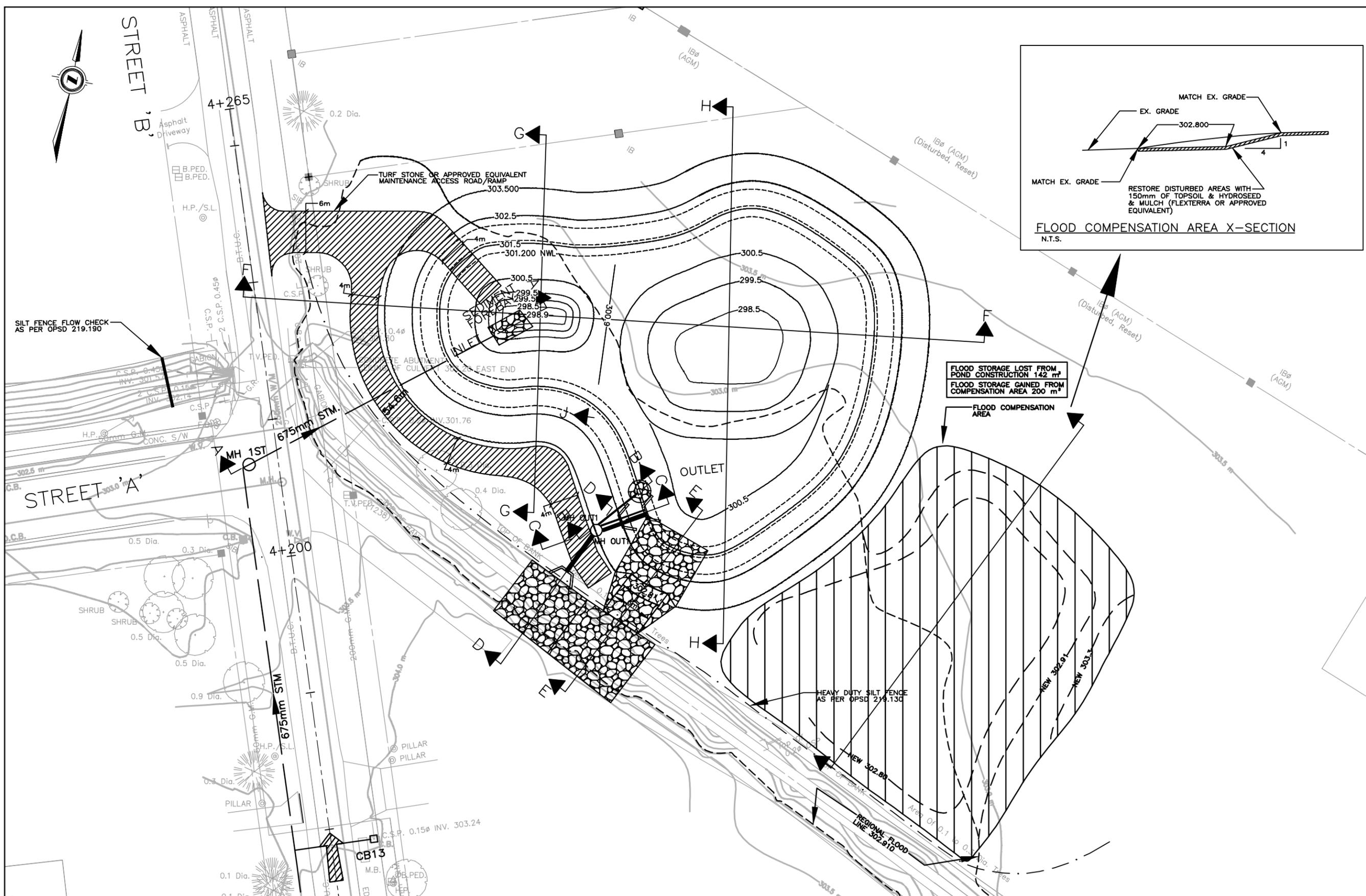
PRE-CONSTRUCTION MEETING

POTENTIAL LIST OF TOPICS

1. Contract administration – lines of authority and emergency phone numbers
2. Correspondence – distribution, number of copies
3. Changes in contract and contract status, drawings and specs
4. Property requirements and status, construction limits
5. Construction schedule, working days, weekend work
6. Utilities
7. Detouring and signing
8. Maintenance of traffic, through and local
9. Disposal of fill, copy of agreement with land owner
10. Contractors superintendent/foreman
11. Site office
12. Project signs
13. Public relations
14. Survey and layout (setting out) and approval
15. Equipment
16. Material suppliers and storage of materials
17. Material testing
18. Instructions to Contractors
19. Municipal/private signs
20. Haul routes

21. Meetings – future and distribution
22. Progress payments
23. Compaction – request signed statement of:
 1. List of all compaction equipment proposed on project for each material to be compacted (i.e., bedding, native back-fill, granular ‘A’ and ‘B’, etc.)
 2. List of equipment proposed for each area of material to be compacted (i.e., bedding bottom lift, side fills, top lift, etc.)
 3. Statement of operator availability for equipment (i.e., full-time or part-time)
 4. Statement on whether equipment will be on-site at all times or will be shared by other crews or work, etc.
24. Emergency vehicle access
25. Site security, signing, delineations and barricades
26. Permits and Approvals, M.O.L., etc.
27. Shop drawings and review after distribution
28. Substitutions and equivalencies
29. Project diary, consultants construction records
30. Protection, site items to be preserved (i.e., trees)
31. Sub-contractors
32. Project specific items – connections at property lines.

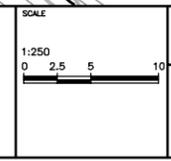
APPENDIX B



FLOOD STORAGE LOST FROM POND CONSTRUCTION 142 m³
 FLOOD STORAGE GAINED FROM COMPENSATION AREA 200 m³

AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION	No	REVISIONS	DATE	BY
				DESIGN		
				DRAWN		
				CHECKED		
				APPROVED		
				DATE		

