



Design Guidelines Manual
2023 Edition



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1. INTRODUCTION

1.0. About the Town of Aylmer

The Town of Aylmer (the Town) is a lower tier Municipality within Elgin County located on the north shore of Lake Erie. The Town is the operating authority for all roadways, storm sewers, sanitary sewers and watermains that are to be installed within all road allowances and registered easements within the Town. The Town is also responsible for all parks and open space on municipally owned lands.

It is the Town's objective is to work collaboratively with developers on site plans and subdivisions towards the end goal of creating great private and public infrastructure and neighbourhoods.

1.1. Purpose of Design Criteria

The design information contained in this guideline is intended to provide guidance beyond legislative and standard design practices for use in the Town. There will be site specific situations where the design will depart from these practices as it is not possible nor is it the intention of the Town to anticipate every situation. The design guidelines manual shall be read in conjunction with the Town's Standard Contract Documents.

NOTE: Additional Items may be required to address specifics for any given development. Each property is reviewed and may require items over and above the zoning By-Law and design guidelines requirements depending upon the site and the nature of the development.

Where it is deemed appropriate or necessary the Drainage Act legislation and procedures therein shall be utilized to service the development.

The Town intends to review and revise the design guideline annually. The design guidelines will be circulated to all applicable stakeholders for review and comment. Detailed lists of revisions and updates to the design guidelines will be published on an annual basis.

1.2. Submissions

Submission and circulation of planning applications and engineering drawings related to Planning Approvals is co-ordinated through the Town's Manager of Planning and Development.

Drawing approval must be obtained from the Infrastructure and Operations Department prior to any work commencing on any site.

2. GENERAL INFORMATION

2.0. List of Contacts

For a complete listing of the various departments see the Town’s list of contacts on their website link:

<https://aylmer.ca/contact/>

2.1. Definitions

Town	Shall mean The Corporation of the Town of Aylmer.
AODA	Means the Accessibility for Ontarians with Disabilities Act
AWWA	Means American Water Works Association which describes the minimum requirements for design, installation, performance, and manufacture of products used in the drinking water industry.
Contractor	Means a person, partnership, or corporation who is contracted to undertake the execution of work commissioned by the Town to install or maintain sewers, private drain connections, maintenance holes, catch basins and other appurtenances.
Complete Streets	Complete Streets are transportation facilities that are designed for all ages, abilities, and modes of travel. On Complete Streets, safe and comfortable access for pedestrians, bicycles, transit users and the mobility-impaired is not an afterthought, but an integral planning feature.
Developer	Shall mean the Owner or party specifically named in a Development Agreement or in a Subdivision Agreement.
Director	Shall mean the Director of Operations, Associate Director of Operations and Infrastructure, or approved designate.
Engineer	Means the Town Engineer or the Engineer’s authorized representative.
Inspector	Means the person(s) authorized by the Town to see that the installation is executed according to the specifications and the approved plan(s) in a good workmanlike manner.

Main or Watermain	Means every water pipe, except services and portions of private watermains as herein defined, installed on the public road allowance or on any other land for which the Town has obtained easements.
MTO	Means the Ministry of Transportation
Private Hydrant	Means a hydrant connected to a watermain and installed on private property. (Fire Department has full rights of connection.)
Private Watermain	Means a pipe connected to a watermain and installed on private property and from which more than one service and/or hydrant lateral are connected.
Service	Means every water pipe installed from a connection on a watermain or private watermain to the meter location or, for a fire service, to the inside of the exterior wall of a structure.
Service Extension	Means the portion of a service from the property line to the meter location, or for a fire service to the inside of the exterior wall of a structure. (i.e.; an extension of a service stub)
Service Stub	Means the portion of a service from a watermain to the property line which will always include one control valve.
Structure	Means a building of any kind, including but not restricted to, apartments, condominiums, single-family homes, town housing, row housing, industrial, commercial, and institutional.
Subdivider	Means the Developer, Owner, or party specifically named in a Subdivision Agreement.
OPSD	Means the Ontario Provincial Standards Drawings
Owner	Shall include any person who or any firm or corporation that is the registered owner of the property under consideration or any agent thereof, a person entitled to a limited estate in land, a trustee in whom land is vested, a committee of the estate of mentally incompetent person, an executor, an administrator, and a guardian.
OBC	Means the Ontario Building Code
ROW	Right-of-way; the width of a road from property line to property line.
Street Line	Limit of the right-of-way; property line.

TAC	Means the Transportation Association of Canada.
PDC	Means a private drain connection

2.2. Acknowledgement of Sources

The Town of Aylmer’s design guidelines were created in compilation using the City of St. Thomas’ and Township of Southwold’s design guidelines, the City of London’s design specifications & requirements manual, and Oxford County design guidelines & specifications.

3. ENGINEERING REVIEW FOR DEVELOPMENT

3.0. Consultation Process

An applicant for a new development shall arrange for a consultation meeting with Town staff through the Town Planner or County Planner depending on the application type, to discuss the development or planning application.

Plans are circulated to Town staff involved with the new development for review prior to the consultation.

Meetings are held at Town Hall or online. The setting is informal and open dialogue with the applicant/agent is encouraged. Town staff will comment on the proposed development and can inform the applicant what reports or studies will be required for the specific development application.

The applicant will then provide the applicable studies, reports, drawings, and other submission requirements as deemed necessary by Town staff to support their development application.

The submission requirements will be broken out below for the subdivision and site plan drawing review process and include typical approval agencies.

3.1. Subdivisions

Subdivision submissions should include reports and engineering drawings that are prepared by the developer's consulting engineer. Depending on the nature of the application, the Town may request the first submission only include the focused design studies and reports to allow for a more detailed review prior to the engineering drawing review. Submissions are reviewed by the Town Departments and consultants as required.

3.1.1. Design Submissions

Design submissions are to be accompanied by any supporting documentation required for the completeness of the design of the subdivision development. Such documentation may include, but may not be limited to copies of the following reports:

- Geotechnical Report
- Traffic Impact Assessment Report
- Environmental Assessment
- Copies of reports submitted to the Conservation Authority
- Storm Water Management Report
- Noise Report
- Natural Heritage Investigations
- Functional Servicing Report
- Vibration Report

- Archaeological Report
- Legal Survey
- Photometric Lighting Report (external works)

3.1.2. Drawing Standards

The following AutoCAD Drawing Standards shall be used in new development submissions.

- The drawing scale for plan and profile drawings shall be in metric, using a scale of 1:500 horizontally and 1:50 vertically. A scale of 1:250 horizontally should be used in congested areas.
- Drawings shall be oriented such that North points up and/or to the right (or left if required).
- Dimensions and elevations shall be provided in metric units.
- Existing conditions should appear faded in comparison to the proposed work and use a text size of 1.6mm of the final hard copy.
- The various utility lines should be identified and appear slightly darker than existing topography.
- Proposed work should appear heavier than existing conditions and use a text size of 2.0mm for notes, elevations and dimensions.
- All linework and text should be drawn using a bylayer colour and linetype to facilitate easy modifications.
- Use of Colour is recommended; drawings and linetypes are recommended to be submitted in colour (ie. blue watermain, red sanitary, green storm, etc.).

3.1.3. Engineering Drawings

A complete set of Engineering Drawings, in addition to the requirements in Section 3.1.2 shall be completed in colour and comprised of the following:

- The approved draft plan
- The proposed plan for registration showing all lot and block numbering and dimensioning
- Cover Sheet (should include the name of development, the owner/developer name, drawing index and key plan showing site location)
- General Plan of Services
- Plan and Profile Drawings
- Area and Lot Grading Plan
- Sediment & Erosion Control Plan
- Storm Drainage Plan, including existing servicing in the area
- Storm Sewer Design Sheets
- Storm Water Management Report
- Sanitary Drainage Plan, including all existing servicing in the area
- Sanitary Sewer Design Sheets
- Water Distribution Plan, including all existing servicing in the area
- Landscaping plan
- Park Grading Plan, if necessary
- Composite Utility Plan, including Hydro Distribution System and Street Lighting
- Street Signage and Traffic Control Plan

- All detail drawings other than the O.P.S. Detail Drawings
- All drawings pertinent to the design
- All other calculations necessary to check the design; and

The required drawings listed above may have several drawings incorporated into one drawing as long as the drawings are neat and legible (i.e. Area/Lot grading Plan combined with Sediment and Erosion Control Plans).

Some of the drawings listed above have been further explained and expanded upon in the subsections below.

3.1.3.1. General Plan of Services

The General Plan of Services will indicate the general overall scope of the project and the geographic relationship to surrounding lands.

- A General Plan of Services drawing shall be prepared for all developments at a scale of no greater than 1:2000.
- When more than one General Plan of Services drawing is required for any development then the division of drawings shall reflect the limits of the Registered Plans as closely as possible.
- The reference Geodetic Bench Mark and the Site Bench Marks to be used for construction shall be identified on the General Plan of Services.
- Road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as the Registered Plan.
- All existing and proposed services, utilities and abutting properties are to be shown, if possible.
- All sewers are to be shown and labeled with length, size, material and flow directions.
- Sewer manholes and catchbasins will be shown and are to be numbered in accordance with the design drawings.
- All watermains, valves, hydrants, reducers, tees and blow-offs are to be shown. Watermains are to be identified by size and material.
- All curb and sidewalks to be shown.
- All fencing to be indicated by the height and type of fence.
- All street light poles and transformers are to be shown.
- Dimensioning of utilities and roadways is not a requirement on the General Plan of Services.
- Registered Plan number must be shown on the As-Constructed General Plan of Services.
- All site information for parks, schools, churches, commercial and industrial development must be shown.
- If a subdivision encroaches on an existing floodplain, the approved fill lines and restrictions must be shown, as specified by the conservation authority.

3.1.3.2. Plan And Profile Drawings

Plan and Profile Drawings will provide the detailed information required for construction of roads and municipal services. The following are the requirements for the plan and profile drawings:

- North Arrow
- Scale shall be 1:500 or 1:250 horizontal; 1:50 vertical
- Plan and Profile drawings are required for all roadways, blocks and easements within the development, for all outfalls beyond the development to the permanent outlet, for all boundary roadways abutting the development and for other areas where utilities are being installed below grade. Plan and profile drawings are not required for rear yard catchbasin leads, but rather a cross section of the proposed work.
- Geodetic benchmark monument location and information.
- All existing or future services, utilities and abutting properties are to be shown.
- All proposed services to be constructed are to be shown.
- The profile portion of the drawing shall be a vertical projection of the plan portion whenever possible.
- All road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as the Registered Plan. Lot and block frontages are to be shown.
- All curb and gutter and sidewalks shall be shown and dimensioned on the plan portion of the drawing.
- All storm and sanitary sewers and watermains shall be shown and dimensioned on the plan and shall also be plotted on the profile of the drawings. The sewers shall have a complete description on the plan and/or profile portion of the drawing including length, grade, material, class of pipe, and bedding requirements. The size of the pipe shall be plotted to full scale on the profile.
- All sewer manholes shall be shown on the plan and on the profile portions of the drawing. The manholes shall be identified number on the plan and on the profile portion of the drawing. All invert elevations shall be shown on the profile with each having reference to the north arrow.
- All catchbasins and catchbasin connections shall be shown. Catchbasins are to be identified by number.
- All rim and invert elevations for manholes are to be shown. Catchbasins shall have rim elevations only.
- All sewer manholes which have safety platforms are to be noted.
- All drop connections are to be noted and referred to the applicable O.P.S. specification, drawing or detail sheet.
- All watermains, hydrants, valves, blow-offs, etc. shall be shown, described and dimensioned on the plan portion of the drawing. In addition, the watermain shall be plotted to true scale size on the profile portion of the drawing and labelled with the pipe size, material and depth of cover.
- The location of all storm, water and sanitary service connections shall be shown on the plan portion of the drawing using different symbols, and line types for each service type. The connections to all blocks in the development shall be fully described and dimensioned (size, length, grade, invert elevations, material, class of pipe, bedding, etc.).
- The centreline of construction with 20 metre stations noted by a point or small cross shall be shown on the plan portion of the drawing.
- The original ground at centreline and the proposed centreline road grade shall be plotted on the profile. The proposed centreline and centreline grades shall be fully labeled including length, grade, P.I. stations and elevations, vertical and horizontal curve data, etc.
- Details of the gutter grades around all 90 degree bends, crescents and cul-de-sacs shall be provided on the plan portion of the drawing.

