



City of Orillia

Engineering Design Criteria: Transportation



City of Orillia
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Revision Record

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City of Orillia

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Table of Contents

1.0	INTRODUCTION.....	1
2.0	DEFINITIONS AND ABBREVIATIONS	1
3.0	REFERENCE DOCUMENTS	3
3.1	Industry and Specifications.....	4
3.2	Applicable Acts and Legislations	4
3.3	Deviations from the Transportation Standards.....	4
4.0	USE OF MANUAL	5
5.0	DESIGN	5
5.1	General Requirements	5
5.2	Road Classification.....	5
5.3	Road Widening, Intersection Improvements and Alignments	6
5.4	Geometric Design Requirements.....	7
5.4.1	Horizontal Curves.....	10
5.4.2	Vertical Curves	10
5.4.3	Backfall at Intersecting Streets	10
5.4.4	Curb Return Radii at Intersections.....	10
5.4.5	Road Subdrain	10
5.4.6	Daylighting Requirements at Intersections	10
5.4.7	Cul-de-Sacs	11
5.5	Driveway Entrances	11
5.5.1	Location of Driveway Entrances	11
5.5.2	Multiple Driveway Entrances	11
5.5.3	Restrictions on Driveway Entrance Locations.....	12
5.5.4	Driveway Entrance Design	12
5.5.5	Construction	13
5.5.6	Driveway Approaches.....	13
5.5.7	Driveway Entrance Grades.....	14
5.5.8	Driveway Entrance Depressions.....	14
5.5.9	Culverts.....	14
5.6	Special Road Works	15
5.7	Pavement Design (Roadways)	15
5.7.1	Top Course Asphalt Placement	16
5.8	Curbs and Gutters.....	16
5.9	Street Name and Traffic Signs.....	17
5.9.1	Plan.....	17
5.9.2	Street Name Signs	17
5.9.3	Traffic Control and Advisory Signs.....	17
5.10	Roadway Markings.....	18
5.11	Traffic Signals.....	18
5.12	Traffic Calming	18
5.13	Traffic Impact Statement (TIS).....	19
5.14	Streetlighting	19
5.14.1	Street Light Locations.....	19
5.14.2	Light Source, Fixture and Pole	19
5.14.3	Approval and Construction	20
5.15	Pedestrian Connectivity.....	20

City of Orillia

Engineering Design Criteria: Transportation

5.15.1	Sidewalks	20
5.15.2	Trails	21
5.16	Parking.....	22
5.17	Cycling Facilities	22
5.18	Utilities	22
5.18.1	General Requirements	22
5.18.2	Electrical Design Requirements.....	23
5.18.3	Electrical Services Plan	23

List of Table

Table 1: Road Classification	6
Table 2: Road Design Criteria	8
Table 3: Intersection Design Criteria.....	9

City of Orillia

Engineering Design Criteria: Transportation

1.0 INTRODUCTION

The City of Orillia Transportation Engineering Design Criteria and Standard Drawings presented herein are intended as guidelines for engineers and contractors for the design and construction of roadway infrastructure to ensure uniform design throughout the City of Orillia. Innovative technological changes that improve or maintain the quality of the design on a life cycle cost basis may be considered at the discretion of the City.

These standards are to be read in conjunction with the latest editions of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), the City of Orillia Standard Drawings, the City's Master Transportation Plan and the City's Official Plan. In the case of a discrepancy, the City Standards and policies shall prevail.

It is the applicant's responsibility to obtain and check with the City of Orillia for up-to-date revisions to the design standards. Copies are available from the City of Orillia or can be downloaded from the web site at www.orillia.ca. All standard drawings are available in pdf format.

The criteria outlined in this manual is intended to be updated on a regular basis to remain consistent with other reference documents. Comments or questions regarding the Engineering Design Criteria can be submitted to infrastructureplanning@orillia.ca.

2.0 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations for terms are used throughout the Engineering Design Criteria manuals.

Definitions

City	City of Orillia.
City Representative / City Engineer	Any person, company, or organization, assigned to a project by the City to carry out work on their behalf. The name of the Representative shall be specified prior to the start of construction on any project.
Contractor	An independent company or individual acting as the Contractor and having entered into a legal contract to supply labour, material, equipment, management to construct, repair or install services.
Developer(s)/Owner(s)	The person(s) entering into the subdivision agreement / site plan agreement with the Corporation of the City of Orillia.
Engineering Consultant	A competent Professional Engineer or firm of engineers employed by the Developer which is skilled and

City of Orillia

Engineering Design Criteria: Transportation

experienced in municipal work and land development projects and registered with Professional Engineers Ontario, possessing a current Certificate of Authorization to practice professional engineering as required by the Professional Engineers Act.

General Manager of Development Services and Engineering

Means the General Manager of Development Services and Engineering for the City of Orillia, or his or her designate, authorized to act on his or her behalf.

Intersection

Means the area embraced within the prolongation or connection of the lateral curb lines or, if none, then of the lateral boundary lines of two or more highways which join one another at an angle, whether or not one crosses the other.

Private Road

Includes any Roadway that is not assumed by the City or the Province of Ontario.