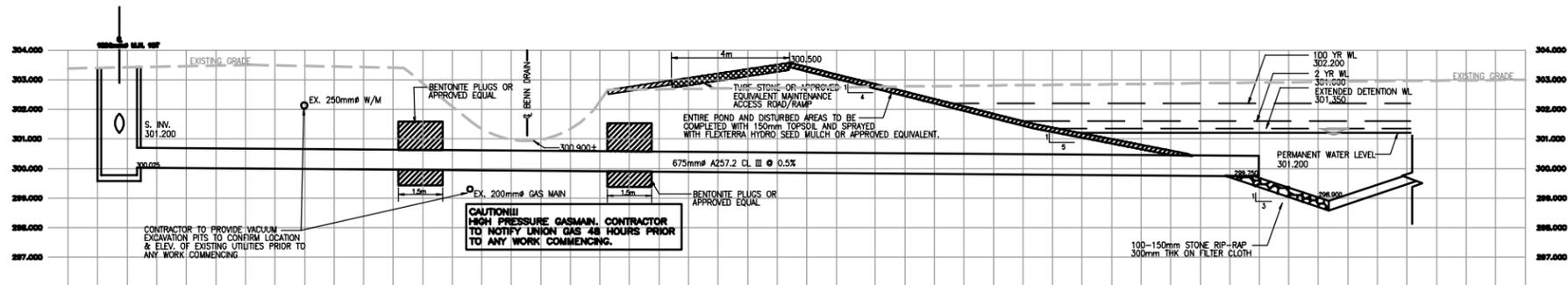
ENGINEERS STAMP



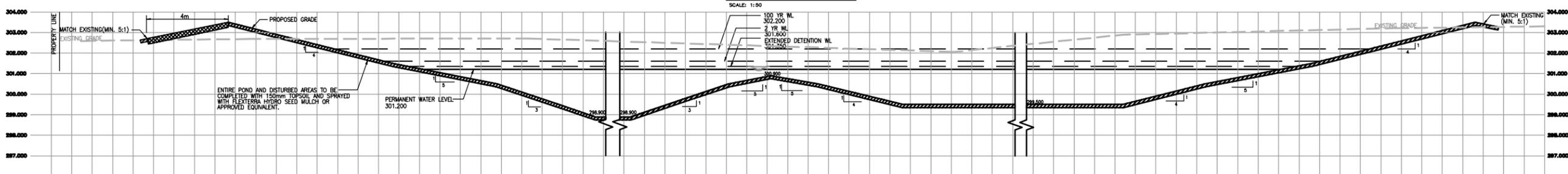
MUNICIPALITY OF NORTH MIDDLESEX
 PROJECT NAME/NUMBER
65-4321

STORMWATER MANAGEMENT
 FACILITY PLAN
 SHEET No
3.2

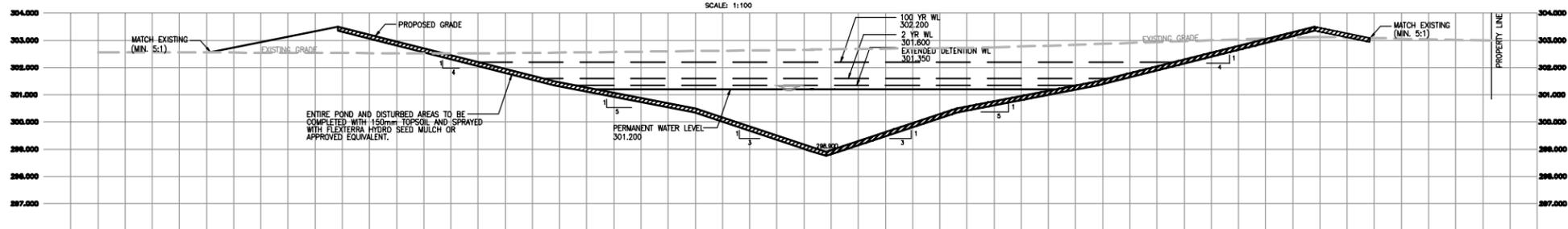
PLAN FILE No



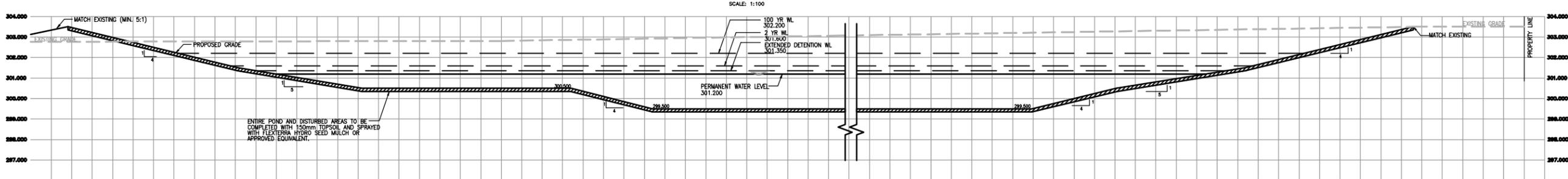
SECTION A-A



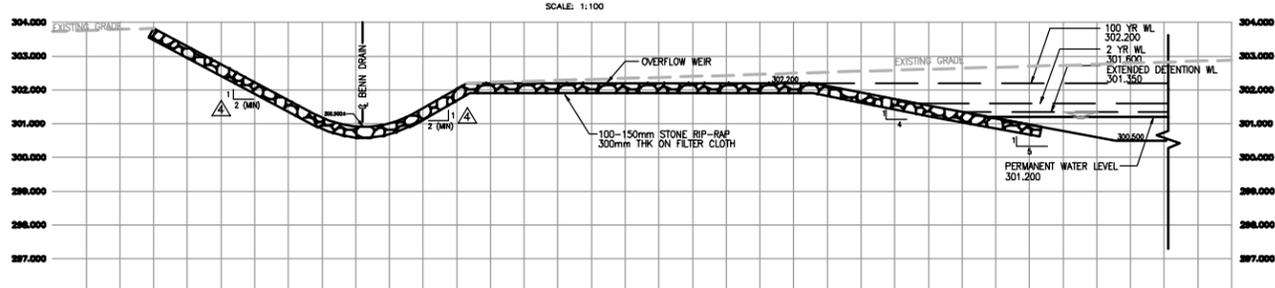
SECTION F-F



SECTION G-G

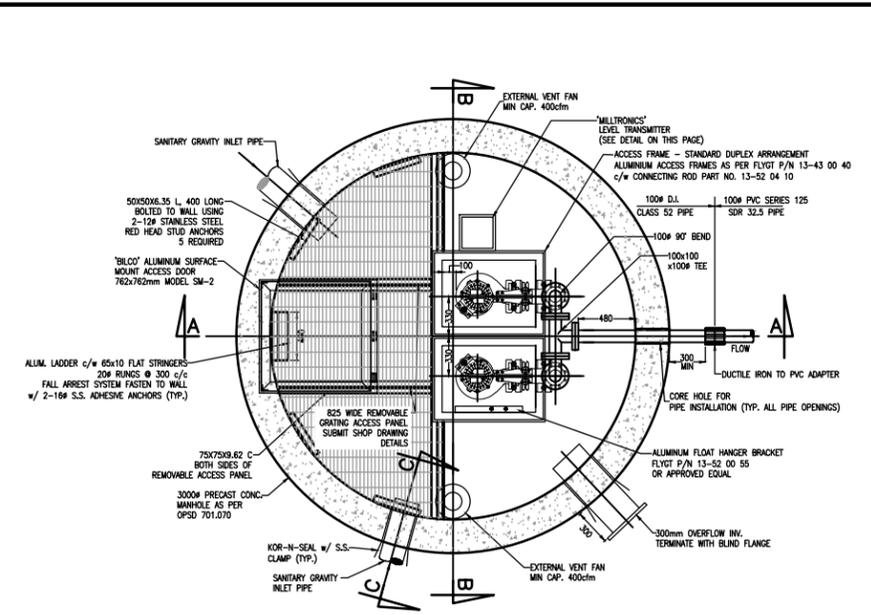


SECTION H-H

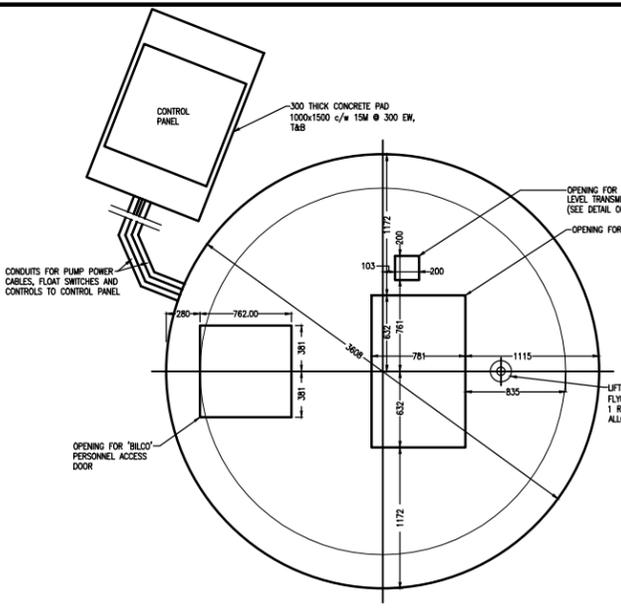


SECTION E-E

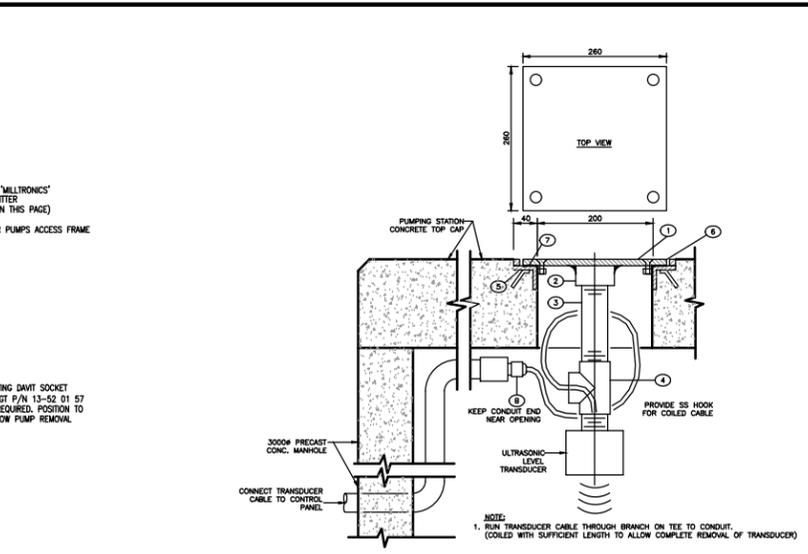
AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION	No	REVISIONS	DATE	BY	ENGINEER'S STAMP	SCALE	MUNICIPALITY OF NORTH MIDDLESEX PROJECT NAME/NUMBER	PROJECT No 65-4321
								AS SHOWN	STORMWATER MANAGEMENT FACILITY SECTIONS & DETAILS	SHEET No 3.3
								(SAMPLE)		PLAN FILE No



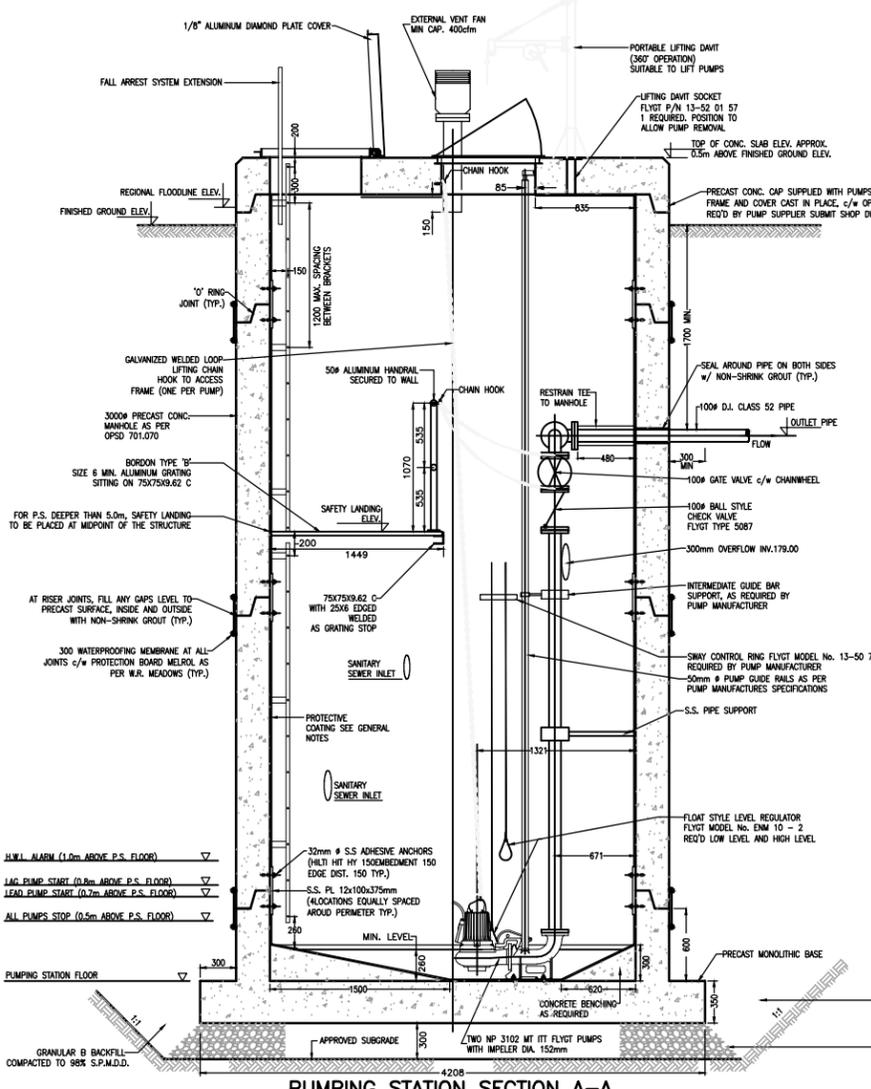
PUMPING STATION-TOP VIEW



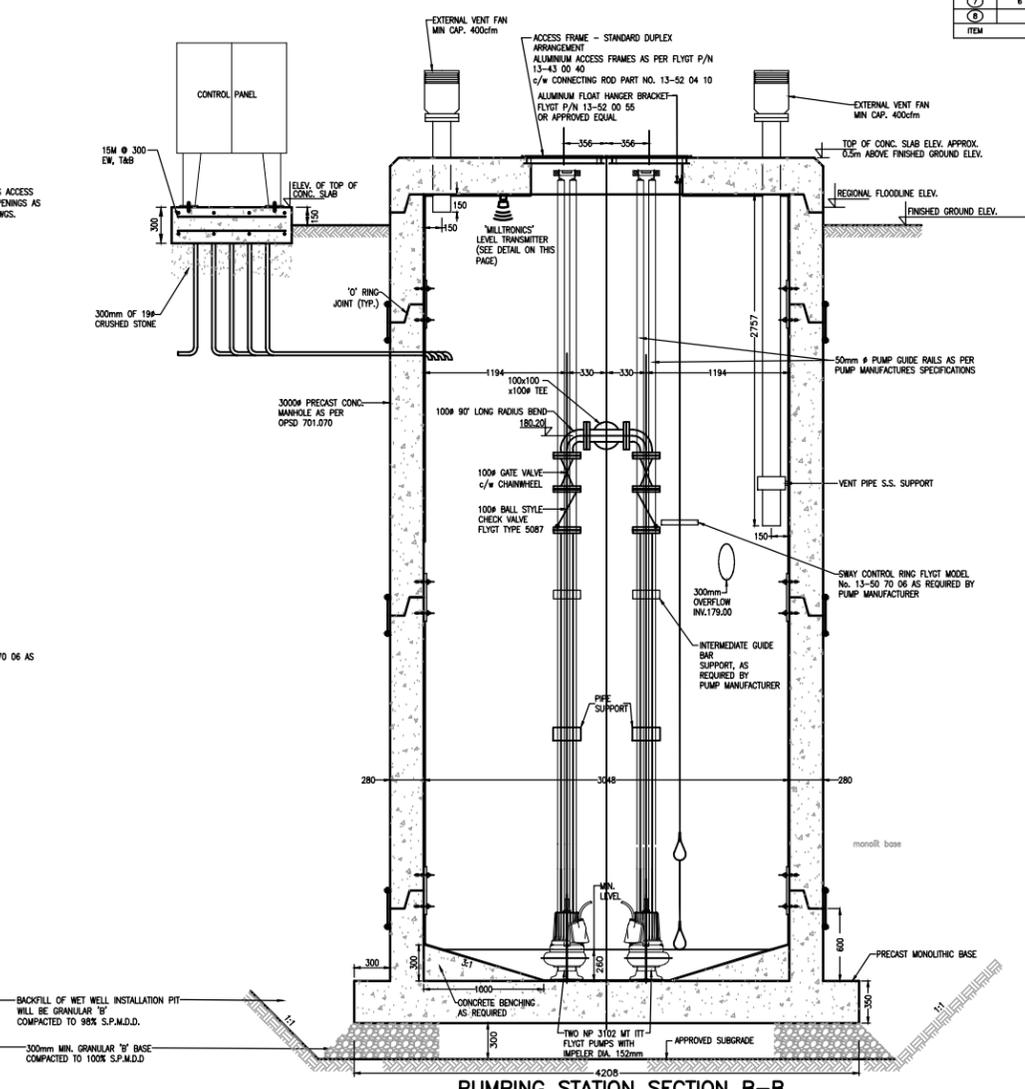
TOP CONCRETE SLAB VIEW



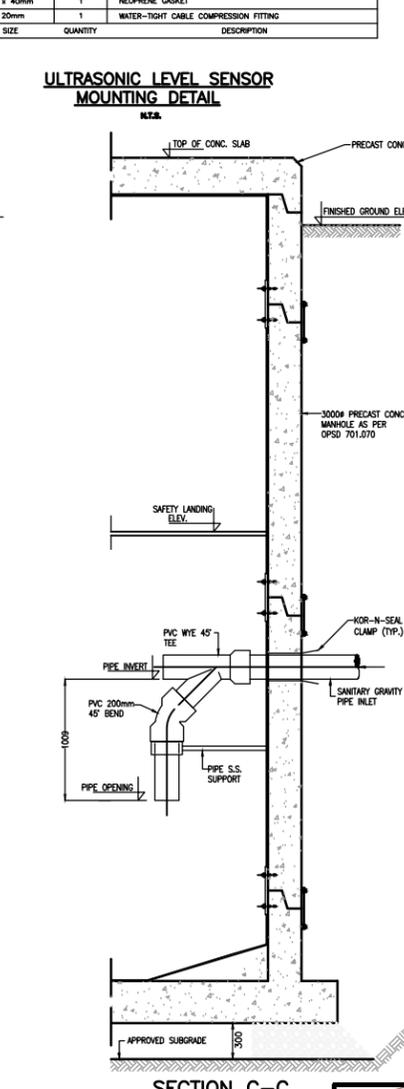
ITEM	SIZE	QUANTITY	DESCRIPTION
1	200 x 150mm	1	6 mm THICK SS PLATE (SEE DIV 5 OF SPECIFICATIONS)
2	25mm NPT	1	SS HALF COUPLING, WELDED TO PLATE
3	25mm NPT	1	PVC NIPPLE
4	25mm NPT	1	PVC TEE
5	42x40x6mm	1	SS CAST IN PLACE FRAME c/w SS NUTS WELDED ON FOR COVER
6	10mm (3/8")	4	COUNTER SUNK HEAD S.S. SCREW (15mm LG)
7	8 x 40mm	1	NEOPRENE GASKET
8	20mm	1	WATER-TIGHT CABLE COMPRESSION FITTING



PUMPING STATION SECTION A-A



PUMPING STATION SECTION B-B



SECTION C-C

- GENERAL NOTES**
- EQUIPMENT AND MATERIAL TO ME SPECIFICATION No. 3, STANDARD SPECIFICATION FOR SUBMERSIBLE SEWAGE PUMPS.
 - PUMPING STATION EQUIPMENT - BY FLYGT
 - ELECTRICAL CONTROL PANEL c/w SCADA MONITORING SYSTEM
 - POWER CABLE
 - PUMP DISCHARGE CONNECTIONS
 - LIFTING CHAINS
 - CHAIN HOOKS
 - GUIDE BARS
 - UPPER GUIDE BAR HOLDERS
 - LEVEL REGULATOR HANGER
 - LEVEL REGULATOR
 - FLOATS
 - PUMPS ACCESS FRAME AND COVER
 - PUMPING AND MOTORS :
 - NP 3102.181MT, IMPELLER 152mm, 2.9 kW, 230V, 1PH, 60Hz, OPERATING AT 1755 RPM, DELIVERING 15.1 l/s AT 7.2m TDH
 - PIPING AND FITTINGS TO BE 100mm IN DIA. DI (DUCTILE IRON) CLASS 52. COUPLINGS - "VIC-FLANGE" STYLE 341, c/w GASKET GRADE 'S' FASTEN WITH TYPE 304 STAINLESS STEEL BOLTS, NUTS AND WASHERS
 - COAT ALL ALUMINUM SURFACES IN CONTACT WITH CONCRETE WITH 2 COATS OF BITUMINOUS PAINT.
 - ALL FASTENERS TO BE S.S. TYPE 304L.
 - WET WELL EXTERIOR TO BE INSPECTED AND APPROVED PRIOR TO BACKFILLING.
 - PROVIDE SAFETY PLACARDS FOR ALL PUMP STATION STRUCTURES AND EQUIPMENT, AS REQUIRED BY THE OCCUPATIONAL HEALTH & SAFETY ACT ANY RELEVANT REGULATIONS READILY VISIBLE.
 - THOROUGHLY CLEAN INSIDE FACE OF MANHOLE AS PER PROTECTIVE COATING MANUFACTURERS REQUIREMENTS.
 - SEAL ALL JOINTS AND PENETRATIONS WATERTIGHT WITH EPOXY MORTAR.
 - SHOP DRAWINGS TO BE SUBMITTED FOR REVIEW.