- Special notes necessary to detail construction procedures or requirements are to be shown.
- Chainages for the centreline of construction are to be shown on the profile portion of the drawing. The P.I., B.H.C., E.H.C., B.V.C., and, E.V.C. chainages shall also be noted.
- Any test pit or borehole locations and soil profile information shall be shown.
- The basement elevation of all existing dwellings on the streets where sewers are to be constructed shall be noted.
- All of the proposed services and features are to be shown on the plan portion of the drawing. Those services below grade that are critical to the new construction shall also be shown in the profile. Test holes may be required to determine actual elevation of these services.
- The curb radii at all intersections shall be shown on the plan portion of the drawing.
- Profiles of roadways shall be produced sufficiently beyond the limits of the proposed roads, to confirm the feasibility of possible future extensions.
- The location of all streetlights and transformers shall be clearly shown on the plan portion of the drawings.

3.1.3.3. Area and Lot Grading Plans

The Lot Grading Plan shall establish the final grade control for all lots and blocks within the development in accordance with the Town's lot grading standards in Section 11 of this Design Criteria.

- North Arrow
- The Lot Grading Plan shall be prepared at a scale of 1:500 for single family, semi-detached areas and for multi-family areas.
- All lots and blocks within the subdivision are to be shown and are to be identified in the same manner as the Registered Plan.
- Geodetic benchmark monument location and information.
- Existing contours are to be shown at maximum 0.5 m intervals within the subdivision limits and 30 metres beyond the subdivision limits.
- Proposed centreline road elevations are to be shown at 20 m stations along all roads within and abutting the subdivision. Elevations are to be shown for the 20 m stations in accordance with the chainage on the profile drawings.
- Proposed elevations are to be shown for all lot corners and intermediate points of grade change. On larger blocks, a proposed elevation is to be shown at 15 m intervals along the frontage of the block and at reasonable intervals along the sides and rear of the block to clearly illustrate the grading of the block in relation to the surrounding lands and house type.
- The specified lot grade shall be shown at a location 6.0 m minimum from the street line. For "split" type drainage patterns, the specified rear house grade shall be shown. The specified minimum top of foundation elevation for each lot shall also be shown.
- The direction of the surface water runoff from the rear of all the lots shall be indicated by means of an arrow pointing in the direction of the runoff.
- All swales, other than the normal side yard swales, are to be shown along with the invert elevation of the swale at regular intervals (i.e. centreline of each lot for rear yard swales).
- All rear yard catchbasins shall be shown along with the rim elevation of the catchbasin grate and the invert elevation of the outlet pipe.

- All curbs, sidewalks, catchbasins, valves, hydrants, streetlight poles, transformers, Canada Post community mailbox locations and easements shall be shown on the lot grading plans. Driveways must have a minimum 1 m clearance to these utilities.
- All trees shall be shown on the grading plan. Trees must be a minimum of 2.0m from proposed driveways.
- All 3:1 slopes (terracing) required shall be shown with the intermediate grades specified.
- Existing elevations are to be shown on adjacent lands approximately 30 metres from the subdivision limit to enable assessment of the grading between the subdivision and the adjacent areas. The interval of those elevations shall be dependent upon the degree of development of the adjoining lands with the developed areas requiring the most information.
- For all design lots, the top of foundation wall shall be shown and labeled on the approved grading plan.
- For all design lots, the underside of footing shall be shown (if required).
- The grading along the limit of the subdivision shall be carefully controlled to avoid disturbance to the adjoining areas.
- Temporary silt fencing shall be installed along the limit of subdivision and maintained for the duration of the contract until such time as seeding or sodding takes place. This fencing shall be noted on the grading plan.
- All semi-detached lots shall be indicated with SD on all drawings.
- The lot grading plans shall show proposed locations for building envelopes, enveloped for private sewage disposal systems and private water supply systems for rural estate developments.
- All culverts shall be designed and shown on the lot grading plans identifying culvert diameter, gauge, minimum length and type.
- All typical grading details and specifications shall be shown on the Lot Grading Plan.
- Masked imaging of the Storm Drainage Areas shall be shown.
- Overland flow route for the entire subdivision
- Ponding limits for 100 year storm at catch basins, rear yard catch basins

3.1.3.4. Detail Plan

A Detail Plan will be required when there is not sufficient space on the Plan and Profile Drawings or other drawings to fully describe the necessary works.

- A Typical road cross section shall be shown on the Detail Plan, illustrating R.O.W. dimensions, pavement structure, sewer and watermain locations, curb and sidewalk locations, and proposed utility locations.
- Details of special chambers, such as metering chambers shall be shown.
- Details of special structures, such as storm sewer inlets and outlets or retaining walls shall be shown.
- Details of special drainage features, including stormwater retention/detention ponds shall be shown.
- Pumping station details shall be shown.
- Any other details or notes as required shall be shown, such as drop structures in manholes.

3.1.3.5. Storm And Sanitary Drainage Plans

A separate drainage area plan for storm and sanitary drainage shall be prepared.

- Scale to suit drawings, but needs to be legible.
- The street and lot layout of the subdivision, street names and property descriptions shall be shown on the Drainage Plans.
- All existing and proposed sewers, manholes, catchbasins shall be shown and labeled with identifying numbers, sizes, lengths, grades and direction of flow.
- All external areas shall be shown on the Drainage Plans. If the external areas are too large to be accommodated, a separate drawing for the external storm areas shall be included in the set.
- Storm drainage areas shall be delineated on an actual contributing drainage area and manhole to manhole basis.
- Sanitary drainage areas shall be delineated on a lotline by lotline and manhole to manhole basis.
- All drainage areas shall be numbered and shall include area in hectares, run-off coefficients for storm or population densities for sanitary.
- The design sheet shall be shown on the Drainage Plans. If the design sheet cannot be accommodated on the area plan, the design sheets can be shown on their own drawing.

3.1.3.6. Utility Plan

The development will require a utility plan for utilities other than water and sewer, from the requirements of various public and private utility agencies. The Utility Plan shall also detail the layout for street lighting.

- Maximum drawing scale of 1:750.
- A legend using standard symbols shall be shown on the Utility Plan.
- The location of all existing and proposed utilities (Hydro, Telephone, Cable TV, Gas, Streetlight), including those in common trenches, shall be shown on the Utility Plan.
- The location of all existing and proposed utility structures and pedestals, including Canada Post community mailboxes shall be shown and labeled.
- Typical utility trench details and duct locations shall be shown.
- Any specific duct and trenches cross section details for road crossing shall be shown.
- Any other utility details or notes shall be shown on the Utility Plan.

3.1.3.7. Landscape Plan

All landscaping plans shall be prepared in accordance with the criteria given within Sections 13 and/or 11 of this Design Guidelines Manual and in accordance with the Ontario Landscape Contractors Standard.

3.1.3.8. Functional Servicing Report

Generally a functional servicing report (feasibility study) is required as background information for Draft Approval for a Plan of Subdivision. A functional report may also be required, for other mid to large-

scale developments potentially having an impact on servicing, grading and drainage, water quality or quantity, and traffic, at the discretion of Town staff.

Prior to the commencement of the design and the functional report, the Developer's Design Engineer shall meet with the Manager of Planning and Development, Director or designate to discuss the Town's requirements. It is suggested that, when possible, this be a joint pre consultation meeting with other affected departments and agencies. The functional report shall provide all details, calculations, costs, alternatives and recommendations necessary to facilitate logical and appropriate decision-making.

The report should provide all relevant background information with respect to Site Constraints / Existing Conditions such as:

- Topography and drainage
- All pipelines (EPCOR Utilities etc.)
- Hydro easements / corridors
- Trunk sewers and watermains
- Utilities
- Environmental features (protected watercourses, terrestrials)
- Traffic impact studies

The functional report shall include, but will not necessarily be limited to the following considerations:

- Concept Plan
- Contour Plan
- General Plan of Services
- Drainage Plan
- Geotechnical Investigation
- Major roadway alignments, cross-sections and intersections;
- Roadway structures;
- Watercourse improvement and channelization;
- Railway crossings;
- Parkland development
- Major trunk sewers, storm and sanitary;
- Stormwater management strategy for the development, using ponds or low impact development practices.
- Storm drainage systems, including overland flow routes and outlets;
- Sanitary drainage systems, including capacity analysis of the receiving system;
- Water distribution systems, including independent pressure and flow testing of the existing systems and network modelling;
- Lot grading design;
- Pumping station locations;
- Electrical distribution
- Traffic Impact Study

3.1.4. Construction Inspection

Periodic construction inspection will be carried out by the Town of Aylmer’s Development and Operations departments. The subdivider’s engineer shall be conducting full time site inspection services for new subdivision developments and be available for consultation during the entire construction period.

3.2. Site Plan Control

To start the site plan process, the applicant must contact the Town’s Planner to arrange a pre-consultation meeting to discuss the site plan objectives and submission requirements to the Town.

Site plan submissions will include detailed reports and site plan drawings that are prepared by the developer’s consulting engineer(s). Submissions are typically reviewed by the Associate Director of Infrastructure and Operations and the Town’s consulting engineer.

3.2.1. Design Submissions

Design submissions are to be accompanied by any supporting documentation required for the completeness of the application. Such documentation may include, but may not be limited to copies of the following reports:

- Geotechnical (soils) Report
- Traffic Impact Assessment Report
- Environmental Assessment
- Photometric Lighting Report (external works)
- Natural Heritage Investigations
- Copies of reports submitted to the Conservation Authority
- Storm Water Management Report
- Noise Report
- Functional Servicing Report
- Vibration Report
- Archaeological Report
- Legal Survey, including deed
- Planning Justification Report

3.2.2. Site Plan Drawings

A complete set of engineering and/or architectural drawings will be required for the site plan application submission. Engineering drawings typically required for site plan developments shall include, but not be limited to:

- Site Plan Drawing (general layout with site data chart)
- Site Grading and Drainage Plan (including sediment and erosion control)

- Site Services Plan and Profile
- Landscaping Plan
- Electrical Services and Utilities Plan
- Lighting Layout and Distribution Plan
- Building Elevations Plans
- Any servicing external to the site, as required.

3.3. Approval Agencies

Depending on the location and nature of the development, the developer may be required to obtain approvals from various other regulatory agencies which include but are not limited to:

The Department of Fisheries and Oceans (DFO)
The Ministry of Environment, Conservation and Parks (MECP)
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)
Elgin County
Catfish Creek Conservation Authority
Elgin St. Thomas Public Health
Adjacent Municipalities where applicable

It is the responsibility of the developer to provide the Town with suitable written documentation of the approval from the regulatory agencies. The development will be subject to the requirements of all by-laws within the Town.

The developer shall be required to enter into a Development Agreement (i.e. Subdivision Agreement or Site Plan Agreement) with the Town and pay fees to the Town such as application fees for zoning and administration fees applicable to the development application.

4. ENGINEERING STANDARDS

4.0. Civil 3D – AutoCAD

Computer-Aided Design (CAD) shall be used to generate all engineering drawings. Vector format “DWGS” files with no X-Refs shall be supplied to the Town. This data shall be supplied when “as-constructed drawings” are submitted for assumption. Storm sewer, sanitary sewer and watermain information must be on a separate layer.

Georeferenced plans are required for each application.

4.1. Drawing Sizes

Full sized drawings to be ANSI D 22” x 34” (559mm x864mm). Reduced drawings are to be 11” x 17” (279mm x 432mm).

4.2. GIS/Asset Management Requirements

4.2.1. Inventory Data

The Final Submission Requirements shall consist of one (1) USB stick or dropbox submission of digital submission (Preferred format is AutoCAD .dwg file, which may include Civil 3D)

The following information should be included in the GIS data base:

- Road Section Number
- Street Name
- Road Surface Length (m)
- Road Surface Width (m)
- Asphalt Type Base
- Asphalt Type Topcoat
- Asphalt Base Depth (mm)
- Asphalt Depth Topcoat (mm)
- Road Surface Condition
- Road Surface Useful Life
- Year Constructed
- Cost of Initial Pavement
- Year of Maintenance
- Cost of Preservation (Betterment)
- Type of Maintenance
- Traffic Counts
- Design Mixes
- Soils Reports
- Traffic Signal (Pole and Fixture)
- Street Light (Pole and Fixture)
- Sidewalks
- Traffic Signs
- Underground services

- Curb

4.3. As-Constructed/Record Drawing Requirements

4.3.1. Final Submission

Prior to assumption the applicant is required to provide a complete project package to the Town. This package includes the following:

- Digital "As Constructed Drawing Set" in an Adobe format (.pdf file), (complete with all required signatures);
- Digital "As Constructed Drawing Set" in AutoCAD format (.dwg file, which may include LDD or Civil 3D)
 - provide all Paper Space Title Blocks and Plot Style Tables
 - all existing survey points are to be contained in the drawing
 - all proposed TIN's, grading models and/or contour lines are to be contained in the drawing
 - all line work must be in Model Space at 1:1 scale and unrotated in a World Coordinate System (WCS)
 - drawing units are to be in metric
 - purge all old or extra drawing layers
 - bind all XRef files (no external attachments upon submission)
 - georeferenced plans are preferred, but not mandatory for submission
 - All digital "Project" support files which do not reside in AutoCAD such as stormwater calculations (PDF acceptable), technical reports, etc.
 - The digital formats may be from industry standard software including Microsoft Office, Adobe, Synchro Traffic, etc

4.3.2. Recording of PDC Services

Once the PDC have been placed, a record of its location must be produced for As-Constructed drawings and provided digitally to the Town. Water, Sanitary and Storm laterals are to be located on these drawings by showing proper plan view location which includes any bends and sweeps between the tee and the R.O.W. tie-in or stub. Also required on the drawing is the pipes invert elevation at the property line.