Professional Engineer

A person licensed by Professional Engineers Ontario (PEO) under the Professional Engineers Act and legally authorized to practice professional engineering, use the protected title "Professional Engineer" or the designation "P.Eng.", and take public responsibility for engineering works.

Standard Drawings

Formal technical documents that use universally accepted conventions to communicate the specifications of a design.

T-turnaround

Refers to a "T"-shaped area that allows vehicles to reverse direction through a 3-point turn.

Turning Radius

Minimum radius required for a vehicle to turn around.

Abbreviations

CSA

Canadian Standards Association.

ESA

Electrical Safety Authority.

ITE

Institution of Transportation Engineers.

MECP

Ontario Ministry of the Environment, Conservation and Parks.

MTO

Ontario Ministry of Transportation.

MUTCD

Manual of Uniform Traffic Control Devices for Canada.

City of Orillia

Engineering Design Criteria: Transportation

OBC	Ontario Building Code.
OPSD	Ontario Provincial Standard Drawings.
OPSS	Ontario Provincial Standard Specification.
OTM	Ontario Traffic Manual.
RP	Recommended Practice for Roadway Lighting and Associated Systems.
TAC	Transportation Association of Canada.

3.0 REFERENCE DOCUMENTS

All proposed roads and transportation infrastructure shall be designed and constructed following the latest version of this manual as well as other latest edition of the following industry standards and best practices, including but not limited to the latest versions of the following:

Transportation Association of Canada (TAC)

- Transportation Association of Canada (TAC)
- Geometric Design Guide for Canadian Roads
- Manual of Uniform Traffic Control Devices for Canada (MUTCDC)
- Canadian Guide to Traffic Calming
- Canadian Roundabout Design Guide
- Bikeway Traffic Control Guidelines

Ministry of Transportation (MTO)

- MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, October 2023 or latest edition
- Ontario Provincial Standard Specifications (OPSS) Ontario Provincial Standard Drawings (OPSD)
- Ontario Traffic Manual (OTM) Books prepared by the MTO

Institute of Transportation Engineers (ITE)

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

Miscellaneous

- City of Orillia Transportation Master Plan, the latest version
- City of Orillia Official Plan, as amended

City of Orillia

Engineering Design Criteria: Transportation

- City of Orillia Multi Modal Transportation Plan
- City of Orillia Parks, Recreation, Culture and Trails Master Plan
- Ontario Building Code (OBC)- 2024 or latest edition
- Roadway Lighting ANSI / IES RP-8 prepared by the Illuminating Engineering Society of North America (IESNA), latest edition
- Guideline for Security Lighting for People, Property and Public Spaces, G-1-03 prepared by IESNA, latest edition
- Ontario Electrical Safety Code (OESC)
- Canadian Highway Bridge Design (CSA S6-14)
- National Cooperative Highway Research Program (NCHRP) Research Report 1043 - Guide for Roundabouts, 2023 Edition
- Roundabout Feasibility Initial Screening Tool Guide developed by the Region of Waterloo, the latest version

3.1 Industry and Specifications

All proposed roads and transportation infrastructure shall comply with the latest version of all applicable industry standards and specifications for quality management and quality control, including but not limited to the following:

- Electrical Safety Authority (ESA)
- Canadian Standards Association (CSA)
- American Society for Testing and Materials (ASTM)

3.2 Applicable Acts and Legislations

This manual does not supersede, nor replace any legislation governing the design and construction of road and transportation systems.

The Proponent shall be fully familiar with the latest version of these legislative requirements when carrying out the design and construction of City linear projects, such as:

- Ontario Highway Traffic Act
- Municipal Act
- Ontario Water Resources Act
- Environmental Assessment Act
- Environmental Protection Act
- Accessibility for Ontarians with Disability Act (AODA)
- Planning Act

By referencing these documents, the City aims to provide a comprehensive and robust framework that supports the design and construction of municipal infrastructure, ensuring safety, efficiency, and sustainability.

3.3 Deviations from the Transportation Standards

These standards are developed considering the latest industry practices, public safety, and the City's ability to maintain the infrastructure. Deviations from these standards may be permitted if

City of Orillia

Engineering Design Criteria: Transportation

site constraints (e.g., environmental, archeological, or other challenges) prohibit the implementation of these standards. All deviations from these standards require written approval from the General Manager of Development Services and Engineering or a designated representative.

4.0 USE OF MANUAL

The intent of the City's Engineering Design Criteria manuals is to facilitate consistent engineering design and construction practices within the City. Moreover, the manuals are intended to:

- Integrate industry standards and best practices;
- Prioritize the health and safety of the public; and
- Reduce impacts to the natural environment and protect resources.

Each section of the manual should be read in conjunction with one another.

- City of Orillia Engineering Design Criteria: General Guidance
- City of Orillia Engineering Design Criteria: Wastewater
- City of Orillia Engineering Design Criteria: Water Distribution
- City of Orillia Engineering Design Criteria: Stormwater
- City of Orillia Engineering Design Criteria: Transportation

5.0 DESIGN

5.1 General Requirements

This section outlines the minimum requirements for the design of road infrastructure to meet the City's engineering standards as stipulated in this manual.