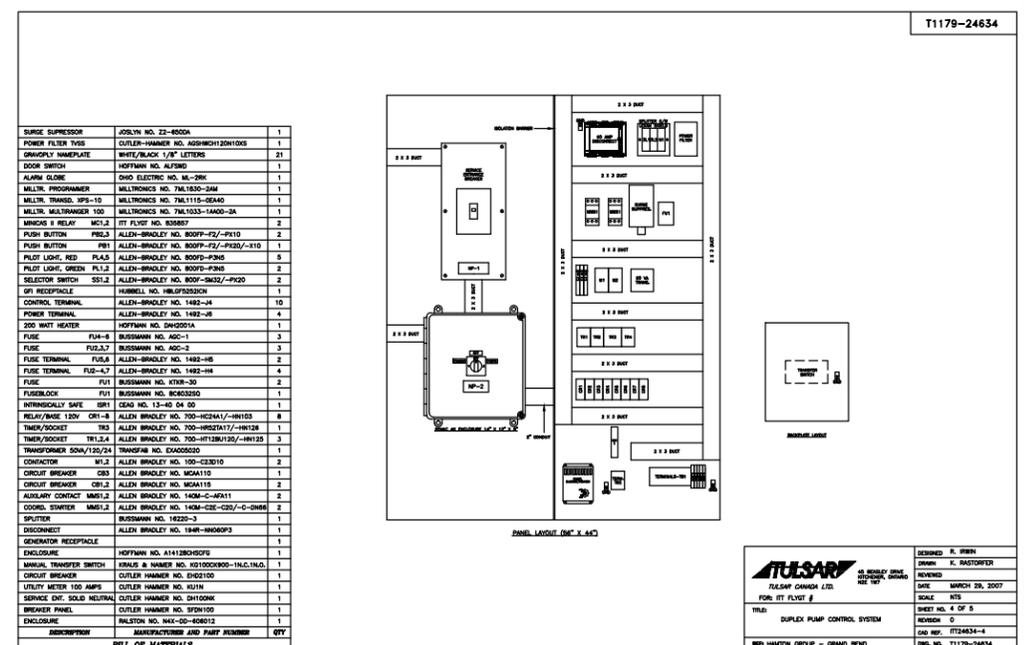
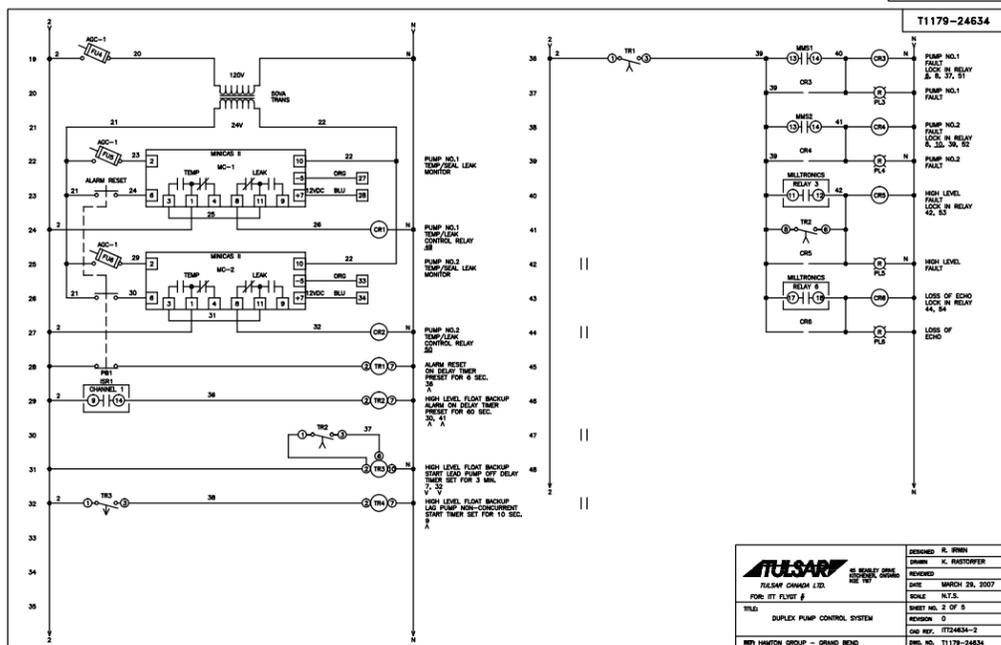
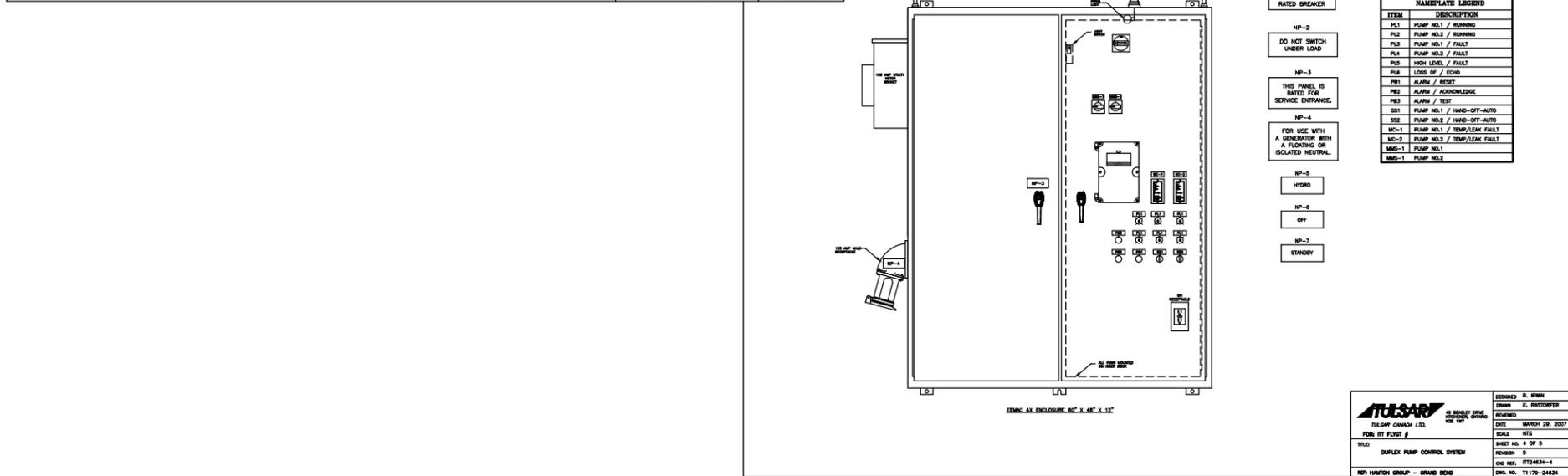
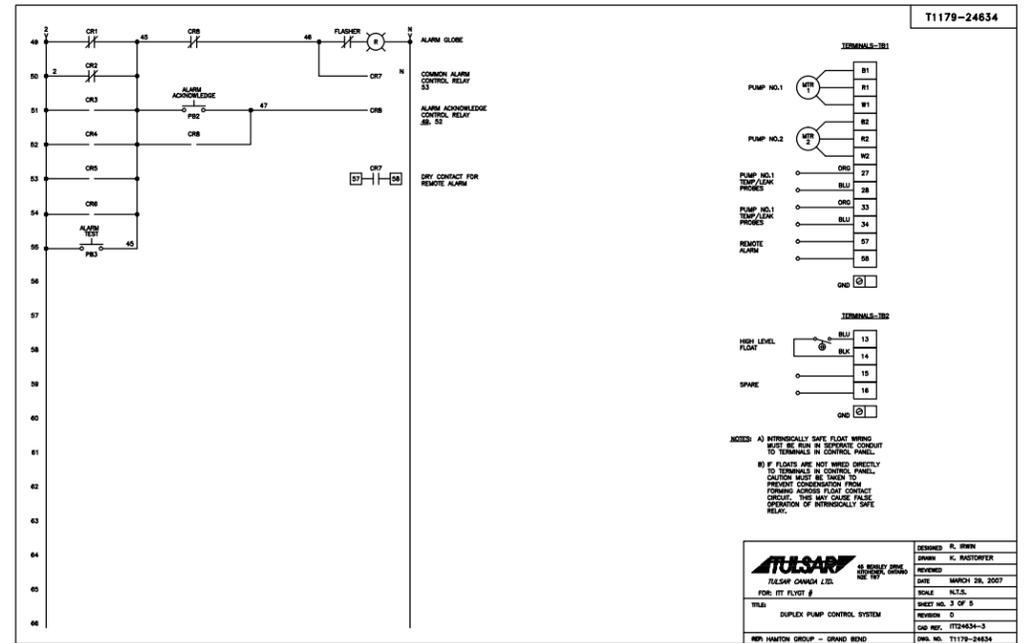
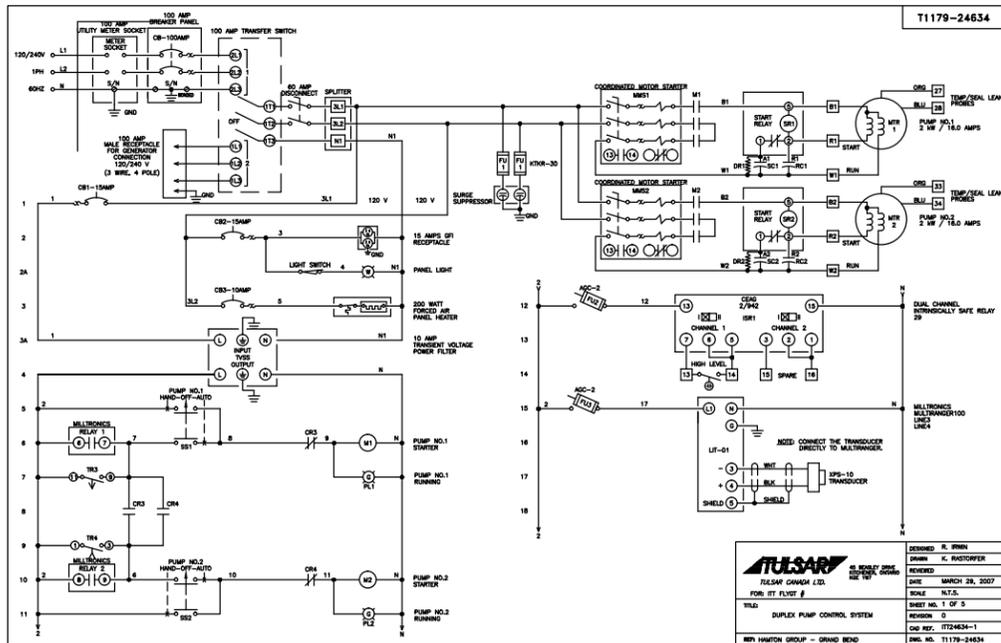
- STRUCTURAL NOTES**
- FOUNDATION DESIGN IS TO BE BASED ON GEOTECHNICAL INVESTIGATION REPORTS PREPARED BY A LICENSED PROFESSIONAL ENGINEER.
 - SUBGRADE ELEVATIONS TO BE APPROVED BY THE GEOTECHNICAL ENGINEER.
 - SUPPORT ALL FOOTINGS AND SLABS ON UNDISTURBED SUB-GRADE WHERE DEEMED SUITABLE BY GEOTECHNICAL ENGINEER, WHERE UNSUITABLE, REPLACE WITH ENGINEERED FILL TO ELEVATIONS RECOMMENDED BY GEOTECHNICAL ENGINEER.
 - REVIEW GEOTECHNICAL REPORT FOR RECOMMENDATIONS CONCERNING DEWATERING AT ALL STRUCTURES.
- TANK BUOYANCY AND UPLIFT RESISTANCE**
- PROTECT ALL STRUCTURES FROM FLOTATION DURING CONSTRUCTION.
 - DEWATER EXCAVATION UNTIL CONSTRUCTION IS COMPLETE.
- MATERIAL SPECIFICATIONS**
- CONCRETE STRENGTH IN ACCORDANCE WITH CSA STANDARD A23.1-94 AND A23.2-94.
 - STRUCTURAL CONCRETE UNLESS OTHERWISE NOTED: 40 MPa AT 28 DAYS.
 - EXPOSURE CLASSIFICATION C-1.
 - MAXIMUM WATER CEMENT RATIO 0.38.
 - USE WATER REDUCING AGENT AND SUPERPLASTICIZER.
 - NORMAL MAXIMUM AGGREGATE SIZE 20mm.
 - ENTRAINED AIR CONTENT RANGE 5% TO 8%.
 - LEAN FILL AND MASS CONCRETE 28-DAYS COMPRESSIVE STRENGTH 15 MPa
 - REINFORCING STEEL: CSA STANDARD G30.18-M92, GRADE 400, DEFORMED BARS.
 - STRUCTURAL STEEL: CSA STANDARD G40.20/G40.21-98, GRADE 350 ROLLED SECTIONS, GRADE 300 PLATES.
 - PROTECTIVE COATING FOR INTERIOR OF PUMPING STATION:
 - INSTALLATION AS PER COATING MANUFACTURER
 - A. SWEEP BLAST TO REMOVE LAITANCE
 - B. TEST FOR MOISTURE CONTENT
 - C. APPLY SEALER DEVCO PRE-PRIME PENETRATING EPOXY @ 1.5mls DRY THK
 - D. 2 COATS DEVCO BARRUST 236 EPOXY @ 4.0 TO 8.0 mls DRY THK
 - E. PROVIDE TOTAL FILM BUILD OF 10.0 TO 16.0 mls