5. TRANSPORTATION

5.0. Roadway Design

All roads shall be designed and constructed in accordance with the current edition of the Manual of Geometric Standards for Canadian Roads, TAC, OPSD's, AODA and OTM regulations. Road design shall incorporate a complete street approach and should promote a healthy and safe community.

5.0.1. General

The following factors shall be considered in the design of all transportation systems in the Town of Aylmer:

- Number and types of vehicles using the roadway
- Accessibility of an area to emergency services
- Spacing, type, intersecting angle and location of intersections and crosswalks
- Sight distance (decision, stopping, intersection, etc.)
- Level of access from adjacent properties
- Traffic calming requirements
- Playground and school zone locations
- Complete Streets, including
 - Neighbourhood/Pedestrian/Cycling Connectivity
 - Tree protection and Improved Planting Zones
 - Placemaking – Community Enhancement Features
 - Pedestrian facilities
 - Cycling facilities
- Intersection offsets
- Intersection control (uncontrolled, Yield, Stop, roundabout or traffic signal)
- Channelization requirements
- Traffic control device warrants
- AODA requirements
- Avoidance of Noise Barrier Walls due to numerous uninterrupted back yards along arterial roads
- Public Transit requirements

Pedestrian, cyclist and vehicular safety shall be held paramount and integral in the design of any transportation system.

5.0.2. Reference Standards and Guidelines

Road design shall be in accordance with the following standards and guidelines, as amended or expanded upon within the Town of Aylmer Design Guidelines:

Transportation Association of Canada (TAC)

- Geometric Design Guide for Canadian Roads (TAC Standards)
- Manual of Uniform Traffic Control Devices for Canada (MUTCD)
- Guide for the Design of Roadway Lighting
- Pedestrian Crossing Control Manual
- Canadian Guide to Neighborhood Traffic Calming

Ministry of Transportation

- Geometric Design Standards for Ontario Highways, 1985 (latest revision)
- Ontario Traffic Manual (OTM) (latest edition)
- MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, 2017 (latest revision)
- OTM Books 5,6 & 7 – Signage
- OTM Book 11 – Pavement Markings
- OTM Book 12 – Traffic Signal Design
- OTM Book 15 – Pedestrian Crossing Treatments
- OTM Book 18 – Cycling Facilities
- Ontario Provincial Standards (OPS) (latest edition)

Institute of Transportation Engineers (ITE)

- Trip Generation Manual
- Transportation and Land Development
- Traffic Access and Impact Studies for Site Development - Recommended Practice

5.0.3. Road Classification

Functional classification of roads in the Town of Aylmer shall be in accordance with the Town of Aylmer Official Plan approved by the County of Elgin.

Through the Town of Aylmer consolidated Official Plan, the following hierarchy of roads and streets have been established:

Road Type	General Function	Typical Right-of-Way Width	Pavement Width (m) or Notes
Provincial Highway	King’s Highway #3 (MTO roadway, Connecting Link)	N/A	MTO roadway, under Town of Aylmer jurisdiction and maintenance as “connecting link”.
County Roadway	Elm Street, Beech Street and John Street (Hwy #73)	N/A	Under Elgin County jurisdiction, maintained by the Town of Aylmer.
Arterial (Major and Minor)	2-4 Lanes - Large to moderate volumes of all types of traffic town-wide	26 m	10.0m (no bike lanes) 14.0m (1.5m bike lane, 0.5m buffer)
Collector (Major and Minor)	Moderate volumes of traffic primarily moving between points of origin and arterial roads.	20-26 m	9.0m (parking, no bike lanes) 12.5m (1.5m bike lane, 0.5m buffer)
Local	Light volumes of traffic moving between points of origin and collector roads.	Urban – 20 m - 18 m upon Council approval	7.0m (0-44 units) 7.5m (45 units or greater)

Roadway classification and right-of-way width will be confirmed at the draft plan approval stage.

5.0.4. Design Speed

Posted Speed (km/h)	Design Speed (km/h)
40	40
50	50
60	70
70	80
80	90

Design speeds for all local and minor collectors shall be 50km/h unless adjacent to schools or high pedestrian generators such as parks, where the design speed is 40km/h.

5.0.5. Design Vehicle

All Arterial and Collector roadways within the Town of Aylmer shall be designed to accommodate a WB-20 Tractor Semitrailer as per TAC.

5.0.6. Minimum Pavement Design

Minimum Pavement Design			
Road Classification	Local	Collector	Arterial
HL3 Asphalt	40mm	40mm	50mm
HL8 Asphalt	50mm	80mm	100mm
Granular 'A'	150mm	150mm	150mm
Granular 'B'	300mm	400mm	450mm

Deviations from these minimum standards shall be based on the recommendation from a geotechnical report by a professional engineer.

5.0.7. Concrete Curb and Gutter

Concrete curb and gutter used in the Town of Aylmer shall be OPSD 600.010 or 600.040 for Local and Collector roads, OPSD 600.010 only for Arterial roads. Any deviation from this standard shall be submitted to the Town Director for approval.

5.0.8. Concrete Sidewalk

Concrete sidewalk in the Town of Aylmer shall be as per AODA standards and the Town's Sidewalk Policy. Concrete sidewalk shall be 1.5 metre minimum width at a thickness of 125 mm and sidewalk adjacent to curb shall be 1.8 metre minimum width.

Thickness of concrete sidewalk at residential driveways shall be at 150 mm and commercial/industrial driveways shall be 200 mm.

5.0.9. Location Of Utilities

The location of all utilities within the road allowance shall be as detailed on the typical cross-section. Utility drawings shall be submitted to the Town Director for approval. All new development utilities are to be constructed underground. Hydro transformers are to be housed in suitable enclosures and mounted on transformer pads installed at the final ground elevation. Bell telephone junction boxes may be mounted at the surface in approved standard enclosures.

5.0.10. Vertical Alignment

Sag and crest curves shall be in accordance with TAC Guidelines. Curves shall be required when change in grade is greater than 1% as per equation below:

$$\Delta\% = S_1 - S_2 > 1\%$$

Where: S_1 = Slope 1

S_2 = Slope 2

5.0.11. Cul-de-Sacs and Bulbs

Subdivision street pattern designs shall avoid the use of cul-de-sacs and bulbs. All street design shall promote connectivity in new development.

5.0.12. Signage Posts

Regulatory sign posts shall be 100 mm x 100 mm (4"x4") minimum pressure treated sign posts or steel U-channel posts, pending on the size and location of the signage. The size and location of the sign will also dictate the required sign post as per OTM Book 5.

5.0.13. Road Sub-Drains

Sub-drains will be required on all developments within The Town of Aylmer.

5.0.14. Snow Clearing – Developer Maintenance Obligations

Snow clearing operations will be carried out by the Town after the roads have been fully assumed and the warranty period has elapsed. Depending on the development agreement, the Town may coordinate snow clearing at the developer's expense.

For site plan control applications, snow storage areas shall be shown on all drawings. In general, all snow clearing for developers shall be carried out at the developers' expense until the roads have been assumed by the Town. It is the developer's obligation to maintain the roadways to O. Reg. 366/18 Minimum Maintenance Standards until the roads have been fully assumed.

5.0.15. Right of Way Occupancy Permit

Any work required by a developer, utility company, or contractor working for a property owner/developer within the Town's right-of-way is subject to obtaining a Right-of-Way Occupancy Permit. If the work is being completed on a County Road, the developer, utility company or contractor will require an Elgin County Road occupancy permit. Please contact the Town at (519) 773-3164 for more information.

Permission is required from the Town for any proposed detours and road closures. Details and/or road closures need to be submitted and reviewed by the Town prior to approval. Where the proposed route utilizes roads that are not part of the Town’s road system, approval from the appropriate road authority will also be necessary. In all cases a road closure notification shall be circulated to emergency services and other affected agencies a minimum of 48 hours prior to the road closure.

All work will be done in accordance with ordinances, by-laws of The Town of Aylmer and in accordance with OTM Book 7.

All disturbed areas shall be restored to its original conditions or better, including but not limited to roadway, sidewalks, traffic loops, etc.

5.0.16. Mailboxes

Community mailbox (CMB) locations will be the responsibilities of Canada Post. The consulting engineer for the developer is to ensure that no utility conflicts exist with the proposed CMB locations. Locations of community mailboxes shall be reviewed and approved by the Town.

5.0.17. Catch Basins

The following chart illustrates the typical catch basin required per road type.

Road Type	Low Points	Non-low Points
Arterial	CICB or DCB	CICB or CB
Collector	CICB or DCB	CB
Local	CICB	CB

All CB’s, CICB’s and DCB’s shall be “setback” to align the front face of the CB frame and grate with the edge of pavement (EP), unless it is adjacent to curb face sidewalk or underground conflicts.

The design engineer shall complete flow calculations to confirm the number and type of CB’s for proposed design.

5.1. Intersection Design

5.1.1. Road Layout/ Sight Triangles

Local streets with bends of approximately 90 degrees are to have a minimum inside street-line radius of 10 metres or a 6.0 metre by 6.0 metre sight triangle. See Town of Aylmer zoning by-laws for further information.

5.1.2. Intersection Geometrics

Intersection geometrics shall accommodate the design vehicle. The following chart illustrates the minimum radii, measured at the edge of pavement.

		To:		
From:	Arterial	Collector	Local	
Arterial	13.5m	12m	10m	
Collector	12m	7.5m	6.0m	
Local	7.5m	6.0m	6.0m	

Designers shall provide truck turning movement design calculations for all turning movements on all arterial roads, collector roads, and local industrial roads.

5.1.3. Intersection Geometric Design Improvements – Signalized

The basic configuration on MAIN ROAD approaches for proposed signal-controlled intersections must include directly-opposing, dedicated Left turn lanes for 4-legged intersections or one dedicated Left turn lane at T intersections; regardless of actual volume demands or capacity analysis results.

The basic configuration on SIDEROAD approaches for proposed signal-controlled intersections should include directly-opposing, dedicated Left turn lanes for 4-legged intersections; unless physical limitations make their implementation injudicious.

On SIDEROADS for T intersections, separate Left & Right turn lanes would be preferred, but may be governed by actual volume demands or capacity analysis.

Consideration may be given to the provision of a dedicated Right turn lane where peak hour turning traffic demands exceed 200 vph and Synchro capacity analysis of the Thru lane produces results nearing or exceeding the threshold of acceptability.

Justification for a free-flow (uncontrolled) right turn channelization requires peak hour demands \geq 600 vph. The proper design to provide free-flow operation requires a parallel Right turn deceleration lane into the Channelization and, either a Right turn acceleration taper away (minimum) or a parallel lane away (preferred). If a Right turn channelization is justified, it should not be provided with a sub-standard geometric design necessitating Yield control.

5.1.4. Intersection Geometric Design Improvements – Unsignalized

MTO Left Turn Lane Warrant Chart analysis is required to justify provision of a dedicated Left turn lane on the MAIN ROAD of any unsignalized intersection. Synchro capacity analysis results are not acceptable in determining Left turn lane requirements for unsignalized intersections.

Where a dedicated Left turn lane becomes warranted in any one direction on the MAIN ROAD approaches of an unsignalized 4-legged intersection, implementation of a directly-opposing Left turn lane with minimum 15m storage will also become justified.

A dedicated Left turn lane (or multi-lane configuration) is not permitted on any SIDEROAD approach to an unsignalized 4-legged intersections.

At T intersections, a multi-lane configuration (separate Left and Right turn lanes) is permitted on the SIDEROAD (stub) approach only if the intersection is located within an urban, low speed (Posted Speed ≤ 60 km/hr).

5.1.5. Roundabouts

The Town of Aylmer will consider the installation of roundabouts at most intersections. All roundabouts are to be designed per the TAC Roundabout Design Guide, latest edition with signage as per OTM Book standards.

The design of roundabout shall include a property line setback from the back of the curb with adequate space to locate utilities in their standard location.

For maintenance purposes, sanitary manholes are not permitted to be located within the raised centre island of the roundabout. The sanitary maintenance hole is to be located within the apron of the island. Storm maintenance holes may be located within the centre island of the roundabout, provided the proposed landscaping does not hinder access to the maintenance hole.

5.2. Driveways

5.2.1. Driveway Widths and Details

If a concrete driveway is installed, expansion joints are to be installed at both sides of the sidewalk and at the curb as per OPSD 310.010. A construction joint is also required at the property line.