All roadway projects shall be designed to facilitate passage of emergency and service vehicles. Curb returns having an 8.0 m. radius and inside bends having at least a 12.0 m. radius are required. On dead end streets provision shall be provided for vehicle turning.

5.2 Road Classification

All roadways shall be classified in accordance with the City Official Plan and its schedules. Road classification may be reassessed or modified according to traffic volume and intended use of the roadway. The functional road classification and associated guidelines pertain to Highways, Arterial Roads, Collector Roads and Local Roads. The proposed classification of all streets in new development shall be confirmed with the City prior to the commencement of the design. For retrofit conditions, the existing classification shall be maintained unless otherwise directed by the City.

The following **Error! Reference source not found.** is presented as a guide to the determination of the road classification.

City of Orillia

Engineering Design Criteria: Transportation

Table 1: Road Classification

CRITERIA	LOCAL	COLLECTOR	ARTERIAL
Source Provided	Land Access	Land Access	Traffic
Movement	Traffic Movement	Transit Routes	Transit Routes
Length of Trip	Short	Medium	Long
Flow	Interrupted	Interrupted	Uninterrupted except at traffic signals and pedestrian crosswalks
Interconnections	Local, Collector	Local, Collector, Arterial	Collector, Arterial, Highways
Estimated A.A.D.T.	0—3,000	< 8,000	5,000 to 20,000

Refer to the latest edition of TAC Chapter 2-Design Controls, Classification, and Consistency for supplemental information.

5.3 Road Widening, Intersection Improvements and Alignments

For the purposes of the Planning Act, Arterial and Collector streets as identified in the City of Orillia's Official Plan Schedules will be considered as "highways to be widened" and the identified right-of-way width in the City's Official Plan will form the basis for any conveyances of land for the purposes of street widening required through approval of site plan, plan of subdivision, or, consent applications.

The right-of-way widths identified in the City's Official Plan are the ultimate widths required to provide for traffic surfaces, boulevards, sidewalks, multi-use trails, utility locations and ditches. The identified road allowance widths are based on the existing situation, expected future development and the intended street function.

In addition to right-of-way widenings, the City may also require conveyances for:

- Street widenings for daylighting triangles at intersections to provide sufficient sight distances, turning lanes and locations for traffic control measures; and
- Turning lanes at any other locations along roads to provide safe and appropriate access to major generators or attractors of traffic. Dimensions of such widenings will be in accordance with the standards of the City.

The City may, under certain topographic conditions, require a greater street width to address appropriate design or traffic safety measures. Where such circumstances are encountered, a further 10 metres may be added to the right-of-way that would be established through the policies of the Official Plan.

Where a dedication of land is being required as a condition of a development approval, the landowner will only be required to dedicate a widening equivalent to 50 percent of the total required width to bring the right-of-way width up to the width specified for the applicable street classification. Where topographic constraints, existing buildings, or infrastructure make it

City of Orillia

Engineering Design Criteria: Transportation

impractical to obtain an equal widening from both sides of the street, the City may secure a dedication from one side to the maximum extent possible provided it does not unduly impact existing features and does not exceed 50 percent of the total street widening requirement

Exact Road Widening widths shall be determined by the City's Development and Infrastructure Planning Division in line with City Policy 8.2.1.1 Road Widening Policy.

Under that Policy, if the widening is as a conditions of a Planning Act Approval then the owner/developer will be required to undertake, at their own expense a draft reference plan for the City's review and acceptance and coordinate the legal transfer process.

5.4 Geometric Design Requirements

As outlined in Table 2: Road Design Criteria and Table 3 below, the design criteria shall meet the latest edition of TAC guidelines. Refer to TAC Chapter 2- Design Controls, Classification, and Consistency and Chapter 3-Alignment and Lane Configuration for supplemental information. Refer to General Guidance Engineering Design Criteria Appendix for Road Cross-Sections. The Tables represents the minimum guidelines as per the TAC Manual; all final designs shall be subject to approval of the City of Orillia.

City of Orillia

Engineering Design Criteria: Transportation

Table 2: Road Design Criteria

Design Element	Road Classification					
	Local		Collector		Arterial	
	Rural	Urban	Rural	Urban	4 Lane Urban	5 Lane Urban
Right-of-Way (ROW) Width (m)	20.0	20	26	26.0	30.0	30.0
Lane Width (m) (minimum) ¹	3.5	3.0	3.75	3.5	3.5	3.5
Width of Parking Lane (m) for 60km/h or less	2.25	2.0				
Curbside Min. Width (m) for 60km/h or less			3.3 - 4.0	3		
Center Turn Lane Min. (m)					3.0 - 3.7	3.0 - 3.7
Design Speed (km/h)	60	60	60	60	90	100
Posted Speed (km/h)	50		60		80	
Stopping Sight Distance (SSD) (level roadways) ²	As Per TAC Section 2.5					
Horizontal curve radius (m)	As Per TAC Section 3.2					
Maximum grade (%)	8	8	8	8	8	8
minimum grade	0.5	0.5	0.5	0.5	0.5	0.5
Superelevation (e _{max}) ³	4%	4%	4%	4%	4%	4%
Vertical curve - minimum 'K'	As Per TAC Section 3.3					
Crest curve						
Sag curve - unlit						
Sag curve - illuminated						
Cross fall from the centerline (normal crown)	2 %					
Design vehicle	City's fire truck	City's fire truck	City's transit bus	City's transit bus	WB-20 Tractor Trailer as per TAC	
Notes: 1. Refer to latest edition of TAC Chapter 4- Cross Section Elements Section 4.2 Lane Widths for supplemental information 2. Refer to latest edition of TAC Chapter 2- Design Controls, Classification, and Consistency for sight distance on grades 3. Superelevation 4% or match existing for the retrofit condition unless otherwise directed by the City						