REVISION No.	DATE	DESCRIPTION
1		ISSUED FOR REVIEW

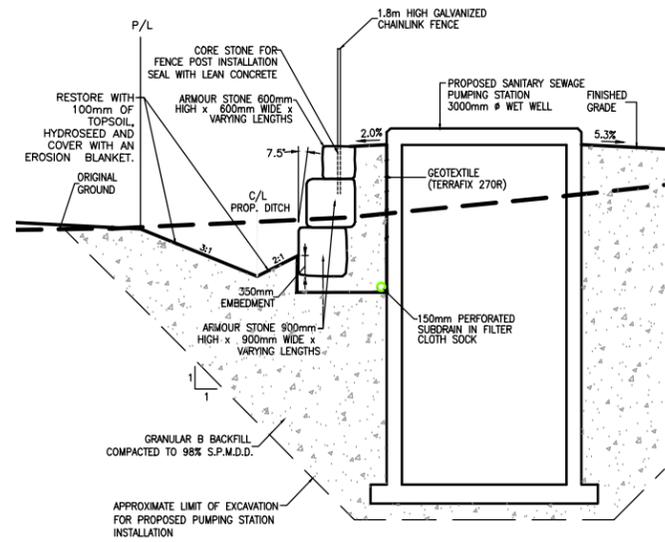


MUNICIPALITY OF NORTH MIDDLESEX

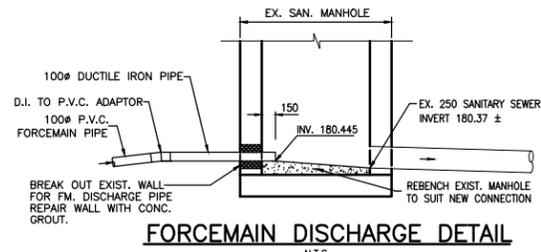
SANITARY SEWAGE PUMPING STATION PLANS AND SECTIONS



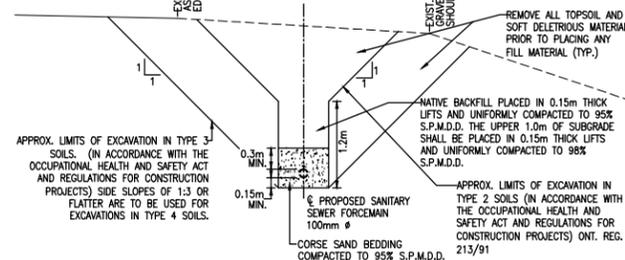
MUNICIPALITY OF NORTH MIDDLESEX		
REVISION No.	DATE	DESCRIPTION
1		ISSUED FOR REVIEW
SANITARY SEWAGE PUMPING STATION ELECTRICAL DETAILS		
DATE	JULY 2012	DWG. NO. 4.2



ARMOUR STONE RETAINING WALL DETAIL A-A
N.T.S.

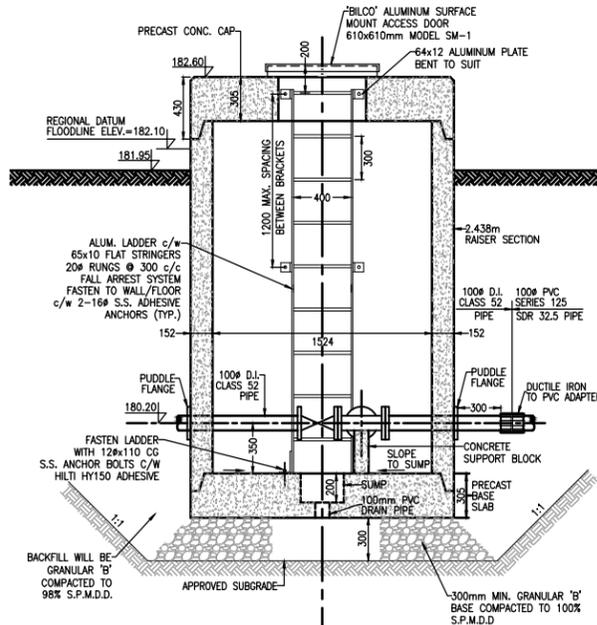


FORCEMAIN DISCHARGE DETAIL
N.T.S.

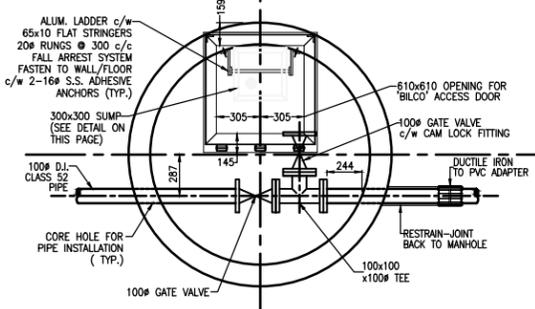


- NOTES:**
1. ALL ASPHALT MATERIAL SHALL BE PRODUCED AND PLACED IN ACCORDANCE WITH THE CURRENT OPSR REQUIREMENTS AND UNIFORMLY COMPACTED TO 97% MARSHALL DENSITY.
 2. SHOULD CONSTRUCTION TAKE PLACE UNDER WET SUB-GRADE OR WEATHER CONDITIONS, SUB-GRADE PREPARATION AND GRANULAR REQUIREMENTS MUST BE REVIEWED BY THE GEOTECHNICAL ENGINEER.

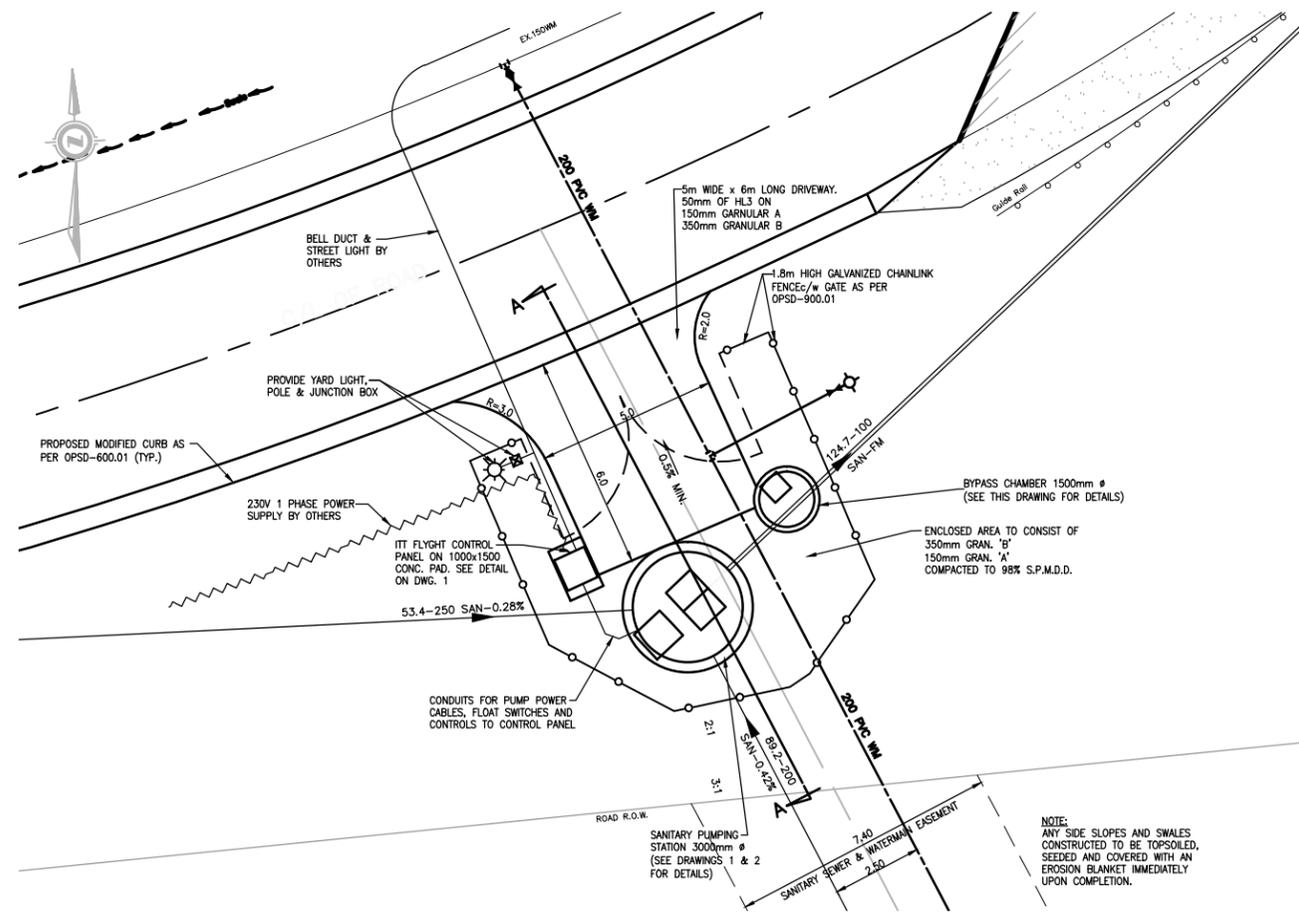
TYPICAL SANITARY FORCEMAIN CROSS SECTION
N.T.S.



SANITARY SEWER FORCEMAIN BYPASS CHAMBER
SCALE: 1:25

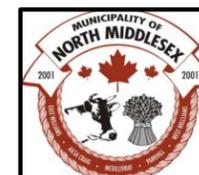


SUMP FRAME & GRATE DETAIL
N.T.S.



TYPICAL SANITARY PUMPING STATION SITE PLAN
HORIZONTAL SCALE 1:100

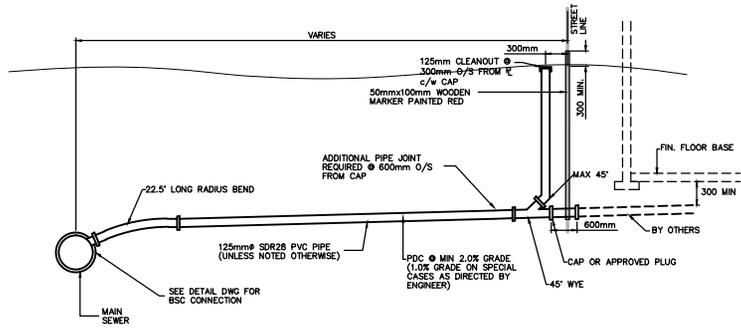
REVISION No.	DATE	DESCRIPTION
1		ISSUED FOR REVIEW



MUNICIPALITY OF NORTH MIDDLESEX

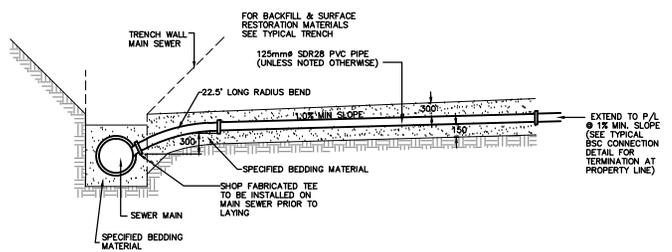
SANITARY SEWAGE PUMPING STATION TYPICAL SITE PLAN AND DETAILS

DATE JULY 2012 DWG.No. 4.3

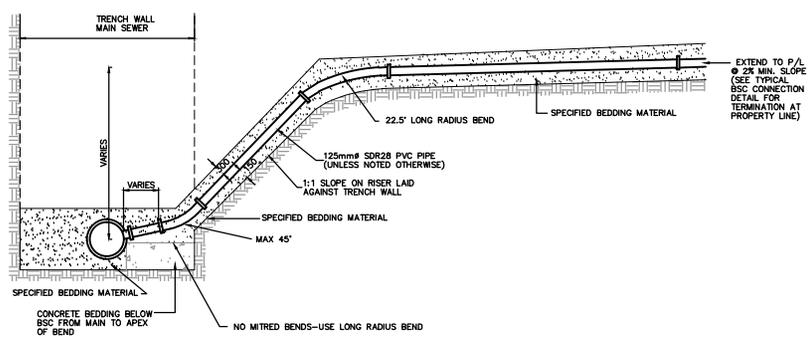


NOTE:
 1. THE FIRST TWO LENGTHS OF PVC OFF THE MAIN SEWER OR MANHOLE SHALL BE 900mm LONG (MAX.) WITH A FLEXIBLE JOINT IMMEDIATELY ADJACENT TO SEWER.
 2. PREFABRICATED TEES SHALL BE USED FOR ALL SERVICE CONNECTIONS ON A NEW SEWER MAIN CONSTRUCTION, INCLUDING SEWER MAINS FOR NEW SUBDIVISIONS PRIOR TO ASSUMPTION. SADDLE CONNECTIONS MAY BE USED WHEN CONNECTING NEW SERVICES TO AN EXISTING SEWER MAIN WITH THE APPROVAL OF THE CONTRACT ADMINISTRATOR.