Maximum driveway width for a 2 car residential garage is 6.0 metres or as per applicable zoning by-laws. Maximum driveway width for Commercial/Industrial development is 10.0 metres.

All driveway approaches shall be paved (i.e. asphalt, concrete or interlocking stone) from the back of curb to the property line.

5.2.2. Minimum Driveway Thickness Requirements in ROW

The minimum compacted depth requirements for driveways shall be as follows:

Single Family Residential

- Asphalt - 50 mm HL3 surface
- Granular base – 200 mm of Granular 'A'

Commercial, Light Industrial and Apartments

- Asphalt

- 40 mm HL3 surface course
- 50 mm HL8 base course
- Granular Base
 - 150 mm of Granular 'A'
 - 300 mm of Granular 'B'

Heavy Industrial Driveways

- Asphalt
 - 50 mm HL3 surface course
 - 75mm HL8 base course
- Granular Base
 - 150 mm of Granular 'A'
 - 300 mm of Granular 'B'

5.2.3. Driveway Grades

The minimum grade for any driveway shall be 2%. The maximum permissible design grade for any driveway shall be **8%**. The maximum grade is not recommended for new development and shall only be used for reconstruction projects due to existing constraints. The desired maximum grade for new development is 4%.

The specified grades for driveways shall be directed away from the houses. The use of reverse fall driveways is not permitted. For industrial and commercial sites requiring site plan approval, a break in grade for driveways shall occur at the property line.

5.3. Temporary Roads and Turnarounds

When it is determined by the developers consulting engineer or Town that a temporary road for construction or access purposes is required and acceptable in an area where a development is proposed, the road shall be built in accordance with plans and specifications approved by the Town. All costs (both construction and decommissioning) of temporary roads shall be borne by the Developer.

Where a temporary road is required as an alternate means of access to a proposed subdivision and will be used after residents occupy the subdivision the road shall be constructed to a 8m width, 2 lane graveled roadway. Signs indicating the temporary nature of the road shall be erected at each end of the temporary roadway.

Where a temporary road is required for construction access only, the road shall be constructed to a 6.0 m graveled lane standard. Where the road crosses curbs, gutters, sidewalks and trails provision shall be made to permit regular vehicle traffic to cross, without damaging, the curbs, gutters, sidewalks and trails.

Signs indicating the temporary nature of the road and that it is for construction traffic only shall be erected at each end of the temporary roadway. Where a roadway temporarily terminates at mid-block and has no provision for egress, a temporary turnaround shall be constructed.

Temporary roadways shall be shown on the design drawings complete with horizontal and vertical alignments, drainage details and cross sections.

5.4. Traffic Impact Assessment (TIA)

5.4.1. General

Engineering studies, assessing the impact of development generated traffic, may be required to be submitted to the Town of Aylmer as part of the approval of a complete planning application.

5.4.2. Warrants

A TIA will be required if:

- A development can be expected to generate more than 100 new peak-hour trips on intersecting or adjacent roadways;
- Where traffic problems such as high accident rates, traffic congestion, short cutting or access problems are being experienced in the area, regardless of the magnitude of peak hour volumes generated by the development,
- Change in land use may change directional distribution of site generated traffic by greater than 20%;
- Variances to the above may be permitted at the Town's discretion.

Additional guidance may be obtained from the Town.

5.4.3. Scope

The scope of a TIA shall generally conform to the reference standards outlined in Section 5.1.5 (Roundabouts) and shall also incorporate the following information and criteria:

5.4.3.1. Traffic Volume Generations

- Existing Turning Movement traffic counts older than 3 years must be updated
- Assume 2% background growth per year.
- 5 Year Projections required to determine the need for traffic control signals (for single-stage developments)

- 10 Year Projections required to determine geometric road improvements (for single-stage developments)
- Multi-stage proposals will require projected traffic data for each stage of development, as necessary to determine Traffic Control & Geometric requirements for each stage.
- a minimum two (2) peak hours must be developed for analysis, and may be comprised of:
 - AM + PM (for residential & industrial developments as determined from historic background traffic data)
 - mid-day + PM (for residential & industrial developments as determined from historic background traffic data)
 - weekday PM + Saturday peak hour (preferred for retail developments)
- If existing or expected heavy truck traffic exceeds 10% for any particular movement, lane or approach, truck factoring of 1 T = 2 pcu's should be integrated into the volume generations,
- Design horizon year for the development shall be the build-out year of the development or as stipulated in the reference standards,
- Mitigative measures, right-of-way requirements, improvements (including traffic control devices) and cost allocation.

5.4.3.2. Capacity Analysis

- Synchro 8, or later version, required to calculate signalized and unsignalized intersection or development access capacity and levels of service.

5.4.3.3. Traffic Signal Warrants

- Synchro peak hour performance results alone cannot be used to determine the need for traffic signals.
- Signalization can only be determined through compliance to the official Ontario Traffic Signal Warrants, as detailed in the Ontario Traffic Manual – Book 12 Traffic Signals (most recent version).
- Refer to OTM Book 12 for further details and information.
- Multi-staged developments will require Signal Warrant analysis for each stage. When Warrants become met at any one stage, the following stages will not require further Warrant analysis.

5.4.3.4. Standard Intersection Minimum Timings

The standard minimum intersection timings shall be as per OTM Book 12 requirements. Section 3.6 outlines required timing intervals.

5.4.3.5. Analysis Procedure And Reporting Requirements

Traffic study reports shall identify all assumptions made. All findings and recommendations shall be supported by acceptable analysis, maps, charts, figures, calculations, tables and modelling input and output files.

5.4.3.6. Drive Through Design

Drive through lengths for restaurants or other businesses shall be designed to accommodate for the queuing of traffic to be contained on-site. This includes the queuing of traffic during the maximum projected volume of traffic identified in the TIA. Queuing of traffic will not be permitted in the Town ROW at any time.

5.5. Parking Requirements – Typical Layouts

All parking shall be as per the Town’s Traffic and Parking Bylaw 33-17. A parking space is subject to the following:

- A. A parking space must have the following minimum dimensions:
 - (i) Length of 5.5 metres;
 - (ii) Width of 2.75 metres;
 - (iii) The minimum width must be increased by 0.3m if the the parking space is obstructed by a fixed object such as a wall, bollard, barrier curb, fence, pipe, etc..

- B. A parking drive aisle must have the following minimum dimensions:
 - (i) 90° parking spaces, two-way drive aisle width of 6.70 metres;
 - (ii) 45° parking spaces, one way drive aisle width of 4.50 metres;
 - (iii) 60° parking spaces, one way drive aisle width of 5.50 metres.

Accessible parking spaces shall be as per applicable AODA, IASR and O. Reg. 191/11 of the Integrated Accessibility Standards.

5.6. Waste Management/Garbage Collection

The design engineer for new or existing development shall ensure that all waste collection locations are designed to accommodate appropriate waste collections. Solid waste collections and screening requirements shall be as per the Town of Aylmer Waste Management By-law No. 21-12, as amended.

A detailed site plan shall be submitted for Town approval showing the collection location(s), access route and facility(ies), and detailing the geometric requirements for the site access.

5.7. Traffic Calming

Traffic Calming features are not supported without thorough investigations and Town approval. Design of new subdivision streets and land use should be undertaken to moderate vehicle speed and volume.

5.8. Traffic Signals

Developments and projects where traffic signals are being considered will require a separate signal wiring plan; and signalized intersection plan showing location of all poles and mounted hardware, handholes, ducts/cables, the controller, and full turn lanes (storage and taper). PHM-125 record drawings are required for all traffic signal drawings. All traffic signals shall be designed to current AODA requirements.

6. STORM SEWERS

This document outlines the minimum requirements for the design of a storm sewer system within the limits of the Town of Aylmer. Storm sewer design shall also be designed in accordance with the design principals as outlined in the most current edition of the Ministry of Environment, Conservation, and Parks (MECP) “(MECP) Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (most recent edition). The design of all new developments will consider a “treatment train” for Stormwater design and management. All storm sewers are to be constructed as per OPSS and OPSD specifications.

6.0. Storm Drainage Area Plans

Storm sewer design computations shall be completed on a standard Storm Sewer Design Sheet. A copy of the design sheet, together with a Storm Sewer Drainage Plan, showing the tributary areas shall be submitted as per the sample storm design sheet in this guideline.

In lieu of precise information on development on the whole or any part of a watershed area, the latest zoning by-law and Official Plan issued by the Planning Department shall be used for all external areas in the design and to determine the specific areas to which these values apply.

The external drainage area plan shall be prepared and shall be submitted at the functional servicing report stage and prior to the commencement of the detailed storm sewer design.

In the case of large areas under single ownership of blocks requiring future site plan agreements, the design shall be prepared on the basis of the whole area being contributory to one manhole in the abutting storm sewer unless more than one private storm connection is necessary to serve the property in which case the appropriate area tributary to each connection shall be clearly shown and taken into account in the storm sewer design.

6.1. Design Flows

6.1.1. Design Storm Frequency

The design storm frequency shall be a 5-year storm for residential, industrial or commercial lands to a sufficient outlet or to a storm water management facility which will control post development peak flows to pre-development flows including the 2, 5, 25, 50 and 100 year storm events.

6.1.2. 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 Town Director. The Rational Formula is as follows:

$$Q = 2.78 \times C \times i \times A$$

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 7.2.5**)

6.1.3. 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.

6.1.4. Rainfall Intensity

For rainfall intensity, the following equation shall be used for the Rational Formula:

$$Intensity (i) = at^b$$

Where:

- i = rainfall intensity (mm/hr)
- a, b = rainfall parameters listed below
- t = inlet time based off of time of concentration (hours)

Parameters for this equation are derived from the MTO's Intensity-Duration-Frequency (IDF) curve lookup tool that can be found here:

http://www.mto.gov.on.ca/IDF_Curves/terms.shtml

Return period	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
A	23.5	31.0	35.9	42.1	46.7	51.53
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

In addition, runoff from major storm events (100 year and larger regional storms) shall be accommodated by an overland flow route that has been designed assuming that all of the source controls and storm water conveyance systems for minor flows have failed.

6.1.5. 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 for residential areas shall be **15 minutes**. For all other areas, supporting calculations shall be submitted to the Town Director for review.

The time of concentration shall be adjusted when lateral flows account for 50% or more of the design flows.

Adjusted time of concentration shall be calculated using the formula:

$$T_{c-adj} = \frac{(T_{ct}Q_t) + (T_{cl}Q_l)}{(Q_t + Q_l)}$$

Where :

- T_{c-adj} = adjusted time of concentration (min.)
- T_{ct} = time of concentration in the trunk sewer (min.)
- Q_t = design flow in the trunk sewer (l/s)
- T_{cl} = time of concentration in the lateral sewer (min.)
- Q_l = design flow in the lateral sewer (l/s)

The adjusted time of concentration is used downstream of the junction manhole.

6.2. Storm Sewer Pipe Design

6.2.1. Design Flow

The Manning Formula is to be used for calculating sewer capacity and selecting pipe size. When determining the appropriate pipe size, designers shall upsize pipes when the storm sewer approaches a capacity of 90%.

The Manning formula is as follows:

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

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)

6.2.2. Manning Coefficient

A coefficient of 0.013 is to be used for all concrete and PVC pipe.

6.2.3. Minimum Velocity

The minimum velocity permitted in storm sewers is 1.0m/sec.

6.2.4. Maximum Velocity

The maximum velocities permitted in storm sewers are:

- 4.5m/sec for 300mm to 825mm diameter sewers;
- 6.0m/sec for 900mm diameter and larger sewers

6.2.5. Minimum Pipe Sizes

- Storm sewers = 300 mm
- Catch basin leads = 250 mm (street, park)
= 300 mm (lot, double CB)
- Private Drain Connections = 150 mm (residential – single family, semi-detached)
= 300 mm (residential multi family block)
= 375 mm (non-residential)
= 300 mm (commercial)

Actual sizes for PDC required for multi family, commercial and institutional block will depend on flow. A decrease in pipe size from a large size upstream to a small size downstream will not be allowed regardless of grade increases.

6.2.6. Minimum Grades for Pipes

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

Size of Pipe	Minimum Slope
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	0.10 %
100 mm or 150mm	Connections 2.0 %

The above grades are for reference only, minimum grades shall achieve the minimum velocity of 1.0m/sec.

The minimum drop across manholes shall be as follows:

- 0° change – 20mm drop
- 1° to 45° change – 40mm drop
- 46° to 90° change – 50mm drop

Where the difference in elevation between the invert of the inlet and obvert of the outlet pipes exceeds 1.0m, a drop structure shall be placed on the inlet pipe, with the invert of the drop pipe located at the spring line of the outlet pipe. Design shall be in conformity with OPSD's.