City of Orillia
Engineering Design Criteria: Transportation

Table 3: Intersection Design Criteria

Design Element	Intersecting Roads				
	Local - Local	Local - Collector	Collector - Collector	Collector - Arterial	Arterial - Arterial
Intersection angle (degrees)	As Per Tac 9.7.2				
Curb radius - minimum (m)	4	4	5	7.5	10
Curb grade – minimum (%)	0.5	0.5	0.5	0.5	0.5
Daylight rounding - min. (m) ⁴	7.5	7.5	*7.5	7.5	7.5
Max grade for through road (%)	3.5	3	3	2	2
Tangent on approach (from limit of daylighting) - min (m)	30	50	60	75	75
Intersection spacing, measured centerline to centerline of intersection (m)	As per TAC 9.4.2 See TAC Table 9.4.1 for signalized intersections				
Driveway radius	As per OPSD 350.010 or 351.010				
Notes:					
4. The Consultant shall design daylighting requirements for all other intersection types according to each situation					

City of Orillia

Engineering Design Criteria: Transportation

5.4.1 Horizontal Curves

Horizontal alignment is to conform to the requirements as outlined in Table 2: Road Design Criteria. In general, “right angle bends” will not be permitted on local streets except in the case of “Cul-de-sac or “Crescents” serving no more than 50 residential lots. Where permitted, these bends must not have a deflection angle greater than 110 degrees.

5.4.2 Vertical Curves

All points of grade change in excess of 1% shall be designed with vertical curves as outlined in the current Ministry of Transportation of Ontario publications. The minimum visibility curves to be used are outlined in the geometric details for each roadway classification in Table 2: Road Design Criteria. The minimum tangent length of any road grade shall be nine metres.

5.4.3 Backfall at Intersecting Streets

At all street intersections, the normal cross fall of the major street shall not be interrupted by the crown line of the minor street. A 1 % to 2 % backfall shall be provided on the minor street at all street intersections. This backfall shall continue to the end of the curb return radii to facilitate proper drainage of the intersection. Overland flow routing of storm drainage through the intersection must be maintained.

5.4.4 Curb Return Radii at Intersections

The curb return radii at street intersections shall conform to the dimensions presented in Table 3 Table 2: Road Design Criteria.

5.4.5 Road Subdrain

Sub-drains will be required on all developments within the City of Orillia. Subdrains shall be constructed in accordance with OPSS.MUNI 405 and as recommended by the geotechnical report. Subdrains shall be connected to a drainage structure. Subdrains shall be a minimum 150 mm in diameter with a minimum 0.5% slope and shall be installed continuously below the curb and gutter unless stated otherwise in the geotechnical report.

5.4.6 Daylighting Requirements at Intersections

Daylighting at all intersection quadrants shall be included in the road allowances to provide for uniform boulevard widths. Such daylighting shall be included on the proposed plan for Registration (M-Plan) and on all engineering drawings.

For local roads intersecting local roads, the minimum daylighting requirement shall be a radius of 7.5 metres. For all other intersections, the size of the daylighting or visibility triangle is a function of the number and width of lanes, the various design speeds on the intersecting roads and the R.O.W. widths on both roads. The Consulting Engineer shall submit detailed calculations for sizing of daylighting triangles at these intersections in accordance with the design criteria prepared by the Ministry of Transportation Ontario, Appendix 9 for TAC Chapter 9 Intersections.

City of Orillia

Engineering Design Criteria: Transportation

5.4.7 Cul-de-Sacs

Permanent cul-de-sacs shall be constructed in accordance with the details provided in OPSD 500.010, 500.020, and 500.030, and shall be designed with a minimum grade of 1% from the centre of the bulb to the curb. A minimum gutter grade of 0.5% shall be maintained around the cul-de-sac. The maximum length of roads that terminate in a cul-de-sac shall be 250 m. The engineering drawings for cul-de-sac shall show gutter, crown and other grades to demonstrate that the road will drain properly without ponding and shall be used as a basis for layout. All cul-de-sacs drawings shall be at a scale larger than the road plan drawings.

5.4.7.1 Temporary Turning Circles

Temporary turning areas will be considered whenever a road is to be continued in the future in a phased Plan of Subdivision. Temporary turning areas shall be design to the satisfaction of the City.