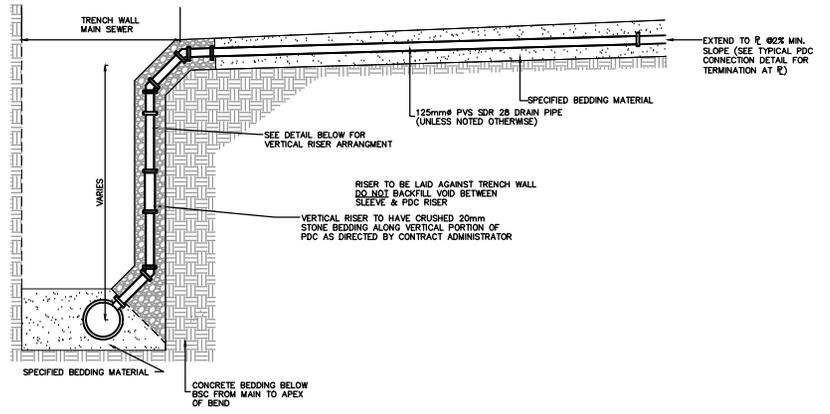
TYPICAL PRIVATE DRAIN CONNECTION
 NOT TO SCALE



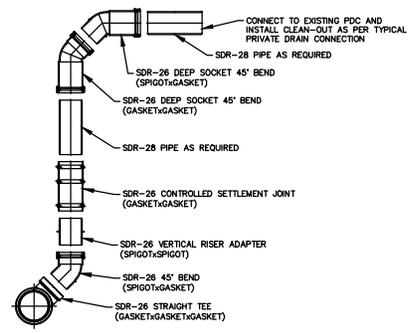
TYPE 1 - SHALLOW CONNECTION - (TO 3.7m DEEP)
 NOT TO SCALE



TYPE 2 - DEEP CONNECTION - (TO 4.9m DEEP)
 NOT TO SCALE



TYPE 3 - DEEP CONNECTION - (DEEPER THAN 4.9m DEEP)
 NOT TO SCALE



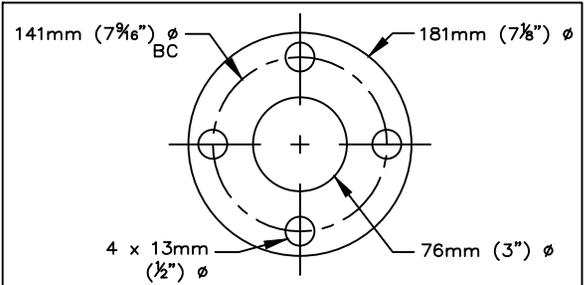
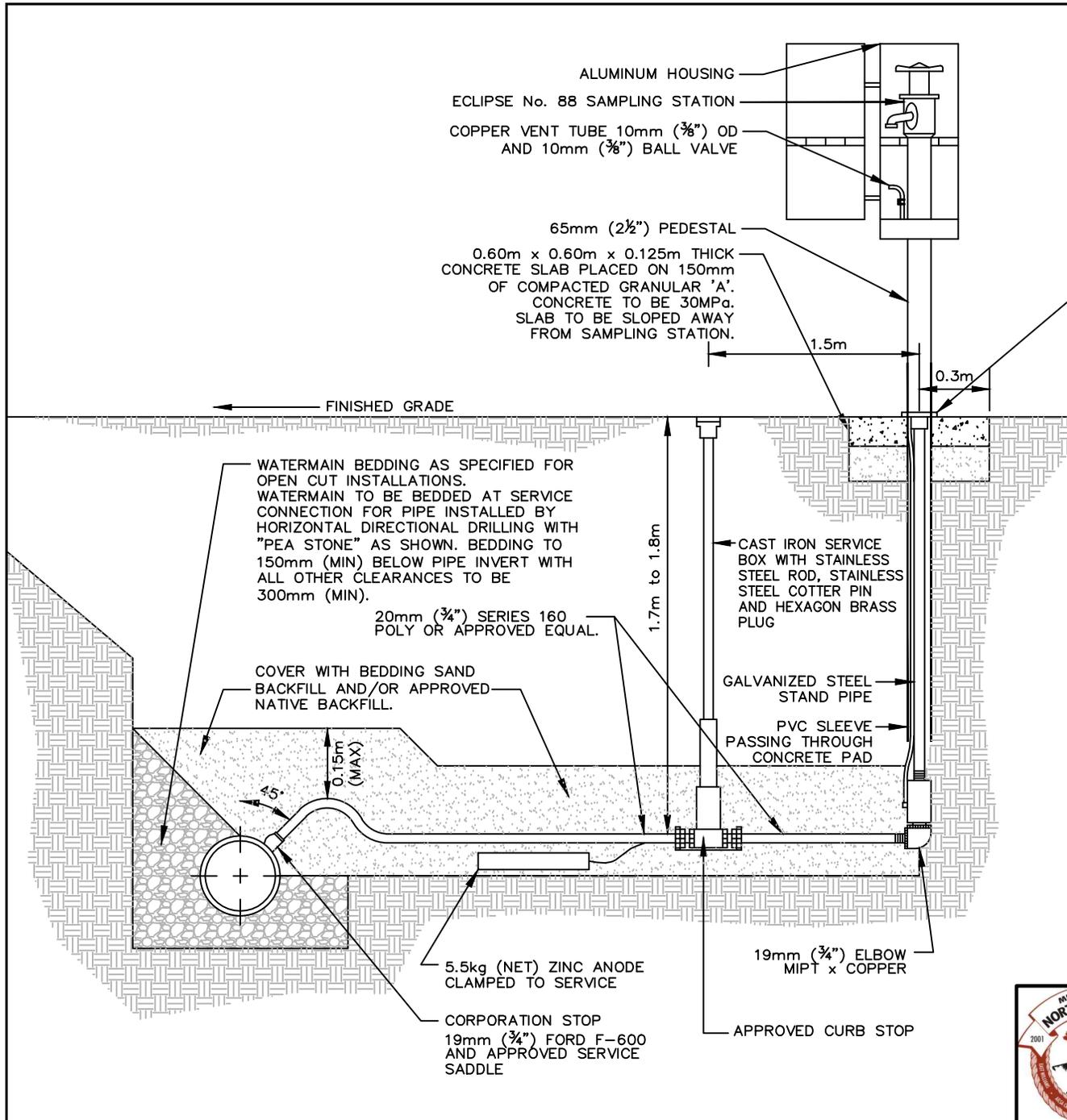
DEEP PDC CONNECTION - VERTICAL RISER DETAIL
 NOT TO SCALE

REVISION No.	DATE	DESCRIPTION



MUNICIPALITY OF NORTH MIDDLESEX
SANITARY PRIVATE DRAIN CONNECTIONS

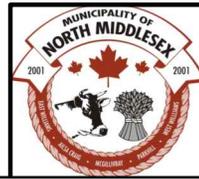
DATE JULY 2012 DWG.No. 4.4



- Notes:
1. THE PVC SLEEVE MUST TERMINATE AT A DEPTH THAT WILL BRING ITS LOWER END TO BELOW THE FROST LINE. IT IS RECOMMENDED THAT THE SLEEVE BE EXTENDED TO THE BASE OF THE STAND PIPE.
 2. KEEP THE AREA BETWEEN THE SLEEVE AND THE RISER OPEN TO ALLOW THE FREE MOVEMENT OF AIR. THIS WILL ALLOW DRAINAGE OF ANY WATER THAT MAY ACCUMULATE AND ACT AS AN INSULATOR.

- Notes:
1. SAMPLING STATIONS SHALL BE BURIED 1.7m TO 1.8m, WITH A 10mm (3/4) FIP INLET AND A (10mm (3/4) HOSE OR UNTHREADED) NOZZLE.
 2. ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, NONREMOVABLE, ALUMINUM-CAST HOUSING MOUNTED UPON 65mm (2 1/2) PEDESTAL.
 3. PVC INSULATOR SHALL COVER EXPOSED STAND PIPE FROM VALVE THROUGH CONCRETE PAD.
 4. WHEN OPENED, THE STATION SHALL REQUIRE NO KEY FOR OPERATION, AND THE WATER WILL FLOW IN AN ALL BRASS WATERWAY.
 5. ALL WORKING PARTS WILL ALSO BE OF BRASS AND BE REMOVABLE FROM ABOVE GROUND WITH NO EXCAVATING. EXTERIOR PIPING SHALL BE GALVANIZED STEEL OR BRASS PIPE.
 6. A COPPER VENT TUBE WILL ENABLE EACH STATION TO BE PUMPED FREE OF STANDING WATER TO BE PREVENT FREEZING AND TO MINIMIZE BACTERIA GROWTH.
 7. ECLIPSE No. 88 SAMPLING STATION AS MANUFACTURED BY KUPFERLE FOUNDRY.