All sewer manholes shall be benched as per OPSD 701.021. This will eliminate the potential for ground water to enter the sewer and into the pipe.

6.4. Catch basins

Catch basins shall be located at a maximum interval of 90m between catch basins, or 90m between a crest of a road to a catch basin.

All catch basins are to be set back off the roadway, as per OPSD's and shall be 1.5 m clear of any driveway curb depression.

Double catch basins or curb inlet catch basins are to be used at all low points on a roadway, and curb inlet catch basins are to exclusively used on Arterial roadways. Inlet grate capacity shall be calculated by the Engineer to determine if catch basin spacing should be reduced. Catch basins shall be spaced such that no ponding occurs in the minor storm events (1:5 year storm event).

Catch basins shall have subdrains installed 2.5m on each side, at a minimum. Material shall be corrugated steel pipe or PVC pipe, with perforations of 6 mm diameter in four rows positioned at 4, 5, 7, and 8 o'clock and 75mm apart longitudinally, or approved equivalent.

6.5. Allowable Ponding

No surface ponding is allowed to develop under a 5-year storm event. Ponding on major overland flow routes allows for 300mm on street catch basins and 450mm on rear yard catch basins. Consultants are to map the ponding area on grading design drawings for all new developments.

Major overland flow routes are to be continuous along roads and easements without flooding onto lots during a 100-year storm.

6.6. Cover

A minimum of 1.5m is required to the top of the outside edge of the pipe to finished grade for all storm sewers.

6.7. Easements

A minimum sewer easement is to follow the Town's zoning by-law requirements. If not specified in the zoning by-law, the minimum easement for one service is 5.0m. These minimum easement widths will be increased depending on the depth and size of the sewer, and as approved by the Town Director.

6.8. Storm Private Drain Connections (PDCs)

All PDC's shall be installed to the property line on all new construction projects.

PDC's shall not be connected directly into a maintenance hole.

PDC's on private property of the town house complexes, row housing and apartments are to be connected to a maintenance hole located on the R.O.W. PDC's for industry and commercial property are also to be connected to a maintenance hole located on the R.O.W.

PDC's shall be installed perpendicular to the sewer main using factory supplied tees, where possible. Under no circumstances, will flow from the PDC enter the main against the flow in the main. Connections shall be as per OPSD 1006.020.

Where there is a conflict with the proposed PDC location due to a maintenance hole etc., then long sweeps must be used to establish a perpendicular connection at the main and perpendicular to property locate at the R.O.W.

All locations and elevations of the storm PDC shall be recorded on a Building Services Report along with as-constructed drawings for the project, whether part of a reconstruction project or new development.

7. STORMWATER MANAGEMENT

This section defines the stormwater management (SWM) guidelines applicable in the Town of Aylmer. Storm sewer systems shall include storm water management facilities and measures to address quality and quantity, aligning with the “treatment train” approach within the Ministry of Environment, Conservation and Parks guidelines (MECP) “(MECP) Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (most recent edition). For all new stormwater management facilities, the developer shall contact the Infrastructure and Development Service Department for further clarification and guidance on applicable requirements and standards that may affect the stormwater management (SWM) facility.

7.0. Stormwater Management Design Criteria

7.0.1. Peak Flow Control

The peak flows discharged from the site shall not increase as a result of the proposed development for the calculated 2 through 100-year storm events. All stormwater management (SWM) measures shall provide an “enhanced” level of protection in accordance with the MECP’s stormwater management and LID guidelines, to make sure the design accommodates climate change.

Extended detention and storage of SWM facilities should discharge over a 24-48 hour period to the five year (5 year) storm event under pre-development conditions. Storm water volume calculations shall be broken out into the following durations (t=minutes): 0, 10, 15, 30, 45, 60, 75, 90, 100, 120, 180, 240, 360, 480, 720, 1080, 1440.

7.0.2. Green Infrastructure and Low Impact Development (LID) Measures

The Town promotes green infrastructure and the use of Low Impact Development (LID) SWM measures. Both natural and man-made devices to assist in providing the treatment train approach. This can include parklands, street trees with enhanced soil characteristics, natural channels and flood plains, LID facilities, and naturalized end of pipe stormwater management systems.

All LID facilities shall have a design capacity that exceeds the existing conditions recharge volume by 15 percent as a factor of safety to account for aging, compaction, and potential clogging. LID locations shall be strategic to mitigate against operational constraints and clogging.

During construction all LID measures shall be bypassed to prevent accelerated clogging.

7.0.3. Design Storm Selection

Design storm information used for the Town of Aylmer is derived from the MTO’s Intensity-Duration-Frequency (IDF) curve lookup tool that can be found here:

http://www.mto.gov.on.ca/IDF_Curves/terms.shtml

The following information table was taken from website above.

Duration	Intensity (mm/hr)								
	5 min	10 min	15 min	30 min	60 min	120 min	360 min	720 min	1440 min
2 yr	133.5	82.2	61.9	38.1	23.5	14.5	6.7	4.1	2.5
5 yr	176.1	108.5	81.7	50.3	31.0	19.1	8.9	5.5	3.4
10 yr	203.9	125.0	94.6	58.3	35.9	22.1	10.3	6.3	3.9
25 yr	239.1	147.3	110.9	68.3	42.1	25.9	12.0	7.4	4.6
50 yr	265.3	163.4	123.1	75.8	46.7	28.8	13.3	8.2	5.1
100 yr	291.4	179.5	135.2	83.3	51.3	31.6	14.7	9.0	5.6

7.1. Stormwater Design Requirements for Development

The following is a summary of the Storm Water Management (SWM) requirements for development submissions. There may be additional information required depending on the site location and SWM constraints.

- Provide all SWM calculations to show the pre-development and post development flows. These flows shall be calculated using the Town’s design guidelines manual as well as MECP Guidelines.
- Provide calculations for SWM facility sizing, orifice sizing, and any other relevant calculations completed for the design of the facility.
- Forebays and other quality controls should be used to minimize the amount of sediment that reaches the main cell of the SWM facility.
- Identify the major overland flow routes and provide volume calculations for the routes at various cross sections to confirm that the major overland flow route will carry the major flow.
- Identify the levels of stormwater in the storage facility for the various rainfall events.
- Identify the major overland flow routes and provide volume calculations for the routes at various cross sections to confirm that the major overland flow route will carry the major flow.
- All designs of SWM ponds must follow the most current edition of the Ministry of the Environment, Conservation and Parks SWM Planning and Design Manual and must also reference the Best Management Practices.
- 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 through 100-year return storm events.

- 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.
- Landscaping and trees shall be included in the design of the SWM facility to improve the quality of the storm water as well as aesthetics for the development.
- Use of shallow grassy lined swales for storm water conveyance is recommended.
- Utilizing inlets for temporary ponding and buried perforated pipe covered with porous material (granular or topsoil material) for infiltration may also be considered.
- Oil grit separators are recommended for developments as a quality control measure for sites less than 2 hectares. Site plans will typically require the installation of a oil grit separator as a quality control device.
- Include all design detail, sizing calculations, sediment removal rate and floatable storage capacity for the unit, ensuring its design and installation, will more than adequately suit the site plan development.
- SWM design will need to consider maintenance requirements for Town staff to maintain and access with ease.

8. SANITARY SEWERS

This document outlines the minimum requirements for the design of a sanitary sewer system within the Town of Aylmer boundary.

Sanitary sewer design shall follow the Town’s standard Sanitary Sewer Design Sheet. A copy of the design sheet, together with a Sanitary Sewer Drainage Plan, showing the tributary areas shall be submitted as per the sample sanitary design sheet provided in this design guidelines manual.

8.0. General Requirements

Sanitary sewers are **not** permitted to accept foundation or weeping tile drainage or roof drainage. Storm water is not permitted to enter the sanitary system.

Sanitary sewers are to be designed and constructed in accordance with the current Town of Aylmer and Ministry of the Environment, Conservation and Parks (MECP) “(MECP) Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (most recent edition). All sanitary sewers are to be constructed as per OPSS and OPSD specifications.

The minimum sanitary sewer diameter is 200mm and the minimum private drain connections (PDC) is 150mm.

The minimum velocity for a sanitary sewer system is 0.6m/s and the maximum allowable velocity is 4.5m/s.

8.1. Peak Flow Calculation

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:

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

Where:

- Q = Flow capacity of sewer (m³/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)

Manning Roughness Coefficients shall be as follows:

Pipe Material	Mannings 'n'
Concrete Pipe	0.013
P.V.C Pipe	0.013
H.D.P.E Pipe	0.013
Corrugated Metal Pipe – 12mm corrugations	0.024
Corrugated Metal Pipe – 50mm corrugations	0.035

8.1.1. Minimum Slopes for Pipes

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

Pipe Size	Slope
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	0.07 %
750 mm	0.06 %

8.1.2. Design Criteria

The following design values should be used for all new development being modified where data is available:

- For new development, a value of 250 l/capita/day should be used for estimating flow rates.
- Infiltration and inflow should be estimated at 8,640 l/ha/day (0.100 l/ha/second) for new development.
- Flow meter studies to confirm existing capacity may be required for new development.
- Continued use of available data for infiltration rates and sewage usage rates should be used for existing development.
- Population density equivalent for various types of development should be as follows:

Development Zoning	Population Density
Low density residential	44 people/ha
Medium density residential	65 people/ha
Institutional (schools, etc)	53 people/ha
Industrial	150 people/ha

- Alternatively population density can be calculated on a lot basis using the following criteria:

Lot Basis

Single Family = 3 people/unit

Semi-detached = 6 people/unit

- The minimum allowance for commercial flows shall be 28 m³/ha/day. Actual flow monitoring data (covering at least 2 years) at the subject site or a similar site observed locally can be used. For common sewage flow rates for Commercial/Institutional uses, see Table 1 on Page 10 of the MECP Design criteria, July 2022 version.

8.1.3. Peak Sanitary

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

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

Where:

Q (d) = Peak domestic flow (L/s)

P = Design population in thousands

q = Average daily per capita domestic flow in (L/capita.d)

M = Peaking factor derived from Harmon Formula

I = Unit peak extraneous flow in (L/s/ha)

A = Gross tributary area in (ha)

Harmon Formula:

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

Where:

M = Ratio of peak flow to average flow

P = Tributary population in thousands. At minimum, a peaking factor of 2.0 shall be used in the design.

8.2. Design Considerations

All sewers 600 mm in diameter or larger shall be shown with two lines in the plan view.

All sewers shown within a road allowance should be 3m apart unless otherwise approved by the Town Director.

Minimum elevation of new basements must be shown whenever the sanitary sewer in the street has less than 2.7m cover.

Bolt down covers are required where manholes are in flood plain or overland flow routes.

No decrease of pipe size from a larger size upstream to a smaller size downstream will be allowed regardless of increase in grade.

No sewer pipes greater than 375mm diameter may be turned at 90°.

8.3. Maintenance Hole Design

Changes of direction of flow, greater than 90° shall not be permitted in one manhole.

In sewers 750mm diameter and greater, changes in direction of flow greater than 45° shall not be permitted in one manhole. The location of all maintenance holes shall be designed to be outside of the vehicles wheel path.

Manholes on sewers shall be located at every change of size, grade or direction of flow but shall in no case exceed the maximum spacing.

- for pipes up to and including 900mm diameter 110 metres
- for pipes over 900mm diameter 150 metres

Allowances for bends in sewer alignments - fall through manholes shall be calculated in accordance with the Table below:

- for 45° bends - use $\frac{3}{4}$ of the losses for 90° bends.
- for 22 $\frac{1}{2}$ ° bends – use $\frac{1}{2}$ of the losses for 90° bends.

Safety grating are required at the mid-point depth of manhole, when the depth is between 5.0 and 10.0m. Additional safety grates are required at third-point depths, when the manhole is equal to or greater than 10.0m in depth. All in coming pipes are to be below safety gratings.

All sanitary manholes in the vicinity of a low point (i.e., low point of roadway or intersection, grassed area, ditch etc.) shall be installed with a manhole lid insert from Parson Environmental or approved equivalent to limit surface water infiltration.

All manhole chamber openings shall be located on the side of the manhole parallel to the flow for straight run manholes, or on the upstream side of the manhole at all junctions.

The obvert of the inlet pipe(s) shall not be lower than the obvert of the outlet pipe. The minimum drop across manholes shall be as follows:

Change of Direction	Minimum Drop
0°	20mm
1 ° to 45°	40mm
46° to 90°	50mm

Where the difference in elevation between the invert of the inlet and obvert of the outlet pipes exceeds 600 mm in height, a drop structure shall be placed on the inlet pipe, with the invert of the drop pipe located at the spring line of the outlet pipe. Design shall be in conformity with OPSD's.

All sewer manholes shall be benched as per OPSD 701.021.