5.5 Driveway Entrances

5.5.1 Location of Driveway Entrances

New driveway entrances may be permitted for existing lots where no driveway entrance has previously been provided, subject to the restrictions of Official Plan, By-Law 1000 and the City of Orillia Engineering Design Criteria.

New driveway entrances may be permitted to replace existing driveway entrances, provided they comply or exceed with City of Orillia Engineering Design Criteria standards.

Arterial streets will generally limit private access to existing lots, commercial and industrial uses.

New residential accesses will only be permitted on Arterial Streets where traffic movement, volume, speed and safety are not compromised, no alternative Local or Collector street access is available and the entrance criteria of the City are met.

Shared access points are encouraged to limit individual accesses onto Collector streets.

Approval from the Environmental and Infrastructure Services is required for a driveway located within 4 metres of a tree on City property before applying for an Entrance Permit.

Entrance Spacing will comply with TAC Section 8.9

5.5.2 Multiple Driveway Entrances

Corner-lot properties may have two driveway entrances, limited to one driveway entrance per frontage, and that only one frontage is permitted to be on an Arterial Road

For residential lots with a frontage exceeding 33 metres, a secondary driveway entrance may be permitted. The minimum separation distance between two driveway entrances on the same lot crossing the same lot line, measured at the property line, shall be:

- No secondary low residential access shall be permitted along Arterial Roads 15.0 metres for access to a local road or collector road.

City of Orillia

Engineering Design Criteria: Transportation

Commercial, Industrial, Institutional and multi residential uses shall be reviewed on submission details and approved based upon existing OPSS, OPSD, Transportation Association of Canada guidelines and against the judgement of the City of Orillia' Development Services and Engineering Department.

5.5.3 Restrictions on Driveway Entrance Locations

The following locations are not permissible for new driveway entrances or widening of existing driveway entrances within the City of Orillia Right of Way:

- An established Plan of Subdivision, or Plan of Condominium, with an Approved Composite utility plan.
- Within 20 metres of a signalized intersection from curbline of intersecting street.
- Any existing residential lot located on an Arterial Road
- Within 20 metres of an Intersection of a Collector Road, Arterial Road, or Highway.
- Within 15 metres of an intersection from curbline of intersecting Local Road.
- Within 15 metres of a bridge termination.
- Within 15 metres of an at-grade Multi-Use Trail crossing.
- Within 30 metres of a roadside guardrail treatment.
- Within 1.5 metres of an existing driveway entrance edge for low density residential uses, except where driveways are shared
- Within 3.0 metres of an existing driveway entrance edge for Multiple Residential, commercial, institutional or industrial uses.
- Driveway cuts shall be located at a minimum distance of 1.0 metre from any property line.
- Within exclusive lanes for channelization, acceleration, or deceleration.
- Where minimum stopping sight distances, as determined by the TAC Design Guide, are not met.
- Where the entrance obstructs or interferes with City-approved on-street parking spaces.
- When reviewing an application, the General Manager of Development Services and Engineering or designate shall consider;
 - Any potential adverse effect on public health and safety.
 - Future Municipal Infrastructure needs Any concerns for the damage or loss of persons or property.

5.5.4 Driveway Entrance Design

Driveway entrances and aprons must be finished with materials such as asphalt, paving stones, impressed concrete, or other durable hard surfaces to the satisfaction of the General Manager of Development Services and Engineering or designate.

The location of driveway entrances on City streets shall be such that the minimum sight distances are maintained in both directions.

Where existing, the municipal sidewalk and roadway curb must be continuous through all driveways.

Driveway entrances must be set flush with the top of sidewalk elevation within 300 mm of either side of the sidewalk.

City of Orillia

Engineering Design Criteria: Transportation

If there is a need to provide parallel parking between driveway entrances along the roadway, a spacing of 7.0 metres is required.

The minimum distance of a driveway to the face of a utility shall be as follows:

- Hydro Pole/Signal - 1.0 metre
- Pole/Light Standard Fire Hydrant - 1.5 metres
- Communications Pedestal - 1.0 metre (Telecommunication utilities)
- Hydro Transformer - 2.5 metres
- Community mailboxes – 1.5 metres
- Transit stop 6.0 metres

5.5.5 Construction

The Developer/Contractor/Owner is responsible for the grading, granular placement and paving of all driveways from property line to curb or street line where a curb does not exist.

The minimum consolidated depth requirements for the granular base and asphalt in driveways shall be consistent with the pavement design identified in Section 5.5.6 of the Transportation Engineering Design Criteria.

Alternate types of driveways (i.e., paving stones, concrete pads, etc.), will be subject to approval by the City.

5.5.6 Driveway Approaches

The Developer/Owner/Contractor is responsible for the grading and paving of all driveways from property line to the street line.

All driveways shall be paved with asphalt or an approved alternate from the edge of the roadway to the garage. The minimum asphalt pavement design for all residential driveways shall be:

- Subgrade compacted to 95 % Standard Proctor Maximum Dry Density.
- 300 mm compacted depth of OPSS.MUNI 1010 Granular “A”.
- 50 mm compacted depth of SP 12.5 or SP 9.5 hot mix asphalt for residential driveways.