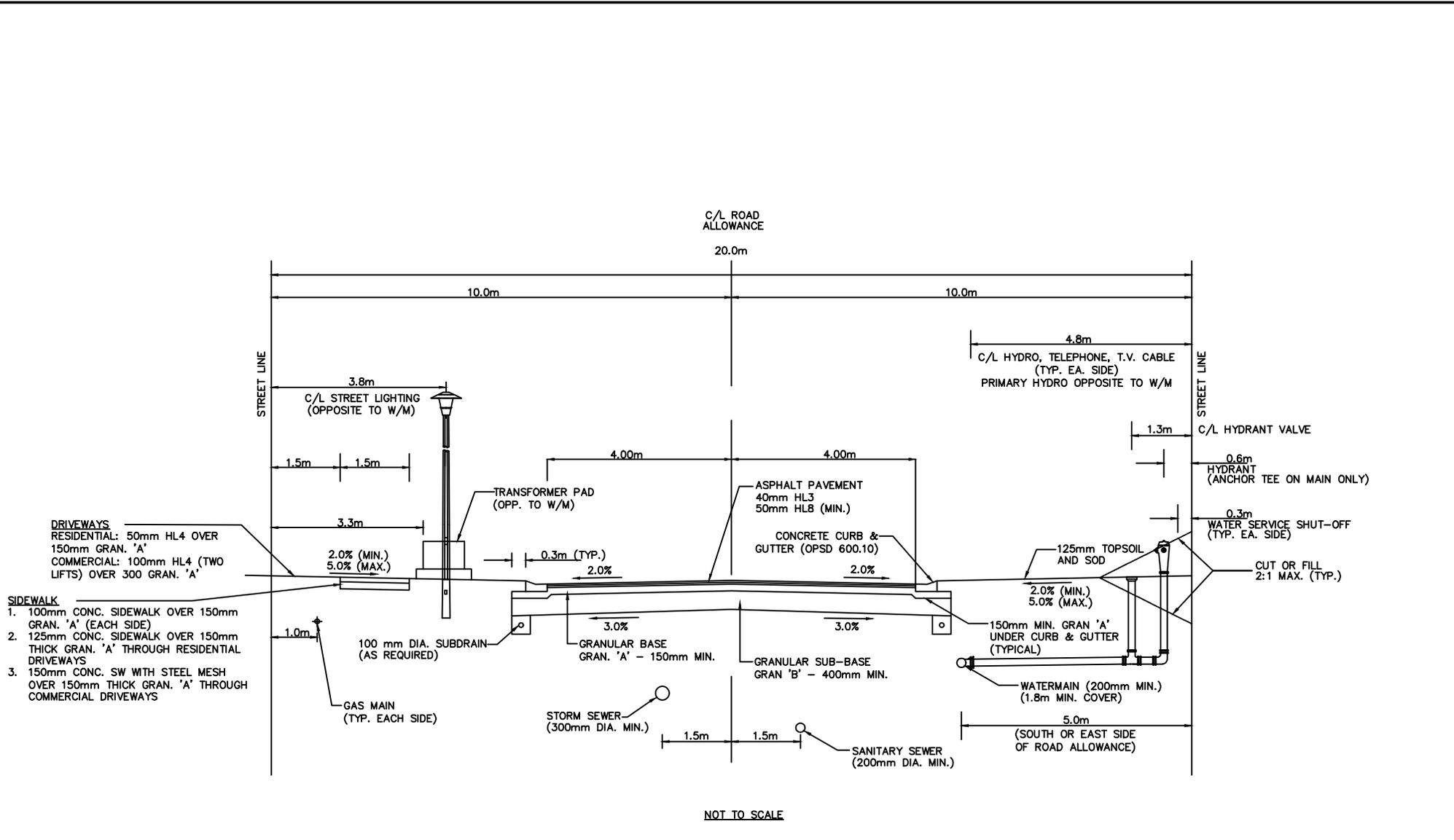
REVISION No.	DATE	DESCRIPTION



MUNICIPALITY OF NORTH MIDDLESEX

TYPICAL WATER SAMPLING STATION

DATE JULY 2012 DWG.No. 5.1



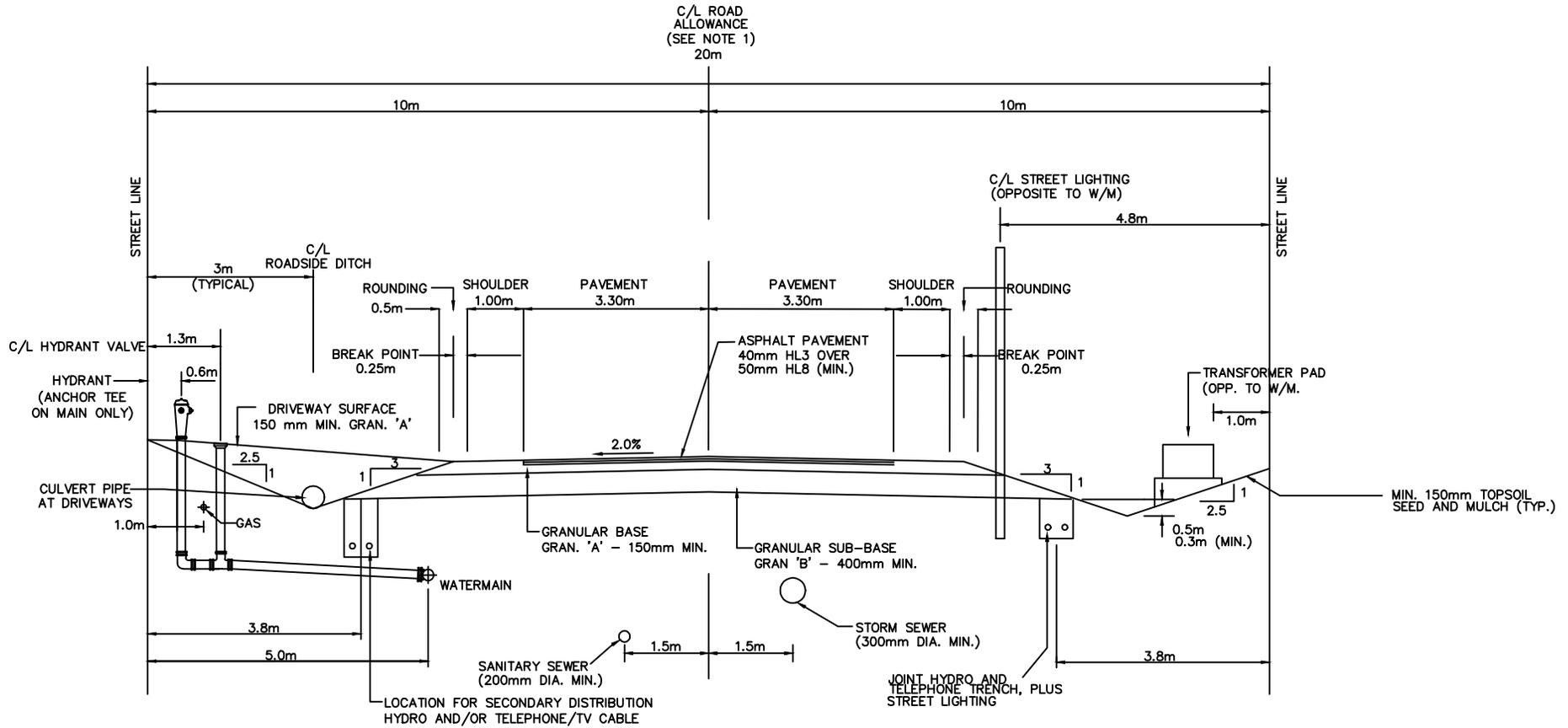
NOT TO SCALE

- DRIVEWAYS**
 RESIDENTIAL: 50mm HL4 OVER 150mm GRAN. 'A'
 COMMERCIAL: 100mm HL4 (TWO LIFTS) OVER 300 GRAN. 'A'
- SIDEWALK**
 1. 100mm CONC. SIDEWALK OVER 150mm GRAN. 'A' (EACH SIDE)
 2. 125mm CONC. SIDEWALK OVER 150mm THICK GRAN. 'A' THROUGH RESIDENTIAL DRIVEWAYS
 3. 150mm CONC. SW WITH STEEL MESH OVER 150mm THICK GRAN. 'A' THROUGH COMMERCIAL DRIVEWAYS

- NOTES:**
- PAVEMENT DESIGN IS A MINIMUM STANDARD. ASPHALT AND/OR GRANULAR THICKNESS MAY BE INCREASED SUBJECT TO A GEOTECHNICAL REPORT. ASPHALT TO BE IN TWO LIFTS.
 - HYDRO AND STREET LIGHTING WIRING TO BE UNDERGROUND, BELL, HYDRO AND T.V. CABLE MAY BE STACKED IN A COMMON TRENCH IF APPROVED BY THE MUNICIPALITY AND UTILITIES.
 - WHERE POSSIBLE, LOCATE STREET LIGHTS, HYDRANTS, PEDESTALS, TRANSFORMER BOXES, ETC. OPPOSITE PERPENDICULAR LOT LINES.
 - GAS AND TELEPHONE PREFERRED ON BOTH SIDES OF STREET.
 - STREET LIGHTING CABLE TO BE IN LINE WITH POLES.
 - SEWERS ON CURVED STREETS TO BE AT LEAST 6.0m FROM PROPERTY LINE.
 - ON STREETS WITH ONLY ONE SIDEWALK, SIDEWALK TO BE ON OPPOSITE SIDE OF STREET FROM WATERMAIN.
 - MINIMUM HORIZONTAL SEPARATION OF BELL AND CATV PEDESTALS: 60m (197'), 0.3m FROM PROPERTY LINE
 - MINIMUM DEPTH OR COVER FOR SERVICES: WATERMAIN=1.8m; GAS MAIN=1.0m; HYDRO/TELEPHONE=1.0m
 - THIS TYPICAL SECTION IS BASED ON DESIGN SPEED (50km/hr) AND TRAFFIC VOLUMES (<2500AADT). THE DESIGNER SHALL REFER TO THE LATEST EDITION OF THE TRANSPORTATION ASSOCIATION OF CANADA (TAC) GEOMETRIC DESIGN GUIDE FOR CANADIAN ROADS MANUAL FOR ALL OTHER DESIGN SPEEDS AND TRAFFIC VOLUMES.

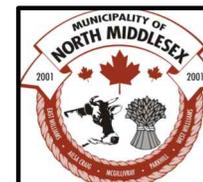


REVISION No.	DATE	DESCRIPTION
MUNICIPALITY OF NORTH MIDDLESEX		
LOCAL URBAN (RESIDENTIAL)		
RIGHT-OF-WAY		
STANDARD CROSS SECTION		
DATE	JULY 2012	DWG.No. 6.1

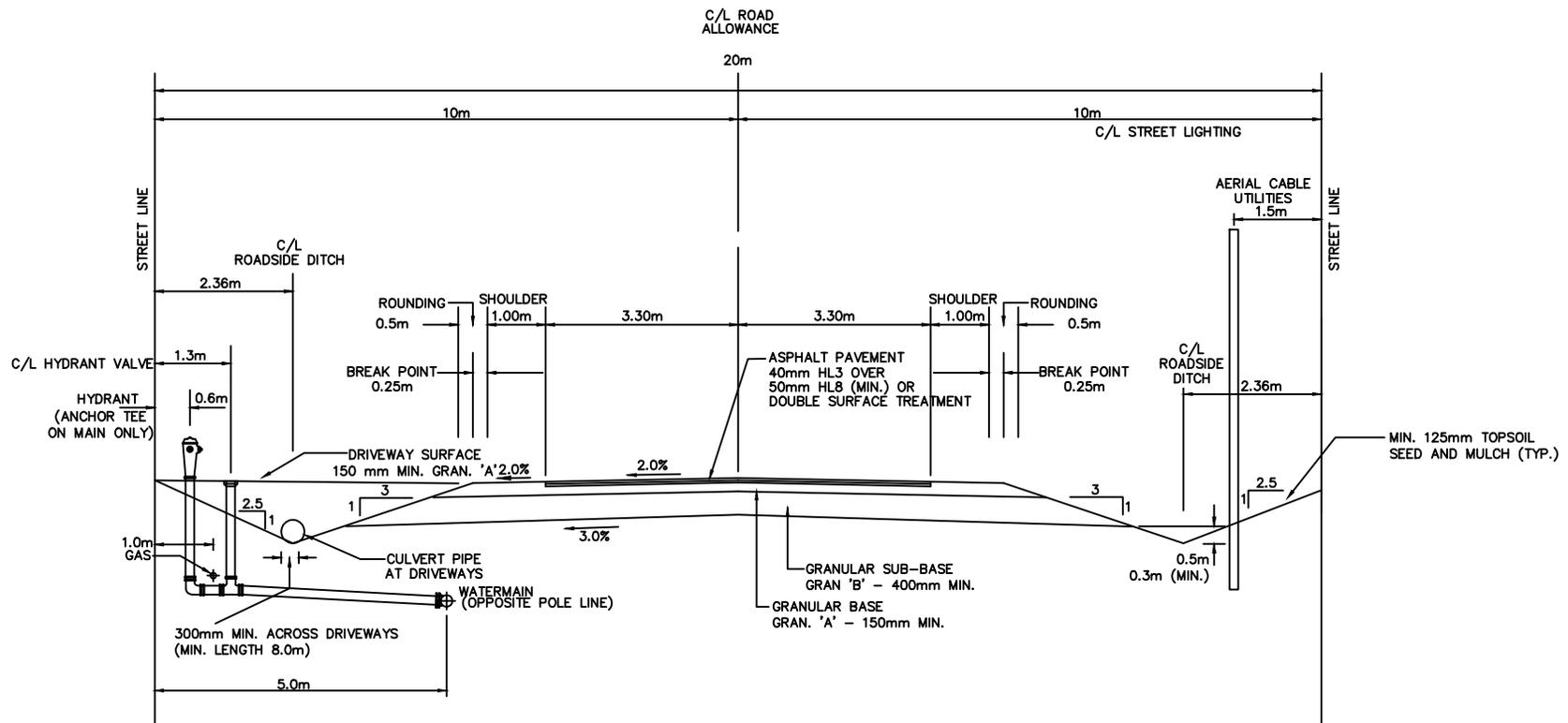


NOT TO SCALE

- NOTES:**
1. IN TREED AREAS R.O.W. CLEARING WIDTH MAY BE REDUCED TO 15m, SUBJECT TO APPROVAL OF MUNICIPALITY.
 2. PAVEMENT DESIGN IS A MINIMUM STANDARD. ASPHALT AND/OR GRANULAR THICKNESS MAY BE INCREASED SUBJECT TO A GEOTECHNICAL REPORT. ASPHALT TO BE IN TWO LIFTS.
 3. MINIMUM DEPTH OR COVER FOR SERVICES: WATERMAIN=1.8m; GAS MAIN=1.0m; SANITARY SEWER=2.9m; HYDRO/TELEPHONE=1.0m
 4. DRIVEWAYS TO BE ASPHALT (60mm, TWO LIFTS) OVER GRANULAR 'A' (150mm) BETWEEN EDGE OF PAVEMENT AND PROPERTY LINE.
 5. DRIVEWAY CULVERTS TO BE MINIMUM 400mm DIAMETER C.M.P. 1% MINIMUM SLOPE, MINIMUM 0.4m COVER, SUBJECT TO STORM WATER MANAGEMENT ANALYSIS, MINIMUM 8.0m LONG.
 6. HYDRANT LEADS TO HAVE MINIMUM COVER FOR FROST PROTECTION.
 7. THIS TYPICAL SECTION IS BASED ON DESIGN SPEED (50km/hr) AND TRAFFIC VOLUMES (<2500AADT). THE DESIGNER SHALL REFER TO THE LATEST EDITION OF THE TRANSPORTATION ASSOCIATION OF CANADA (TAC) GEOMETRIC DESIGN GUIDE FOR CANADIAN ROADS MANUAL FOR ALL OTHER DESIGN SPEEDS AND TRAFFIC VOLUMES.



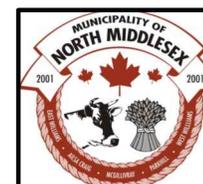
REVISION No.	DATE	DESCRIPTION
MUNICIPALITY OF NORTH MIDDLESEX		
LOCAL SEMI-URBAN RIGHT-OF-WAY STANDARD CROSS SECTION		
DATE	JULY 2012	DWG.No. 6.2



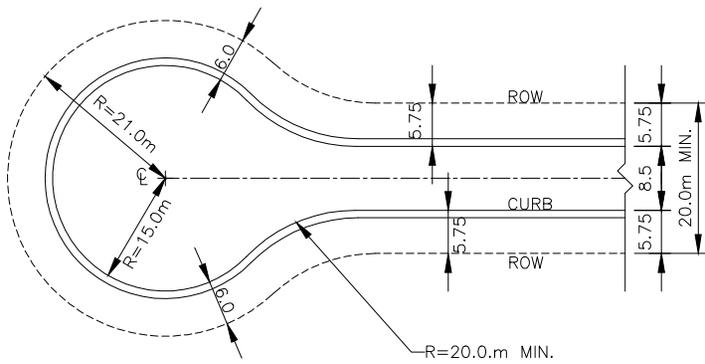
NOT TO SCALE

NOTES:

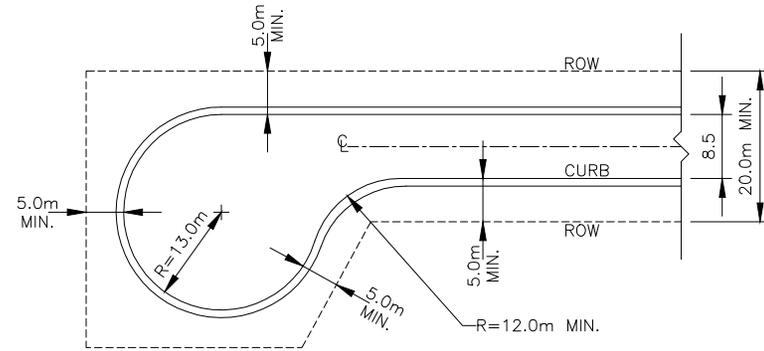
1. IN TREED AREAS R.O.W. CLEARING WIDTH MAY BE REDUCED TO 15m, SUBJECT TO APPROVAL OF MUNICIPALITY.
2. PAVEMENT DESIGN IS A MINIMUM STANDARD. ASPHALT AND/OR GRANULAR THICKNESS MAY BE INCREASED SUBJECT TO A GEOTECHNICAL REPORT. ASPHALT TO BE PLACED IN TWO LIFTS.
3. MINIMUM DEPTH OF COVER FOR SERVICES: WATERMAIN=1.8m; GAS MAIN=1.0m; SANITARY SEWER=2.9m; HYDRO/TELEPHONE=1.0m
4. DRIVEWAYS TO BE ASPHALT (60mm) OVER GRANULAR 'A' (150mm) BETWEEN EDGE OF PAVEMENT AND PROPERTY LINE.
5. DRIVEWAY CULVERTS TO BE MINIMUM 300mm DIAMETER C.M.P. 1% MINIMUM SLOPE, MINIMUM 0.4m COVER, SUBJECT TO STORM WATER MANAGEMENT ANALYSIS, MINIMUM 8.0m LONG.
6. HYDRANT LEADS TO HAVE MINIMUM COVER FOR FROST PROTECTION.
7. HYDRANTS IN RURAL AREAS TO BE INSTALLED WITH MARKERS, SUBJECT TO APPROVAL OF MUNICIPALITY.
8. THIS TYPICAL SECTION IS BASED ON DESIGN SPEED (50km/hr) AND TRAFFIC VOLUMES (<2500AADT). THE DESIGNER SHALL REFER TO THE LATEST EDITION OF THE TRANSPORTATION ASSOCIATION OF CANADA (TAC) GEOMETRIC DESIGN GUIDE FOR CANADIAN ROADS MANUAL FOR ALL OTHER DESIGN SPEEDS AND TRAFFIC VOLUMES.