For the case of constant diameter upstream and downstream with no lateral in-flow into a manhole, the coefficients in the following table are applicable:

Straight Manhole

Head loss coefficients K in terms of $\frac{v^2}{2g}$

Length of Manhole	Head Loss Co-efficient K
1 x pipe diameter	0.07
3 x pipe diameter	0.22

No radial pipe will be allowed for pipe having a diameter of less than 675mm.

8.4. Pumping Stations

All sanitary sewers for development should be gravity unless there are constraints within the sewage system and only if approved by the Town. Town staff shall be consulted on design criteria, operational preferences, and other requirements during the pump station design. Stations shall have full backup power, SCADA connectivity, and flow monitoring. Any design of a pumping station shall take confined space entry into consideration. When a person needs to perform a confined space entry into the pumping station, there shall be no areas or points that a person shall have to unhook from the life line.

8.5. Sanitary Private Drain Connections (PDCs)

Each property shall be provided with a sanitary PDC of a minimum diameter of 150 mm (6") having a minimum slope of 2% and a clean out.

In industrial and commercial areas, an inspection manhole shall be located at property line on the service. The minimum diameter of sanitary PDC for industrial blocks are 200mm diameter at 2% slope.

Sanitary PDC's shall not be connected into sanitary manholes. All sanitary sewer lateral connections shall be installed using prefabricated tees.

The location of the end of all lateral connections shall be marked by a 50mm x 100mm wooden stake, 2 meters long, projecting one meter above the ground with the stake painted **white**.

All locations and elevations of the sanitary PDC shall be recorded and submitted to the Town of Aylmer along with as-constructed drawings for the project, whether part of a reconstruction project or new development.

8.6. Easements

All sewer easements must be a minimum of 5.0m wide for one service. These minimum values must be increased where the depth or diameter of service dictates a greater working area.

8.7. Sanitary Testing Requirements

The contractor shall supply, at their own expense, all labour, equipment and materials necessary to carry out infiltration / exfiltration tests, deflection testing and video inspection of all sanitary sewer and appurtenances as specified under this section. All tests shall be carried out under the direction and supervision of the Town of Aylmer Operations Department.

8.7.1. Infiltration / Exfiltration Tests

Infiltration and exfiltration tests shall be conducted on new sanitary sewers as per the requirements in OPSS 410.07.16.03 and 410.07.16.04.

8.7.2. Deflection Test

A deflection test shall be conducted on new sanitary sewers as per the requirements in OPSS 410.07.16.05.

8.7.3. Video Inspection

All new sanitary sewers shall be video inspected using Closed Circuit Television (CCTV) equipment. CCTV inspection shall be conducted in accordance to OPSS 409. Digital copies of the CCTV inspection reports and videos shall be provided to the Town.

9. WATERMAINS

9.0. General

These specifications in this section shall apply to all water services and to all watermains including appurtenances which are located within the Town road allowance, or on property which will be transferred to Town ownership. These specifications shall also apply to all water meter placements.

The designer shall design to Town and AWWA specifications and also make reference to the Ministry of the Environment, Conservation and Parks “Design Guidelines for Drinking-Water Systems” and to the MECP’s “Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit”. If there is a discrepancy between the Town specifications and the MECP guidelines then the Planning Department shall be contacted to resolve the issue.

Any deviation from these specifications must be submitted in writing to the Town Director.

These specifications shall apply to all services and private watermains and to all watermains up to 450mm diameter including appurtenances. For watermains larger than 450mm diameter and for any other water system installation, special specifications must be prepared for and approved by the Town Director.

The water distribution system is for the purpose of supplying and distributing water, but does not include plumbing or other works to which the Ontario Building Code applies.

A water distribution system may exist for the purpose of distributing potable or non-potable water; however, water distribution systems for potable and non-potable water may not be intermixed or cross-connected. Private supplies of potable water may not be cross-connected to the municipal or public water distribution system.

9.1. Permitted Uses

Permitted and non-permitted uses of water are identified in By-law 09-09 (A By-law to enact rules and regulations for the supply, operation and maintenance of the Municipal Water Works System)

9.2. Watermain Design

9.2.1. Pressure and Flow Requirements

Watermains shall be sized to maintain the greater of:

- Maximum day demand plus fire flow at a pressure not less than 140 kPa at all points in the distribution system.

- Maximum hourly demand at a pressure not less than 275 kPa in residential areas and not less than 310 kPa in industrial areas.
- Average day demand at a pressure not less than 275 kPa.
- Maximum residential pressure should not exceed 690 kPa and a minimum residual pressure (peak hour) shall not be below 275 kPa.

Watermain shall be designed so that the velocity for normal rates will be between 0.6 and 1.5 m/s. The maximum velocity for fire demand shall not exceed 3.0 m/s. Fire flows shall be calculated on the standards of the Fire Underwriters Survey.

9.2.2. Design Water Demands

9.2.2.1. Total Water Demands

Gross water consumption rate recorded for the Town is 450 L/d average per capita.

9.2.2.2. Domestic Water Demands

Average domestic unit demand varies from 270 to 450 L/d per capita. This demand varies with location and projected future increased use.

Applicable demands and peaking factors should be obtained from the Town Director.

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).

9.2.2.3. Commercial, Institutional and Industrial Water Demands

These demands vary greatly with the type of water using facilities or process present in the development. If the Developer (designer) does not know the required demand, they should refer to the MECP "Guidelines for the Design of Water Distribution Systems". For industrial demands, the Developer (designer) should discuss water requirements with the Town Director.

The following demands shall be used as minimums in the absence of reliable flow data:

- Commercial: 28 m³ / hectare day
- Light industrial: 35 m³ / hectare day
- Heavy industrial: 55 m³ / hectare day.

Peak flow rates shall be determined with the Town Director on a project specific basis.

9.2.2.4. Fire Demand

To estimate the fire flow requirements for a particular structure or area of the Town, the designer should refer to the guide "Water Supply for Public Fire Protection - A Guide to Recommended Practice", (latest revision) prepared by Fire Underwriters Survey, Insurers Advisory Organization, 180 Dundas Street West, Toronto, Ontario M5G 1Z9, the Ontario Building Code and the Ontario Fire Code.

9.2.3. Friction Factors

The following Hazen-Williams "C" values shall be used for design, regardless of material:

Diameter	"C" Factor
100 and 150mm	100
200 and 250mm	110
300 to 600mm	120
Over 600mm	130

9.2.4. Minimum Pipe Sizes

The minimum pipe size for any domestic water service is 25mm.

The minimum size for watermains shall be 50mm for supplying only domestic services or 150mm if fire protection is to be provided. Actual watermain pipe size requirements are to be confirmed by modeling methods.

Accepted pipe sizes are 25mm, 50mm, 100mm, 150mm, 200mm, 250mm, 300mm, 400mm, 450mm, and 600mm. For larger pipe sizes, the designer should consult with the Town Director. Consideration for future growth and development will also be required with the design.

9.2.5. Water Quality

Watermains and their networks shall be designed such that water shall not remain unused in the watermain for more than three (3) days under average day demand.

To demonstrate a three day turnover, the designer shall provide a hydraulic analysis as outlined elsewhere in this document. The hydraulic analysis shall also provide calculations to determine if and where automatic flushing devices are required and determine the appropriate size of flushing device (25mm or 50mm).

The Town of Aylmer has primary responsibility to ensure that the minimum chlorine residuals are maintained in the distribution system and therefore reserves the right to require watermain looping and/or automatic flushing devices and/or blow-offs to facilitate the maintenance of the chlorine residual.

On private property, where there is concern (When a (3) day water turn-over cannot be achieved) that there may be degradation of the water quality in the private service, that has the potential to re-enter the municipal water system, the Town reserves the right to require premise isolation. This shall consist of appropriate backflow protection to the risk posed and shall be installed at the property line and at the owners expense.

9.3. Watermain Layout

9.3.1. Location of Watermain in Road Allowance

Watermains shall be located in accordance with the Town's Standard ROW Cross Sections. Deviation from the standard location must be approved by the Town Director.

The standard location must be used on straight streets. On bends, the main may deviate from the standard up to 1.0m closer to the street line but not closer to the curb and gutter as approved by the Director. Maximum use may be made of pipe joint deflections so that a minimum number of bends are used on any curved laying line. PVC pipe will require more bends because the allowable joint deflection is smaller. Refer to AWWA C600 for Ductile Iron Pipe, AWWA M23 for PVC pipe and supplier specifications for allowable joint deflection and pipe bending.

Watermains shall be terminated opposite street lines or property lines.

9.3.2. Depth of Watermain

Watermains shall have no less than 1.7m nor more than 2.0m of cover from final surface grade. Variations from this cover may be made only if approved on plans or in writing by the Town Director.

For unimproved roads with open ditches, watermains shall be laid 2.1m minimum below road grade or 1.2m below the bottom elevation of the ditch, whichever is greater. Consideration shall be taken by the designer for the vertical alignment of the road and its impacts with the watermain resulting from future road improvements.

9.3.3. Pipe Insulation

Where joint deflections, offsets, or other issues arise that require the watermain to be laid with less than 1.5m of cover from final surface grade, insulation shall be placed to prevent freezing.

Insulation is also required between a watermain and storm sewer/culvert where there is less than 1.5m minimum separation. Please refer to the Town's Supplemental Specifications for insulation detail and

requirements. Compaction of granular material above insulation shall be inspected by the contract administrator to verify that the integrity of the insulation is not impacted during construction.

9.3.4. Blow-offs and Dead Ends

Dead end watermains shall not be permitted unless unavoidable. All dead end watermains are to have a 50mm blow off installed as per the Town's Supplemental Specifications.

Where a watermain ends in a cul-de-sac, a 50mm watermain loop shall be installed from the minimum 150mm watermain to last fire hydrant around the cul-de-sac, where the loop reconnects back to the watermain. The designer can contact the Town's Planning Department for further details of the cul-de-sac watermain loop.

A hydrant and valve shall be installed at the end of a watermain on a street that is to be extended in the future. A 50mm blow off may be substituted at the discretion of the Town Director.

9.3.5. Thrust Restraint

See the Town's Supplemental Specifications for thrust restraint details and requirements.

9.3.6. Separation between Watermains and Sewers/Utilities

Designers should refer to the Ontario Ministry of Environment, Conservation and Parks (MECP) Guidelines regarding the location of watermains relative to sewers and to the Public Utilities Act of Ontario regarding the location of watermains relative to other utilities.

Sewers and watermains located parallel to each other should be constructed in separate trenches maintaining the maximum practical horizontal separation. Under normal conditions, watermains shall be laid with minimum 2.5m clear horizontal separation from any sewer or sewer manhole; the distance shall be measured from the nearest edges.

9.3.7. Crossings

The designer shall refer to the Ministry of the Environment, Conservation and Parks Procedure F-6-1, Procedures to Govern the Separation of Sewers and Watermains.

Under normal conditions, watermains shall cross above sewers and Private Drain Connections (PDC) with a minimum vertical separation of 0.50m to allow for proper bedding and structural support of the watermain over the sewer or PDC.

Where it is not possible for the watermain to cross above the sewer or PDC, the watermain passing under a sewer or PDC shall be protected by providing:

- A vertical separation of at least 0.6m between the invert of the sewer or PDC and the crown of the watermain.
- That a minimum of 5.0m length of water pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer or PDC.
- Structural support is provided to prevent excessive joint deflection and settling.
- The crossing is not within 2.0m of a watermain joint (for watermains larger than 450mm diameter).

The same criteria shall be applied in new construction (i.e. subdivisions) and in conditions where an existing watermain is present. Also, the same criteria as noted above shall be applied if the watermain crosses above or below a sewer, PDC or other utility.

9.3.8. Watermain Looping

Water distribution systems shall be designed to exclude any dead-ended pipe. Water distribution systems shall be designed so that no more than sixty (60) units with individual water services and meters shall be serviced from a single source of supply. If the looped watermain is connected to a single watermain, a valve must be installed in the watermain to permit isolation of supplies.

A looped watermain connected to a public or private watermain or watermains must be installed:

- when one water service will not supply the required flow for domestic use and fire protection or,
- for an apartment complex containing one or more structure and more than 300 dwelling units or,
- for a townhouse, condominium or similar complex having more than eighty (80) units with individual water services and meters.

The looped water servicing must be installed to service the private development from two sources. If the looped watermain is connected to one public watermain, an isolating splitter valve must be installed in the public watermain to permit isolation of supplies, at no cost to the Town.

9.4. Easements

Easements may be required for watermains to be assumed by the Town located outside a road allowance on privately owned property.

Easement widths are determined by the depth of cover from the centreline of the road/round to the invert of the watermain or a minimum of 5.0m, assuming no other services are located within the

easement. If additional services are located in the easement, adequate width of easement and separation of services for construction and future maintenance purposes shall be provided.