The minimum consolidated depth requirements for the granular base in commercial, industrial, institutional and multiple residential driveways shall be as follows:

- Subgrade compacted to 95 % Standard Proctor Maximum Dry Density.
- 160 mm compacted depth of OPSS.MUNI 1010 Granular “A”.
- 300 mm compacted depth of OPSS.MUNI 1010 Granular “B”
- 100 mm compacted depth of SP 12.5 or SP 9.5 hot mix asphalt for commercial, institutional and industrial driveways.

City of Orillia

Engineering Design Criteria: Transportation

5.5.7 Driveway Entrance Grades

Driveway entrance grading shall be in accordance with OPSD 350.010 for industrial, commercial, institutional and multiple residential entrances and OPSD 351.010 for individual residential entrances.

Maximum grades are not recommended and should be employed only in exceptional cases where physical conditions prohibit the use of lesser grades.

The minimum driveway entrance grade shall be 0.5%.

A negative-grade driveway is one that slopes downward from the municipal ROW and shall not be permitted within new developments.

The use of negative-grade driveway entrances is actively discouraged within infill developments unless no other grading solution exists and will only be considered under special circumstances subject to approval by the City. Where negative sloping driveway entrances are used, a positive slope of at least 2.5 % must be maintained from the garage over a minimum distance of 10.0 metres. A complete hydrologic and hydraulic analysis may be required to be prepared by a qualified Professional Engineer (P.Eng.) to demonstrate no negative impacts for all storm events up to and including the 100-year storm; refer to the City of Orillia Stormwater Engineering Design Criteria.

5.5.8 Driveway Entrance Depressions

The width and location of the depressions in the curb and gutter for single residential dwelling unit driveway entrances shall be as detailed on OPSD 351.010 with particular attention being placed on the location of the garage and the direction of traffic flow.

Driveway cuts shall be located at a minimum distance of 1.0 metre from any side lot line.

Driveway entrances depressions are to be placed when concrete curb and gutter is initially poured. Double driveway entrances depressions are to be placed for all residential dwelling lots.

The width and location of the driveway entrance depressions for multiple residential, commercial, institutional and industrial driveway entrances shall be as detailed on OPSD 350.010. These driveway entrances shall be designed to accommodate the anticipated vehicular traffic without causing undue interference with the traffic flow on the street.

All multiple residential, commercial, institutional and industrial driveway entrances shall be provided with barrier curbs constructed to blend into the roadway curb and gutter.

5.5.9 Culverts

The minimum length of each residential HDPE, or as recommended in drainage design, driveway culvert shall be 7.0 metres and the minimum diameter shall be 400 mm. The maximum length of residential driveway entrance culverts shall be 9.0 metres. The maintenance and repair of such culverts shall remain the responsibility of the Developer/Landowner until such time as the works have been accepted by the City.

Culverts shall be backfilled with a minimum compacted base of 150 mm of 19 mm limestone and cover of 300 mm of 19 mm limestone.

City of Orillia

Engineering Design Criteria: Transportation

The construction of driveway entrance headwalls at each end of the driveway culvert will not be permitted, unless otherwise approved by the City.

A 3.0-metre-wide platform area shall be constructed in the ditches fronting each fire hydrant. The minimum culvert length shall be 6.5 metres and minimum diameter shall be 400 mm.

5.6 Special Road Works

Whenever it is necessary to cut through an existing city road, the Developer will be responsible for properly compacting the backfill material and restoring the surface pavement to its original conditions immediately upon completion of backfilling operations.

Before making detours, permission and approval is required from the City. Where the road is not part of the city road system, approval from the appropriate road authority will also be necessary. In all cases the Fire, Police Departments, City Transit, School Bus Companies and Ambulance Service must be notified by the Developer or their Contractor.

All work shall be done in accordance with By-laws of the City.

5.7 Pavement Design (Roadways)

Pavement design shall be completed by a geotechnical engineer and recommended pavement structure provided in the geotechnical report or to the City's minimum pavement structure.

- a) Asphalt materials shall be placed in accordance with OPSS 1010, 1150, 1151 and 310.
- b) The minimum pavement design for all local roadways shall be:
 - Subgrade soils compacted to a minimum of 95 percent Standard Proctor Maximum Dry Density.
 - 400 mm compacted depth of OPSS.MUNI 1010 Granular B.
 - 150 mm compacted depth of OPSS.MUNI 1010 Granular A.
 - 60 mm compacted depth of SP 19.0 hot mix asphalt binder course.
 - 40 mm compacted depth of SP 12.5 hot mix asphalt surface course.
- c) The minimum pavement design for all Collector and Arterial roadways shall be:
 - subgrade soils compacted to a minimum of 95 percent Standard Proctor Maximum Dry Density.
 - 400 mm compacted depth of OPSS.MUNI 1010 Granular B.
 - 150 mm compacted depth of OPSS.MUNI 1010 Granular A.
 - 100 mm compacted depth of SP 19.0 hot mix asphalt binder course.
 - 50 mm compacted depth of SP 12.5 hot mix asphalt surface course.
- d) The minimum longitudinal grade for any roadway shall be 0.5 % and the maximum grade shall be 8.0 percent.