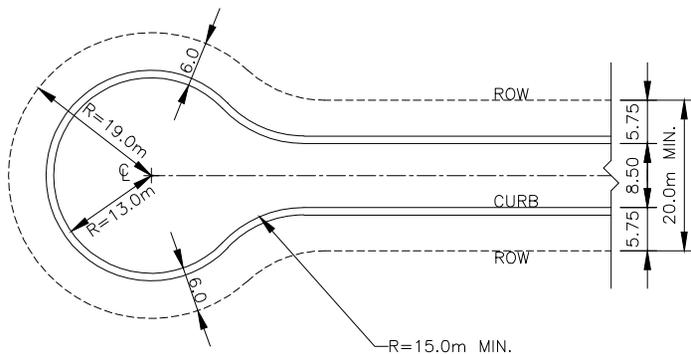
REVISION No.	DATE	DESCRIPTION
MUNICIPALITY OF NORTH MIDDLESEX		
LOCAL RURAL RIGHT-OF-WAY STANDARD CROSS SECTION		
DATE	JULY 2012	DWG.No. 6.3



TYPE 'A'



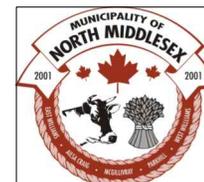
TYPE 'B' MINIMUM
(SEE NOTE 2)



TYPE 'A' MINIMUM
(SEE NOTE 2)

- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
 2. SPECIAL ACCEPTANCE REQUIRED.
 3. DRAINAGE AND GRADING AS SPECIFIED.

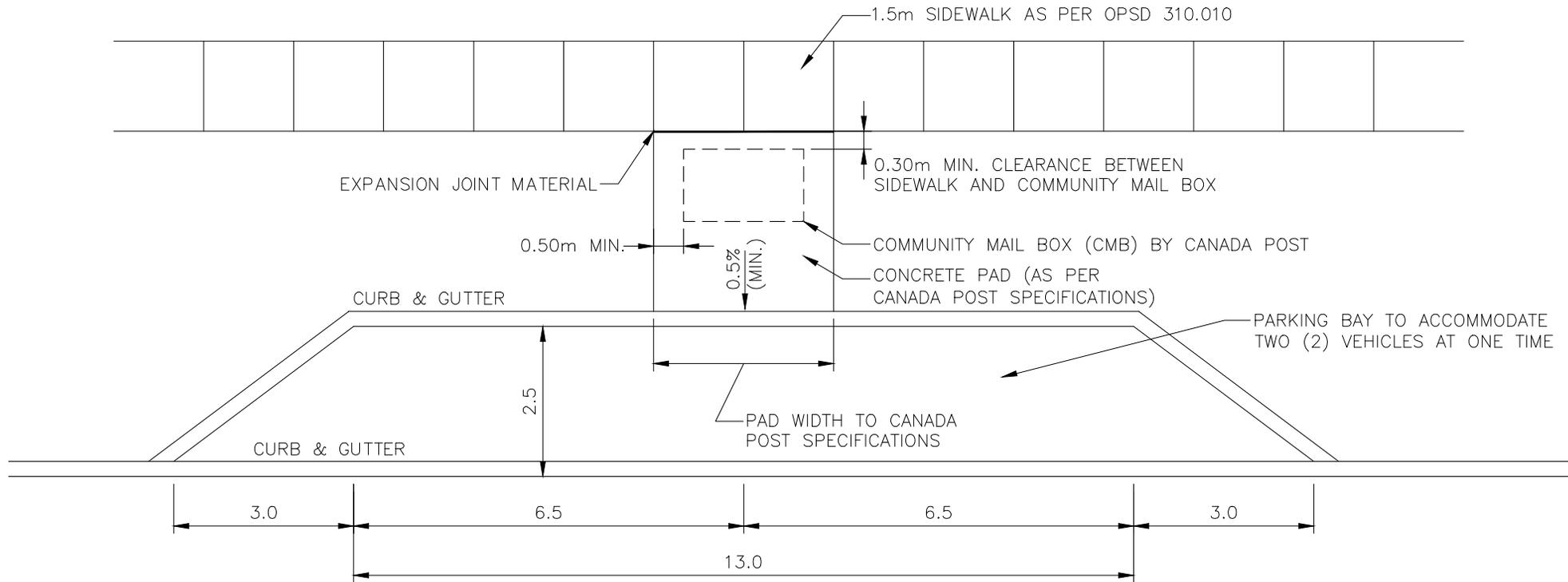
REVISION No.	DATE	DESCRIPTION



MUNICIPALITY OF NORTH MIDDLESEX

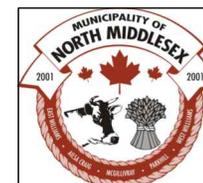
TURNING BASINS
FOR
TERMINATED STREETS

DATE JULY 2012 DWG.No. 6.4

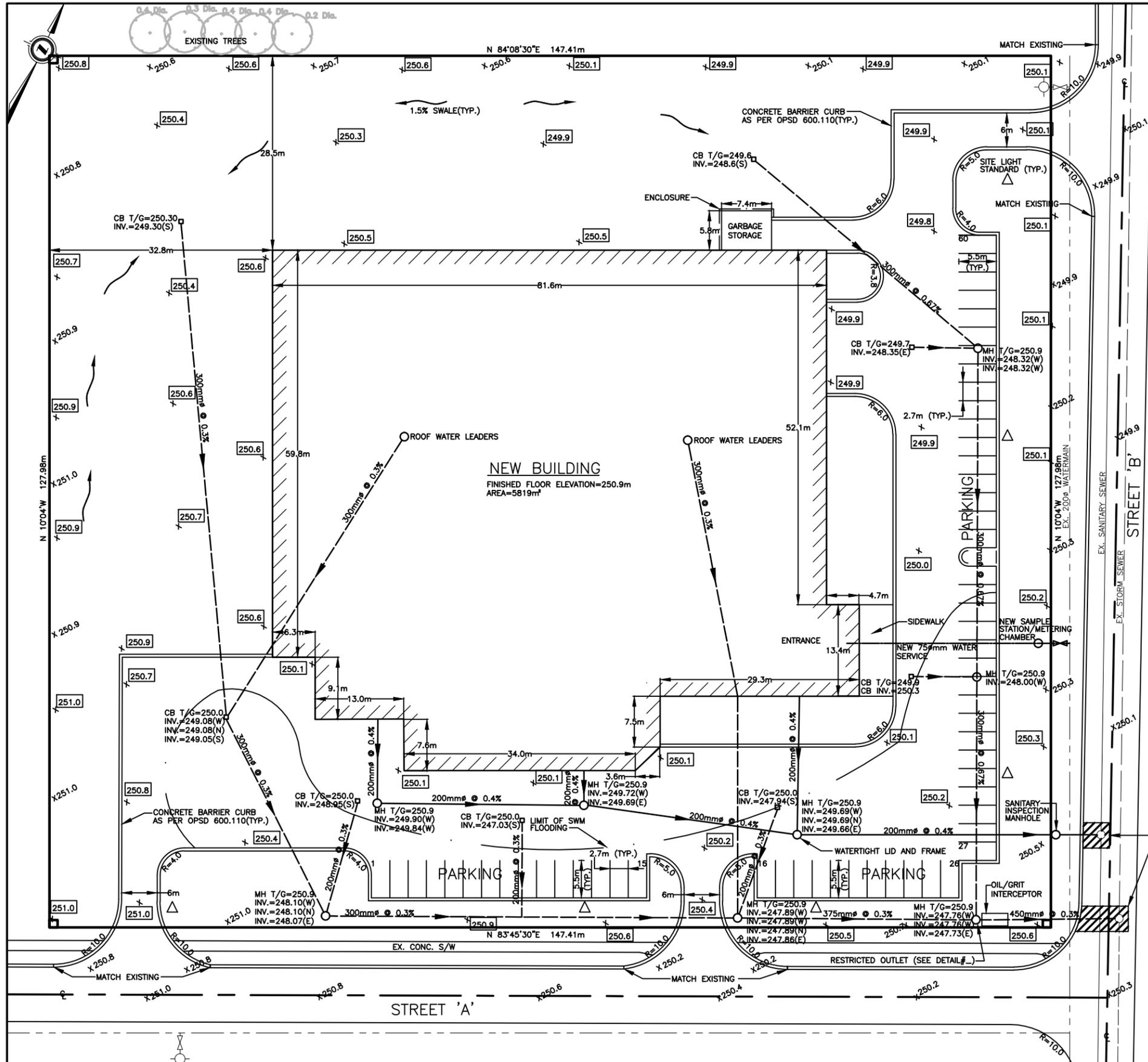


NOTES:

1. ALL COMMUNITY MAIL BOX INSTALLATIONS MUST DRAIN IN THE SAME DIRECTION AS THE BOULEVARD. DRAINAGE ONTO THE SIDEWALK IS NOT PERMITTED.
2. WHERE THE DESIGN OF THE PRECAST PAD DOES NOT PROVIDE 0.3m CLEARANCE BETWEEN SIDEWALK AND CMB, THEN A CAST-IN-PLACE CONCRETE ACCESS IS REQUIRED.
3. RETAINING WALLS ARE NOT PERMITTED.
4. IF REQUIRED, REGRADING AROUND INSTALLATION SHALL BE ACHIEVED WITH MAX. 3:1 SLOPE.
5. CONCRETE PAD AND CMB AS PER CANADA POST SPECIFICATIONS.
6. PARKING BAY FOR CMB TO ACCOMMODATE TWO (2) VEHICLES AT ONE TIME WITH STANDARD VEHICLE LENGTH BEING MIN. 6.5m.
7. MINIMUM CLEARANCE BETWEEN CMB AND EDGE OF CONCRETE PAD TO BE 0.5m.
8. GRANULARS ARE TO BE PLACED AS PER OPSS 314.
9. ASPHALT TO BE PLACED AS PER OPSS 310.



REVISION No.	DATE	DESCRIPTION
MUNICIPALITY OF NORTH MIDDLESEX		
COMMUNITY MAIL BOXES WITH PARKING BAY		
DATE	JULY 2012	DWG.No. 6.5



LEGEND

- SANITARY SEWER AND MANHOLE
- STORM SEWER AND MANHOLE
- EXISTING SANITARY SEWER AND MANHOLE
- EXISTING STORM SEWER AND MANHOLE
- CATCH BASIN
- EXISTING GRADE
- PROPOSED GRADE
- EX. WATERMAIN HYDRANT AND VALVE
- NEW WATER SERVICE AND VALVE
- PROPERTY LINE AND BAR
- SITE LIGHTING

NOTES:

1. LOT ENTRANCES TO MATCH EXISTING GRADES OF ADJOINING ROADWAYS.
2. PARKING PROVIDED - 60 SPACES
3. PARKING LOT STRUCTURE:
 - 65mm HL3
 - 150mm GRANULAR 'A'
 - 300mm GRANULAR 'B'
4. REFER TO LANDSCAPE PLAN FOR ADDITIONAL REQUIREMENTS.
5. LOT PERIMETER TO MATCH ADJACENT PROPERTIES.
6. BUSINESS SIGNS IN ACCORDANCE WITH THE MUNICIPALITY'S BY-LAW.
7. ON SITE FIRE PROTECTION SYSTEMS (i.e. LOOP MAINS) SEE DETAILS DWG#...
8. FIRE ROUTES APPROVED BY THE MUNICIPALITY.
9. FUTURE ADDITIONS/EXPANSION OF BUILDING.

EROSION CONTROL MEASURES DURING CONSTRUCTION

1. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY MEASURES TO CONTROL ALL SILT ENTERING THE STORM DRAINAGE SYSTEM, ALL TO THE SPECIFICATIONS OF THE MUNICIPALITY'S ENGINEER.
2. PROTECT ALL EXPOSED SURFACES, AND CONTROL ALL RUN-OFF DURING CONSTRUCTION.
3. ALL EROSION CONTROL MEASURES TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION COMPLETE.
4. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.
5. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
6. MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
7. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
8. PROTECT ALL CATCH BASINS, MANHOLES, AND PIPE ENDS FROM SEDIMENT INTRUSION.
9. KEEP ALL DITCHES AND SUMPS CLEAN DURING CONSTRUCTION.
10. PREVENT WIND-BLOWN DUST.
11. STRAW BALES TO BE USED IN LOCALIZED AREAS AS SHOWN OR AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.
12. PROVIDE A GRANULAR MAT TO PREVENT COHESIVE SOIL TRACKING AT ALL ENTRANCES TO EXISTING ROADS.
13. SEDIMENT CONTROL MEASURES TO CONFORM TO "GUIDELINES FOR URBAN CONSTRUCTION SITES, ONTARIO", 1987.