9.5. Watermain Pipe Material

9.5.1. Reference Specifications

All materials for watermains and associated appurtenances shall be new and shall conform to those listed in the Town's Supplemental Specifications and the latest revision of the Standards of the American Waterworks Association (AWWA).

Material other than that listed in the Town's Supplemental Specifications may be used if it is approved in writing by the Planning Department. The Planning Department will designate the AWWA Standard and/or other specifications and conditions applicable for use of such approved material.

The Town reserves the right to select any materials or product it deems appropriate for the application. The Town also reserves the right to remove from the specifications any product previously approved but found inappropriate for the application. This includes but is not limited to pipe material, valves, or fittings. The designer shall clearly indicate on drawings and contract documents the materials which are acceptable for use in a particular application where the use of one or more of the approved materials list is not acceptable.

9.5.2. Pipe Material Transitions

Watermain pipe material transitions shall occur at valves or tees.

9.6. Disinfecting and Bacteriological Testing Of Watermains

For requirements regarding swabbing, flushing and disinfecting and bacteriological testing of watermains, see section the Town's Supplemental Specifications.

9.7. Location of Valves

9.7.1. Residential Developments

In residential developments, valves shall be located so that any section of watermain serving up to a maximum of 60 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. Valves shall be located on at least 3 legs of watermain at an intersection.

In high density residential, commercial, and industrial developments, valves shall be located no more than 150 m apart.

9.7.2. Looped Services/Private Watermains

Valves shall be installed on looped services or private watermains to isolate buildings or groups of buildings so that no more than eighty (80) individual water services or apartment complex containing 300 dwelling units or more are on any one valved section. The Owner shall install a valve on the street watermain between connections to a looped private watermain if there is not an existing valve, at no expense to the Town.

9.7.3. Watermain Crossings of Rivers, Railways, Bridges, Controlled Access Highways

Valves shall be placed on each side of a watermain crossing with a river, railway, bridge, or controlled access highway.

9.7.4. Locations of Valves at Street Intersections and Roundabouts

For street intersections, water valves shall be located at the extension of street lines.

For intersections with roundabouts, water valves may be placed in the raised portion of the roundabout island if possible. However, if conflicts occur with other features of the roundabout (i.e. curb and gutter of the island), the valves may alternatively be placed in the boulevard clear of curb and gutter from approaching streets to the roundabout.

9.8. Fire Hydrants and Fire Department Connections

All fire hydrants situated within the road allowance are the sole property of the Town and shall be installed in accordance with the Town's Supplemental Specifications, and shall be maintained by and operated only by the Town.

The detail of hydrant and valve installations shall be according to the Town's Supplemental Specifications.

9.8.1. Location and Spacing of Hydrants on Road Allowances

Hydrants shall be spaced no greater than 150m in residential areas, and 105m in commercial and industrial areas, measured along the centerline of the main. In rural areas where new watermain is to be installed, designers shall add hydrants at each intersection. Hydrants shall be 1.5m away from any driveway or physical obstruction that would limit the operation and maintenance. Hydrants are to also be installed at property line boundaries.

Hydrants shall not be located on dead-end streets unless such streets exceed 90 m in length. Where located on dead-end street the hydrant shall be located at 90 m from the end and a smaller size watermain (minimum 50mm) shall be used beyond the hydrant so that water quality is maintained.

9.8.2. Hydrants on Private Property

Hydrants will be located on private property where required by the Town. Fire hydrants must be installed at grades such that they are readily accessible to the Fire Department. The Developer must pay for cost of installation of these hydrants. Hydrants on private property must adhere to 7.16 of By-law 09-09 Water by-law.

9.8.3. Hydrants for Fire Department Connections

Requirements are given in Section 3.2 of the Ontario Building Code.

9.9. Water Services, Fire Services, and Private Watermains

For the design and materials requirements all water service pipe and fire service mains on private property, the Ontario Building Code and By-law 09-09 shall apply. It shall be noted that water quality requirements are not addressed in the Ontario Building Code. Where there is a concern that there may be a degradation of water quality in the private servicing that has the potential to enter the municipal water supply system, the Director reserves the right to require premise isolation. Premise isolation shall consist of appropriate backflow prevention measures to the risk posed, and shall be installed at the property line at the owners expense.

The following apply to the water services on public property up to the property line:

9.9.1. Size Required

The Developer will be responsible for private main and service sizing. The Town Director shall be consulted for available pressures and flows at the main under design conditions. If the results of hydrant flow tests are to be used, the Town Director shall be consulted for necessary adjustments since flow tests are not usually done at design conditions. Minimum size for services is 25mm diameter. Acceptable service sizes are 25mm, 40mm, 50mm, 100mm, 150mm, 200mm, 250mm, and 300mm diameter.

25mm diameter or larger services should be installed for estate lots, larger homes, deep setbacks or where automatic lawn sprinkler systems or fire sprinkler systems are to be used.

9.9.2. General Requirements

Each dwelling unit, including detached and semi-detached units, townhouses, multi-unit and row houses, must be serviced with a separate water meter and water service connected to a main or private main.

Each unit in a commercial or industrial mall must be serviced with a separate water meter and water service connected to a main or private main.

Swimming pool facilities and lawn sprinkler systems must be serviced by a connection to the metered side of a water service that is in use yearlong and is located in a frost free structure.

Unless otherwise approved by the Town Director, all structures not noted above shall have one water meter and one water service connected to a main or private main.

When there are two watermains on a road allowance, the water service shall be laid from the structure to the watermain which, in the opinion of the Town Director, provides adequate flow and/or pressure.

Services to semi-detached housing must front the unit they serve.

Electrical systems of all new developments shall not be grounded to the water system. Refer to Ontario Hydro Electrical Safety Code (Section 10) for grounding requirements.

9.9.3. Looped Private Main / Service

A looped private main connected to a main or mains must be installed:

- When one main will not supply the required flow for domestic use and fire protection.
- For an apartment complex containing more than one structure and more than 300 dwelling units.
- For a townhouse, condominium, single family dwellings or similar complex having more than 60 units with individual services and meters.
- For a subdivision servicing more than 60 units.
- At the discretion of the Town Director within new subdivision developments

9.9.4. Location

The service pipe must be installed at right angles to the main and in a straight line from the main to the meter. The standard single unit residential or subdivision service stub will be normally located as per the standard servicing locations.

A private main to a complex of structures shall be located to serve all structures in the complex with the least amount of bends possible.

Services off a private main are subject to the same requirements as services off a main.

The Developer should ensure that services and private mains are located so that "berm" or "mound" type landscaping will not cause excessive cover over pipes.

Any deviations to service stub locations must be approved by the Town Director.

All locations and elevations of the water services shall be recorded on an individual Building Services Report for each property and submitted to the Planning Department along with as-constructed drawings for the project, whether part of a reconstruction project or new development.

9.9.5. Non-Conforming Installation

If a service stub, a service or a private main is installed or extended that is not in accordance with these specifications or with the service drawing approved by the Town, such installation will be required to be removed and relocated to conform with the specifications or approved drawings.

All relocation work required shall be at the expense of the Developer or Contractor.

9.9.6. Fire Service

9.9.6.1. Fire Service Design

The determination of fire service requirements and the sizing of supply piping shall be the responsibility of the Designer. If a domestic service is combined with a fire supply service, the Designer is responsible to ensure that the supply pipe is large enough to carry the combined demand. Design and installation of sprinkler and standpipe systems and their supply services shall conform to the requirements of the Ontario Building Code, the Town's Design Guidelines Manual, and the Fire Code and must be approved by the Chief Official of the Town.

The designer shall obtain information from the Town Director regarding flows and pressures available for fire systems. If the flows and pressures required are in excess of the minimum design standards given in this manual and in excess of the actual capacity of the system, the Developer shall install booster pumps and/or storage to satisfy the required demand.

9.9.6.2. Fire Service Layout

Layout and installation of fire services to the structure including required valves and hydrants must be approved by the Town Director and the Town Fire Department. This requires a submission of plans as specified in Section 3.

A domestic sprinkler or standpipe service may each be installed as a separate service from the main. Sprinkler and standpipe services may be combined or a domestic service may be combined with either or both but the Developer is advised to obtain the approval of his Insurance Underwriter before combining them.

If combined, the domestic service can be connected to the fire service inside the building provided the complete system is designed as specified in this Section. If not combined, the domestic service must be installed separately from the main or private main.

All fire protection systems must have a backflow prevention device conforming to the Ontario Building Code, as amended. They must be ULC approved alarm check valves or ULC approved resilient seat check valves installed immediately downstream from its connection with the domestic service or immediately inside the building if the fire service is not combined with the domestic service. Fire services are not metered with the exception of a sprinkler system in individually metered dwelling units.

9.9.7. Service to Blocks in Subdivisions

Where service stub size and/or location for any block cannot be determined prior to street construction, the Town Director will not approve installation of the service stub. The following policy administered by the Town Director will apply and the cost will be paid by the Developer of the block serviced. Where any water service connection is required to be made following construction of curb, gutter, concrete sidewalk and/or wearing surface coat of asphalt on any street in the new subdivision, such water service connection shall not be made using open cut methods but shall be made using drilling or boring techniques and in such a manner as to eliminate the possibility of settlement of such curb, gutter, concrete sidewalk or wearing surface coat of asphalt; it being understood that this policy shall apply except where, in the opinion of the Town Director, ground conditions are such that the use of drilling and boring methods become unreasonable or uneconomical.

For all water servicing on blocks in a subdivision, quality control is required until the service is connected to the future use. Automatic flushers are the preferred use if the water service is planned to be connected and the developers engineer will need to submit water quality report detailing the time requirement for flushing this service.

9.9.8. Backflow Prevention on Commercial / Industrial Services

New commercial or industrial services must have a backflow prevention device conforming to the Ontario Building Code as amended.

9.9.9. Service and Private Main Valves

Services shall be located such that curb stops are not located in driveways. Main valves shall not be located in driveway entrances.

On services of 50mm diameter and smaller, a main or corporation stop shall be installed at the main and a curb stop shall be installed on the property line.

On services of 100mm diameter and larger where the main cannot be closed off for the service connection, a tapping sleeve and valve will be required at the main. Where the main can be closed off

and a tee cut into it, or where a new main is being installed, an approved valve shall be installed on the property line.

Approved valves shall be installed on looped private mains to isolate buildings or groups of building so that no more than sixty (60) individual services are on any one valved section. The Developer shall install a valve on the street main between connections to a looped private main if there is no existing valve.

All service valves shall be installed with approved valve boxes. Curb stops shall be installed with approved valve boxes and operating rods. 38 mm or larger water services shall have a 50 mm square operating nut and 130 mm diameter screw type service box with “Bubba Base” and shall have a rod extension (as per Town’s Supplemental Specifications).

9.9.10. Meters

All domestic services must be metered. Fire services are not metered except sprinkler systems in individually metered dwelling units. The meter shall be installed immediately inside the first external wall (excluding cold storage rooms) at the point of service entry into the building. Any variation from this location must be approved in writing by the Town Director.

The Developer shall provide sufficient space for installation and maintenance of the meter. The Town's staff will supply and install the meter. The meter must be accessible for reading and maintenance and must be protected from freezing and other damage. The meter or piping shall not be installed above or below any electrical panel and no closer than one metre horizontal distance. Meter pits are required where the meter is required to be more than 40m from the road allowance.

10. DEVELOPMENT GRADING

10.0. 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 design engineer and approved by the Town along with the subdivision servicing drawings.

10.1. Lot Grading Details

The following minimum design details are to be considered during the lot grading design:

- Yard surfaces shall have a minimum of 1.5%, preferably 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 225 mm. Minimum swale depth to be 150 mm. Maximum swale depth to be variable, but dependent on location and safety considerations
- Maximum distance from rear lot line to centre of swale is 1.5m.
- Swales shall have a minimum grade of 1.5%, preferably 2%.
- 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 shall be 100 m. The maximum area contributing to the rear yard swale shall be 0.5 hectare.
- No front yard catch basins shall be allowed.
- Driveways:
 - Optimum grade: 2% to 4%
 - Maximum grade: 8%
 - Walks: Optimum cross slope: 2%
- Maximum slope between houses in new developments shall be 4:1 (4 horizontally to 1 vertically)
- Retaining walls shall not be used in new subdivision development.

- 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 Town (such as with rear yard “walk-out” basements).
- Any exceptions shall be approved by the Town Director.

10.2. Boulevard Grading

All boulevards between the curb and street line shall be fine graded. The slopes on boulevards shall be not less than 2%, preferably 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.

10.3. 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, elevations and in accordance with the approved development grading plan. Further, builders will be required to submit to the Town lot grading certificates, signed and sealed by a professional engineer/Ontario Land Surveyor after final grading has been completed.

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

11. PARKS, OPEN SPACE AND LANDSCAPING

11.0. General

When 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 complete the necessary works as identified by the Town's Parks Department within the Subdivision Agreement. Access for maintenance must be incorporated into the layout.