In general, pavement design shall be completed by the geotechnical consultant in accordance with the most recent City of Orillia Standards, OPSS and OPSD.

The minimum pavement design for all new streets shall be as detailed on the Standard Drawings and identified in Section 5.5 of the City's Transportation Engineering Design Criteria. In all cases, a qualified Geotechnical Consultant shall be engaged by the Developer to sample,

City of Orillia

Engineering Design Criteria: Transportation

test and design a suitable pavement section for each particular site. Soil sampling shall be carried out in the presence of the Geotechnical Consultant at intervals not exceeding 40 metres along the centreline of the road. The composition and design thickness of the pavement section shall be determined from:

- Mechanical sieve analysis of the subgrade soil
- Frost susceptibility
- Drainage
- Traffic volumes

Copies of all test results and proposed road designs shall be submitted with the Engineering Drawings. In no case will a pavement design less than the minimum City of Orillia Standard as shown on the standard drawing for the particular road classification be considered acceptable.

Prior to the placement of asphalt pavement, the Consulting Engineer must submit to the City for approval, the asphalt pavement mix designs. The pavement design must be sufficient to provide for ultimate wheel loads over the road, prior to placement of surface course asphalt.

5.7.1 Top Course Asphalt Placement

Prior to placement of top course asphalt, the following works must be completed:

- All sidewalk, curb and boulevard work.
- Raise maintenance hole and catch basin frames.
- Install delineation for raised frames 40 mm above asphalt lift.
- Flush and sweep surface and evenly apply tack coat.
- Base course asphalt pad as required in accordance with OPSS.
- Final sewer video inspection.
- Place top course asphalt in accordance with OPSS.

The following conditions must also be met:

- A minimum period of one year has expired from the completion date for the placement of the base course asphalt.
- 85% of the dwellings have received unconditional Occupancy Certificates.
- All undeveloped lots are rough graded in accordance with the approved lot grading plans.
- All service connections for Multiple Residential, commercial, institutional or other blocks (including parkland) are installed.
- The approval of the City is obtained in writing.

5.8 Curbs and Gutters

Where constructed to an urban cross-section, new City streets shall be constructed with barrier curb and gutter OPSD 600.070 on all roadways unless approved otherwise by the City. Prior to final acceptance all curb blemishes will be rectified by removing a minimum 1 m section of curb and replacing.

City of Orillia

Engineering Design Criteria: Transportation

A driveway entrance is required for each lot. Curb depressions are required at each intersection as per OPSD 310.030.

A minimum of 300 mm of Granular 'B' material compacted to 95% Standard Proctor Density will be required as a base for all curb installations.

Minimum grade on curb is 0.75% desirable, 0.5% absolute minimum.

5.9 Street Name and Traffic Signs

5.9.1 Plan

The proposed location and type of all street names and traffic control signs shall be shown on Plan and Profile Drawings in accordance with the latest edition of OTM Books and MUTCDC.

The naming of streets, shall be in accordance with the City's street naming policy 8.1.7.1 and with directions provided in the City's Municipal Addressing Manual.

5.9.1.1 Location

Street name signs shall be placed at each intersection and shall identify each street at the intersection. The location of the street name signs is shown in the City of Orillia Standard Drawing. Please refer to the latest edition of OTM Book 1B- Sign Design Principles for supplemental information.

5.9.2 Street Name Signs

For all new developments, street name signs will be supplied and installed by the City with all costs charged to the Developer. For retrofit conditions, the existing street name sign shall be salvaged and reinstalled as per the design unless otherwise directed by the City.

5.9.3 Traffic Control and Advisory Signs

5.9.3.1 Location

Traffic control and advisory signs shall be located in conformance with the latest edition of Ontario Traffic Manuals or the Highway Traffic Act Regulations for Ontario.

All signs, with exception of "Parking" signs, shall be mounted approximately at right angles to the direction of and facing the traffic they are intended to serve. On curved alignments the angle of placement should be determined by the course of the approaching traffic rather than by the roadway edge at the point where the sign is located. Signs for different purposes should not be placed closer together than 30 m.

Parking signs shall be mounted facing 30 – 45 degrees to the flow of traffic.

5.9.3.2 Type

All traffic control and advisory signs shall conform to the current revised standards of the Ontario Traffic Manuals.

City of Orillia

Engineering Design Criteria: Transportation

5.9.3.3 Installation

All traffic control signs shall be mounted on galvanized steel punch out type or uniflange type posts, 3.65 m. in length. Channel posts shall be a minimum 14 gauge thick and a minimum width of 45 mm. The posts shall be pre—punched with a minimum of 24 holes at 50 mm centres compatible with standard bolthole arrangements for traffic control signs. Signs shall be individually installed on separate posts.

The Developer or the Contractor must install traffic control signs at the completion of the base course asphalt road construction and before the issuance of Building Permits. Signs must be maintained by the Developer or the Contractor until “Final Acceptance” by the City.