LOT DATA:

ZONING:
 AREA: m2(%)
 BUILDING AREA: m2(%)
 LANDSCAPED AREA: m2(%)
 DRIVEWAY AREA: m2(%)

REG. PLAN:
 LOT NO.:
 MUNICIPAL ADDRESS:

I CERTIFY THAT THE PROPOSED SITE PLAN SERVICING, GRADING, DRAINAGE AND RELATED APPURTENANCES COMPLY WITH SOUND ENGINEERING PRACTICES AND THE MUNICIPALITY'S DESIGN GUIDELINES AND CONSTRUCTION STANDARDS

NAME, SIGNATURE, DATE:

No	REVISIONS	DATE	BY



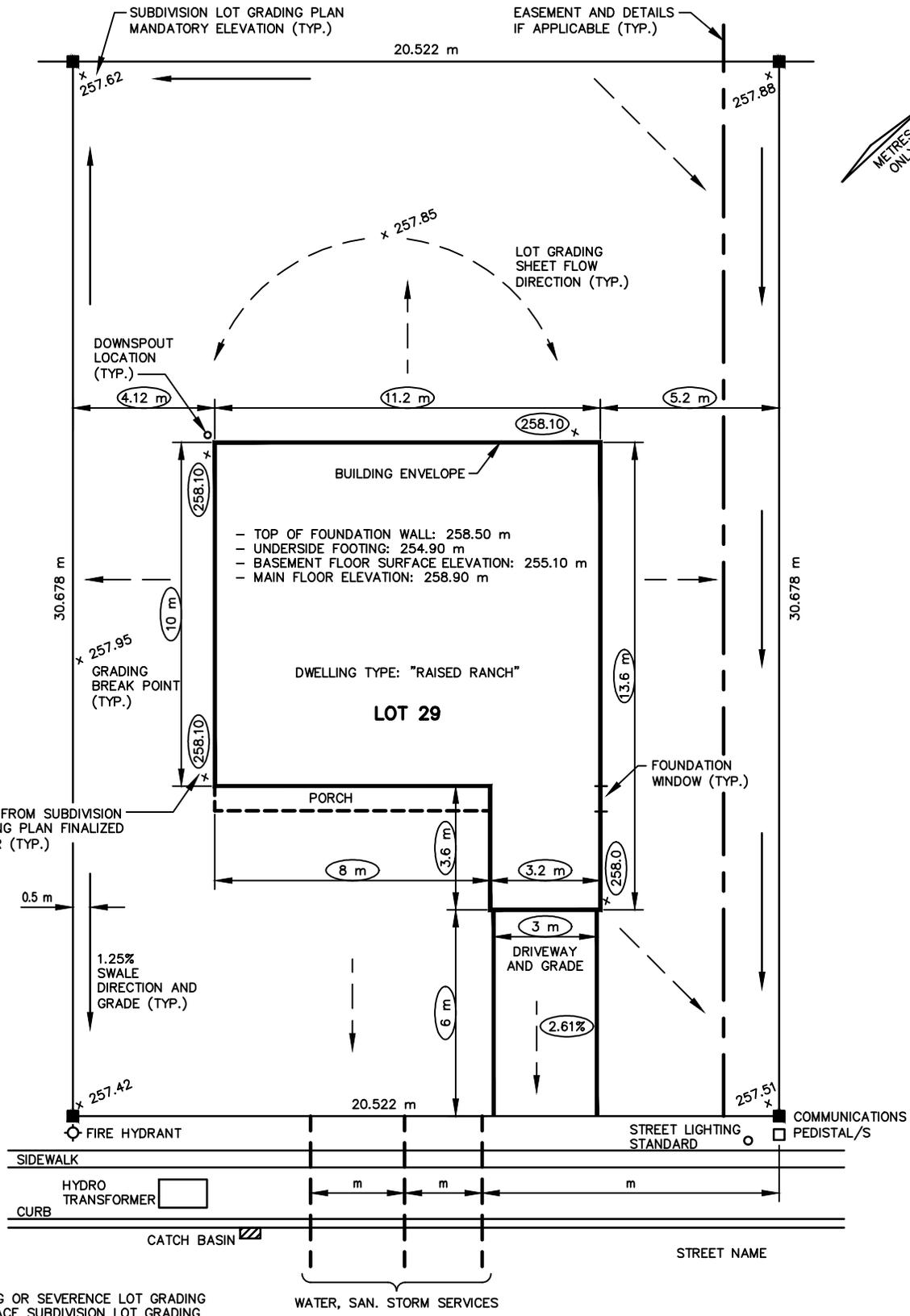
SCALE: N.T.S.

MUNICIPALITY OF NORTH MIDDLESEX
 SITE NAME

PROJECT No: 12-3456

SHEET No: SP-1

PLAN FILE No:



NOTE:

1. FOR INFILLING OR SEVERENCE LOT GRADING PLANS REPLACE SUBDIVISION LOT GRADING PLAN MANDATORY ELEVATIONS WITH EXISTING GRADES AROUND PERIMETER OF PROPOSED LOT

TYPICAL LOT GRADING PLAN

TYPICAL LOT GRADING PLAN
HERE

BUILDER:

NAME:
ADDRESS:

LOT DATA:

ZONING:
AREA: m2 (%)
BUILDING AREA : m2 (%)
LANDSCAPED AREA: m2 (%)
DRIVEWAY AREA: m2 (%)

PLAN PREPARED BY:

ORGANIZATION:
ADDRESS:
FILE:
PHONE:
FAX:
EMAIL:

I CERTIFY THAT THE PROPOSED LOT GRADING AND APPURTENANCE DRAINAGE WORKS COMPLY WITH THE APPROVED SUBDIVISION GRADING PLAN, SOUND ENGINEERING PRACTISES AND THE MUNICIPALITY'S DESIGN GUIDELINES AND CONSTRUCTION STANDARDS

NAME, SIGNATURE, DATE:

APPROVED BY:

ORGANIZATION:
ADDRESS:
NAME, SIGNATURE, DATE:



**MUNICIPALITY OF
NORTH MIDDLESEX**

DRAWN BY:

CHECKED BY:

TYPICAL LOT GRADING PLAN

REG. PLAN:

LOT NO.:

MUNICIPAL ADDRESS:

SCALE:

NO.

REVISION

BY

DATE

**TYPICAL LOT GRADING PLAN
TITLE BLOCK AND BORDER**

APPENDIX C

GENERAL CONSTRUCTION NOTES

All work shall be done in accordance with the minimum standards and specifications of the Municipality of North Middlesex.

The contractor shall notify the municipality at least 48 hours prior to commencing construction on the road allowance

All existing boulevards and road surfaces disturbed during construction shall be restored to a condition at least as good as original all to the satisfaction of the contract administrator.

Prior to commencement of any construction, ALL sewer outlet information, benchmarks, elevations, and dimensions must be checked and verified, and any discrepancies reported to the engineer.

Prior to commencing any work on the installation of services, an approved set of plans must be available on the site, and remain there while work is being done.

At least 48 hours prior to commencing construction on any existing road allowance maintained by the County of Middlesex, the contractor shall obtain the necessary permits from the County Engineer's Department, after discussion with the staff.

The utility locations shown on these contract drawings have been obtained from drawings and data believed to be accurate but cannot be guaranteed to be complete or correct. The contractor shall contact all applicable authorities for the exact locations prior to construction.

Prior to the commencement of construction, all existing underground utilities that will be affected by construction shall be located and marked. All utilities damaged or disturbed during construction shall be repaired or replaced to the satisfaction of the governing body at the contractor's expense. The contractor is to meet all the requirements of the owners of the utilities on this plan and must make satisfactory arrangements with the utility companies for crossing their installations and for providing adequate protection during construction.

All existing underground plant (hydro, telephone, gas mains, sewers) which will be crossed under during the installation of the services shall be supported by a support beam or by other methods, as may be required by the owners of the plant being crossed under.

Construction and detour signing: minimum construction and detour signs required shall be in accordance with manual of uniform "Traffic Control Devices" Book 7, and the latest revision of the MTO "Traffic control manual for roadway work operations".

All excavation wholly or partly within proposed or existing roadways, shall be backfilled and compacted in accordance with Ontario Provincial Standard Specifications.

All bedding material shall be compacted to a minimum of 95% of the material's Standard Proctor Maximum Dry Density (SPMDD). All watermains to have bedding and pipe cover of granular 'B' sand bedding a minimum depth of 300 mm over the top of the pipe unless otherwise noted.

All fill material placed within the right-of-way shall be placed in accordance with OPSS206. In areas to be filled, the subgrade shall be proof rolled to obtain 95% Standard Proctor Dry Density. Only acceptable earthen or granular materials shall be used within the road allowances.

Backfill shall be select native excavated material placed in thin layers compacted to at least 95% SPMDD.

Maintenance of flow: all existing surface and underground drainage systems must be maintained during construction.

Existing trees are not to be removed unless approved by the applicable authority having jurisdiction.

All concrete shall be 25 MPa in 28 days unless otherwise stated.

Restrained joints: restrained pipe joints are required at all fittings, valves and deflections exceeding allowable limits. Submit design calculations and restraint details to the engineer prior to construction in accordance with the contract documents.

The contractor shall take all necessary precautions under The Occupational Health and Safety Act while working in the vicinity of the overhead power lines.

EROSION CONTROL NOTES

All erosion control measures to be in place before starting construction and remain in place until restoration complete.

Maintain erosion control measures during construction.

Minimize area disturbed during construction.

The contractor shall construct temporary measures to control silt entering the storm drainage system, all to the specifications of the municipality's engineer.

Protect all exposed surfaces, and control all run-off during construction.

Keep all ditches and sumps clean during construction.

Protect all catch basins, manholes, and pipe ends from sediment intrusion.

Prevent wind-blown dust.

Straw bales to be used in localized areas as shown or as directed by the municipality during construction.

All collected sediment to be disposed of at an approved location.

All dewatering to be disposed of in an approved sedimentation basin.

Provide a granular matt to prevent cohesive soil tracking at all entrances to existing roads.

Sediment control measures to conform to "Guidelines for Urban Construction Sites, Ontario", May 1987.

SHOP DRAWING SUBMISSION PROCEDURE

General

1. When required in a development, during the construction phase, the following specifies general requirements and procedures for developers' submissions of shop drawings, product data and samples to the municipality's engineer for review. Additional specific requirements for the submissions will be assessed on a project by project basis.
2. Do not proceed with work until relevant submissions are reviewed by developer's engineer.
3. Present shop drawings, product data and samples in SI metric units.
4. Where items or information is not produced in SI metric units converted values are acceptable.
5. Developer's responsibility for errors and omissions in submission is not relieved by municipality's engineer's review of submissions.
6. Notify municipality's engineer, in writing at time of submission, identifying deviations from requirements of contract documents stating reasons for deviations.
7. Developer's responsibility for deviations in submission from requirements of contract documents is not relieved by contract administrator's review of submission, unless contract administrator gives written acceptance of specific deviations.
8. Make any changes in submissions which municipality's engineer may require consistent with contract documents and resubmit as directed by municipality's engineer.
9. Notify municipality's engineer, in writing, when re-submitting, of any revisions other than those requested by contract administrator.

Submission Requirements

1. Coordinate each submission with requirements of work and contract documents. Individual submissions will not be reviewed until all related information is available. Review all documents before submission to the municipality's engineer. Submissions must to complete for each system. Partial systems will not be reviewed.
2. Submissions shall include:
 - a. Date and revision dates
 - b. Project title and number.
3. Name and address of:
 - a. Subcontractor
 - b. Supplier
 - c. Manufacturer.
4. Contractor's stamp, signed by contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with contract documents.
5. Details of appropriate portions of work as applicable:
 - a. Fabrication
 - b. Layout, showing dimensions, including identified field dimensions and clearances
 - c. Setting or erection details
 - d. Capacities
 - e. Performance characteristics
 - f. Standards
 - g. Operating weight
 - h. Wiring diagrams

- i. Single line and schematic diagrams
 - j. Relationship to section number and applicable standards
 - k. Calculations and reports where specifically noted
 - l. Completed equipment data sheets as noted in the contract specifications.
6. After municipality's engineer's review, distribute copies.

Shop Drawings/Construction Procedures

1. Shop drawings/construction procedures: original drawings, or modified standard drawings provided by developer, to illustrate details of portions of work, which are specific to project requirements.
2. Maximum sheet size: ANSI D (22"x34").
3. Submit two copies of shop drawings/construction procedures and one reproducible original for review by the contract administrator.
 - a. Two copies to be reviewed and retained by the contract administrator
 - b. One reproducible original to be reviewed and returned to developer
 - c. Developer to reproduce and distribute drawings to suppliers and subcontractors
 - d. All subcontractor's and manufacturers' drawings shall first be sent directly to the developer, who shall keep a record of the drawings numbers and dates of receipt. The developer shall check thoroughly all such drawings, all other details, to assure himself that they conform to the intent of the developer's engineers drawings and the specifications, and shall promptly return to the subcontractors and/or manufacturers, for correction, such of the drawings as are found inaccurate or otherwise in error. After the developer has checked and approved such drawings, he shall place thereon the date of such approval and the legible signature of the checker and shall then submit them to the developer's engineer for review. The developer's engineer reserves the right to refuse to check or review drawings of a subcontractor or manufacturer which are not submitted in compliance with the foregoing requirements.
 - e. Shop drawings/construction procedures shall be complete in all respects and shall show clear compliance with the specifications. Where applicable, performance figures of equipment, finishes and reference to other relevant drawings must be noted on the shop drawings. Details of ancillary items being supplied with the particular equipment must be submitted. Piecemeal submissions will not be considered. Wiring and elementary control diagrams shall be submitted for electrical equipment. Descriptive brochures where applicable shall be included for information. Any notation on the draft drawings which is on the prints and not on the original from which the prints were made shall be in green ink.

Product Data

1. Product data: manufacturers' catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactures products, may be accepted in lieu of shop drawings.
2. Above will only be accepted if they conform to the following:
 - a. Delete information which is not applicable to the project
 - b. Supplement standard information to provide additional information to project
 - c. Show dimensions and clearances required
 - d. Show performance characteristics and capacities
 - e. Show wiring diagrams, when requested, and controls.

Samples

1. Submit for review, samples in duplicate as requested in respective specification sections. Label samples as to origin and intended use in the work.
2. Samples: examples of materials, equipment, quality, finishes, workmanship.
3. Where colour, pattern or texture is criterion, submit full range of samples.
4. Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.
5. Notify the municipality's engineer in writing at the time of submission of deviations in samples from the requirements of contract documents.