Within new developments, the Town desires to help facilitate the integration of the stormwater management (SWM) facilities into open space and passive recreation opportunities where possible. Trails, sidewalks and other pedestrian connections should be created to promote and accent adjacent natural areas within the new developments.

11.1. 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 Town's Parks Master Plan as required.

11.2. Site Clearing

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.

11.3. Site Grading / Drainage

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

11.3.1. 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 1.5%. Maximum side slope permitted is 4:1.
- Maximum depth to bottom of channel shall be 1 metre. Minimum depth of swale shall be 150mm.
- Except for natural watercourses, in general, catch basins shall be provided in open channels and swales at maximum intervals of 100 metres.
- Swales or open ditching shall not cross the entrance way into the park area.
- Natural wetland areas may require special attention and preservation.

11.3.2. Grading

- In general, the minimum grade for grassed areas shall be 2%. However, areas to be developed for future soccer or baseball facilities may have grades less than 2%. 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 Town 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 75mm to produce an even, loose textured surface free of all stones, roots, branches, etc. larger than 50mm in diameter.
- Topsoil shall be loose textured and free of all stones, roots, branches, etc. larger than 50mm in diameter.

11.4. Fencing

All fencing shall adhere to the Town of Aylmer Division and Privacy Fence By-Law 37-17.

Where permanent fencing is required within or along parkland boundaries, it shall be 1.5 meters high and shall meet material specifications as approved by the Town on a project by project basis. Any proposed fencing that requires gate access shall be approved by the Town prior to any installations.

11.5. Topsoil Requirements

Topsoil shall be a fertile, natural loam, capable of sustaining healthy growth, containing organic matter for clay loams and organic matter for sandy loam.

Topsoil shall be loose and friable, free of subsoil, clay lumps, stones, roots or any other deleterious material greater than 25mm diameter. Topsoil shall be free of all litter and toxic materials that may be harmful to plant growth. Topsoil containing sod clumps, crabgrass, couch grass or other noxious weeds is not acceptable. Topsoil shall not be delivered or placed in a frozen or excessively wet condition.

11.6. Landscaping Plan

Landscaping plans are typically required for site plan control applications. All plans shall be reviewed by the Town.

For subdivision developments, tree boulevard planting plans are required, shall be as per the Town of Aylmer Tree Management Policy and shall be reviewed and approved by the Town.

Detailed tree species lists are provided in schedules A, B, C, D, E and F of the Tree Management Policy.

11.7. Stormwater Management Facility Landscaping

All landscaping of the stormwater management facility shall be supplied and installed by the developer, in accordance with the approved Landscaping Plan, during the first planting season after the registration of the development agreement.

Native and non-invasive trees, shrubs, ground covers and aquatic plants are required in a low maintenance landscape design which has regard for the ecology of the site and the eco-region.

All lands conveyed to the Town are to be seeded. Seeding of exposed soil surfaces should be done as soon as possible after fine grading is completed.

All landscape treatments as specified in the approved landscape design shall be installed after the seed has established, but within 2-years of registration of the subdivision or development agreement.

All slopes greater than 4:1 from a horizontal distance of 3.0 meters from the bottom of the basin to the property line (not including walkways and trails) shall be planted.

Low maintenance vegetated buffers will be required around the pond perimeter. This buffer shall be comprised of tall grasses and wild flowers, followed by trees and densely planted shrubs. A densely vegetated margin on the aquatic safety bench would serve as an aesthetic amenity and an additional barrier. Where trees are to be planted, they must be planted at a minimum rate of 1 tree (50mm cal.) per 50 square metres.

12. STREET LIGHTING

12.0. General

This section describes the standards to be followed for the design of street lighting in the Town of Aylmer and is to be used where required in conjunction with IESNA RP-8-14 Standard Practice for Roadway Lighting and the TAC Guide for Design of Roadway Lighting.

The classification of roadways and their recommended luminance light levels are as per IESNA RP-8-14 and TAC-2006 Guide for the Design of Roadway Lighting.

Street lighting in the Town is to provide uniform lighting at a level that is adequate and comfortable for vehicular and pedestrian movement on Town streets and sidewalks. All street lighting in the Town shall be designed by a qualified lighting designer using the luminance method as described in RP-8-14, unless otherwise noted, incorporating the information presented in this design standard.

Street lighting design shall take into consideration all of the approved luminaires of a given type so as to allow interchangeability of luminaires during maintenance operations.

Recommendations given herein are to be used for the specific cross section of road layout shown. Variations in cross section, road layout or pedestrian conflict levels must be dealt with on an individual design basis and a specific lighting design and associated calculations submitted to the Town for review.

All street lighting design and construction is subject to ESA inspection and approval. All materials used for street lighting in the Town must meet CSA specifications.

Energy efficient luminaires (i.e. LED lighting) shall be used in all new developments and roadway installations.

12.1. Light Pollution

In an effort to reduce light pollution, the Town requires that street lighting be designed and constructed to limit the amount of light directed towards the sky. This includes limiting both the amount of light used in an area and limiting up light from luminaires. Since the impact of lighting differs in relative terms depending on the surrounding area, “Lighting Zones” have been developed describing different ambient lighting conditions. The appropriate lighting level restrictions for each “Lighting Zone” are being finalized by IES. Refer to IES RP-33 Outdoor Environmental Lighting.

All lighting designs must be submitted to the Town for review with the necessary back-up material. Shop drawings, lighting design data, cross sections, etc. must be provided. Where the Town’s standards are not applicable, the designer shall submit the appropriate road cross section(s), the proposed road and pedestrian conflict classifications and lighting levels to the Town for review. No design shall proceed without the Town’s approval of the road and pedestrian conflict classifications.

12.2. Pavement Classification

In general the pavement classification to be used in luminance calculations shall be R3 which represents the average asphalt roadway surface in Ontario. Refer to Section 2.3 of RP-8-14.

12.3. Lighting Design

A photometric plan for exterior lighting shall be prepared by an electrical lighting specialist competent in lighting and photometrics or an electrical engineer and submitted to the Town for review. The plan must be legible and have sufficient information to show light levels. The designer must determine if luminaire shields are required and their orientation, and specify them as part of the shop drawing submission.

12.4. Light Trespass

In general, the Town standard is that exterior lighting systems shall be designed such that the vertical illuminance level at property lines within the municipal right-of-way does not exceed a maximum of 3.0 lux for residential and 15 lux for dense urban developments (downtown) at a height of 1.5m above finished grade along the property line. If this level cannot be achieved approval must be obtained from the Town for a variation.

12.5. Adaptive Lighting

Adaptive lighting is provided by a lighting system that is able to adjust lighting levels to better adapt to local conditions, time of day, special events, or minimum maintained lighting levels thereby providing energy conservation and reduced light pollution.

For luminaires to be compatible or “ready” for future incorporation into a street lighting control management system by means of the installation of an external remote control module, the luminaire LED driver would need to have 0 – 10V dimming functionality and the luminaire housing needs to be fitted with a wired C136-41 (dimmable) type photocell socket.

12.6. Material Specifications

12.6.1. New Developments

All new developments shall use either Energy Efficient type cobrahead or decorative style luminaires that are dark sky compliant subject to approval by the Town. All submissions to the Town must have photometric calculations submitted along with approval drawings.

Developers may submit an alternative decorative style luminaire to the Town for approval to be used throughout a new development. Alternative decorative luminaires need to meet all lighting criteria as described in this section prior to acceptance by the Town.

12.6.2. LED Luminaire Specifications

The luminaire shall be of type designed for arm or pedant mount. The luminaire shall be cUL or CSA listed, have a IP 66 classified enclosure, and pass 3G vibration test. The enclosure shall be cast aluminum with integral weather tight LED driver compartments and high performance heat sinks specifically designed for LED lighting applications.

The luminaire shall be of sufficient wattage to meet the minimum applicable requirements needed to meet RP-8-14, equipped with a built-in power driver, and shall be designed for operation on a 120 volt, 60 Hz, and shall operate normally in temperatures from -20 degrees Celsius to 50 degrees Celsius. The correlated color temperature (CCT) shall be 4000K. The Minimum Color Rendering Index (CRI) shall be 65. System efficacy has to be no less than 70 lm/W.

All equipment shall be as specified herein or approved equal.

The luminaire shall contain a surge protection device (SPD) to protect all electrical components from harmful line transient voltage surges as a result of utility line switching, lightning strikes, or other electrical supply system disturbances. The SPD shall meet a 6kV, 3kA surge level and meet application and testing requirements as per ANSI/IEEE C.62.41.2 for Category C-Low operation and ANSI/IEEE C62.45. The SPD shall be mounted such that it is easily accessible and replaceable.

12.6.3. Photo-Electric Controllers

Photo-electric controllers shall be electronic twist lock photo controllers with:

- A filtered (human eye spectral response) silicon light sensor with infrared blocking filter
- MOV surge protection
- Rated for 120 volts
- Load rating: 1000 watts, 1800vA ballast
- Turn on level at 16 lux and turn off at 1.5 times turn on
- Operating temperature range from -40°C to 70°C

Photo-electric controllers must be manufactured using non-hazardous materials. All photo-electrical controllers must meet CSA specifications and are subject to ESA inspection and approval.

12.6.4. Photometric Requirements

Submissions of luminaires for approval to the Town shall include the certified photometric test data report, the light distribution pattern, the luminaire efficiency and measurements as per IES- LM- 79-08. The test report shall certify that the luminaire complies with the photometric requirements, and includes the performance data of the luminaire over time and junction temperature. cUL or CSA certification, IP 66 certification and 3G vibration certification shall also be submitted.

All tests shall be performed by an independent and recognized testing laboratory.

12.6.5. Guarantee

The Supplier shall guarantee the entire luminaire against defects of materials and parts, workmanship, and failure to operate properly in service for a period of ten (10) years after date of final delivery or ten

(10) years after being placed in service, whichever occurs first. Guarantee shall cover operation of luminaire, luminaire shall be considered defective if any part of the luminaire fail, power driver is not performing correctly, lighting output has decreased by 30% of the initial delivered lumens, or lighting color has changed to outside the specified range.

Upon luminaire failure within the guarantee term, the warranty shall include for complete luminaire replacement (exclusive of labour to remove and re-install) from the manufacturer. Individual component replacements in the field by the supplier (or their agents) will not be permitted.

12.6.6. Identification of Wattage and Labeling

On the housing of the luminaire there shall be an identification means permanently attached to allow for identification of the wattage. The means shall be visible to an observer standing at street level under the installed luminaire and shall be subject to approval at the time the sample is submitted. Identification means shall consist of a black number on a gold colored square.

A label shall be included inside the luminaire. It shall have light output lumens, watts, lumens/watt (Efficacy), color rendering index (CRI), correlated color temperature (CCT) and IESNA LM-79-2008.

12.6.7. Submission

The following information is to be submitted as part of the shop drawing approval package:

- Nominal line voltage
- Luminaire wattage
- Lamp type and ANSI designation
- Ballast type
- Optical system
- ANSI/IES luminaire classification and distribution type
- Photometric curve or test report number
- Shielding options
- Luminaire shop drawings with options supplied clearly shown
- Photometric calculations for roadway luminaires are to be installed

12.7. Poles

New luminaires are to be placed on existing poles wherever possible. Where no suitable existing pole is available, a new pole compatible with existing poles is to be installed.

For (urban) roadways with barrier curbs having 60 km/hr or less design speed, light poles shall be located a minimum of 1.0 metre behind the back of the curb.

For (rural) roadways (that is, with no curbs) with a design speed of 60km/hr or less the minimum pole setback shall be 3.0 m minimum subject to the guiding principles outlined below.

For rural roadways, poles shall be located behind the ditch on the same side of the street, preferably at common lot lines. Due to the variability that may occur in rural subdivision design, the location of the poles may vary between developments. However, the guiding principles for the pole location shall be;

- No closer than 1.0 m to the property line (frontage)
- In a consistent offset from the property line for each street
- A minimum of 1.0 m behind the top of the ditch
- At a location where the luminaire height is within the manufacturers and/or utility guidelines

For all roadways with design speeds greater than 60 km/hr, pole offsets shall be in accordance with TAC guidelines for clear zone requirements based on roadway design speed.

Light poles shall be located minimum 5 metres offset from large shade trees and minimum 3 metres offset from small ornamental trees.

The recommended light pole heights above ground are provided in the following table.

Roadway Classification	Lanes	Median	Pole Height
Local	2	N/A	7.5 m
Collector	2	N/A	9.1 m
Collector	3	N/A	9.1 m
Arterial	2	N/A	9.1 m
Arterial	3 or 4	N/A	12.0 m
Arterial	4	Yes	12.0 m

12.8. Brackets

Luminaires are to be placed over the roadway and not over the boulevard wherever possible.

13. STANDARD DRAWINGS & APPENDIXES