Upon completion of base course asphalt, the Developer/Contractor shall place signage at each point of ingress/egress to the subdivision stating the following:

“THIS ROAD UNASSUMED BY THE CITY OF ORILLIA - USE AT OWN RISK”

Each sign shall be 450 mm wide by 600 mm high with black letters on white reflectorized background, mounted on ‘U’ channel posts, 3.65 metres in height.

5.10 Roadway Markings

The pavement markings shall be in accordance with the latest edition of OTM Book 11, OPSS 710 and as stipulated in this manual. The pavement markings design shall be approved by the City prior to the application. Temporary markings on the base coat of asphalt may be required if directed by the City. All transverse pavement markings and symbols shall be applied with durable pavement markings.

5.11 Traffic Signals

Traffic Signals are to be designed on individual site-specific bases and in accordance with the latest City’s manual, OTM Book 12, OESC and applicable OPSS. Electrical drawings shall include, as a minimum, notes / legend, layout for signal and pedestrian poles, pedestrian / bike crossing line paintings, schematic wiring diagram, miscellaneous details, handholes, cables/ducts, controller, associated hardware and removals. PHM-125 record drawings are required for all traffic signal drawings.

Pedestrian crossing treatments shall be in accordance with the latest edition of OTM Book 15.

5.12 Traffic Calming

The traffic calming measure shall be designed in accordance with City of Orillia’s Traffic Calming Manual supplemented by the latest edition of TAC geometric design and traffic calming guidelines.

City of Orillia

Engineering Design Criteria: Transportation

5.13 Traffic Impact Statement (TIS)

TIS may be required to assess the impact on traffic due to the development subject to approved Terms of Reference of the City. TIS shall be in accordance with the latest edition of the ITE manual.

5.14 Streetlighting

Streetlights are required for all roadways and most walkways in the City as required by the City's Official Plan, and other locations as directed by the City. All streetlighting shall be approved by the City prior to installation. The lighting systems shall be designed as per the IES Recommended Practice (RP) 8-21 or latest guidelines. The lighting design and calculations shall meet the requirements of Illuminance Method.

The Developer shall arrange with Hydro One for the connection of all lighting systems. The planned design of the roadway will include lighting and will be part of the planning, design, and construction of all roads.

5.14.1 Street Light Locations

Poles shall be located at a maximum spacing of 45 m.

Where possible, pole locations are to be placed on the projection of side lot lines. Where community mailboxes are proposed within a plan of subdivision, streetlights must be located immediately adjacent to the community mailboxes.

Adequate illumination at all intersections must be provided.

Illumination shall be required at all transit stops.

No streetlights should be placed within 3.0 m of a transformer. Staggered arrangement of luminaire poles is not acceptable.

On curving roadways, lights are to be placed on outer radii where possible with spacing to be reduced by 30%.

Proposed lighting levels adjacent to Provincial and County roads are to be reviewed and approved by the appropriate road authority.

5.14.2 Light Source, Fixture and Pole

All luminaires shall comply with all applicable requirements of CSA Standard C22.2 No. 9, "General Requirements for Luminaires" and shall be in accordance with the City's approved material specifications.

Landmark luminaires of appropriate wattage are to be used on collector and arterial roads. Each light shall be controlled by a dusk to dawn photo electric cell.

For local roads poles for 7.60 m mounting height are to be direct burial type round concrete complete with 3.0 m aluminum tapered elliptical arm, 100 mm by 175 mm handhole and cover,

City of Orillia

Engineering Design Criteria: Transportation

ground lug at the handhole and two below grade wiring apertures as per City of Orillia approval. Lighting must be located on the same side as the sidewalk.

City approved poles of appropriate height and class, with tapered single elliptical aluminum arms of appropriate length, are to be used on collector and arterial roads.

5.14.3 Approval and Construction

For new developments, approval of plans for streetlighting must be obtained from the City. Electrical Safety Authority (ESA) approval for the installed street lighting system must be obtained by the developer. The Developer must guarantee and maintain the lighting until final acceptance of the development by the City. The City, upon acceptance of the streetlighting, will pay energy charges.

For retrofit conditions or new streetlights within the municipal Right of Way (ROW) the consultant shall coordinate with Hydro One for the engineering design and approvals prior to tendering the project.

5.15 Pedestrian Connectivity

5.15.1 Sidewalks

The location requirements for sidewalks in new subdivisions shall be confirmed with the City prior to commencing the detailed design.

Sidewalks are required on both sides of all arterial and collector roadways and on at least one side of a local street. Generally on local roadways, sidewalks are required on only one side of the street, however the locations of schools, parks, places of worship, commercial establishments etc., the length of street, traffic volume expected, and the number of residential dwelling units serviced will be used as criteria in determining both where the sidewalk is located and whether a sidewalk is required on one or two sides of the street.

The construction of a sidewalk shall connect to existing pedestrian infrastructure or the nearest intersecting street.

The sidewalk shall not terminate mid-block, and all curb ramps shall direct pedestrians to other existing publicly owned pedestrian infrastructure. Termination and or the direction of pedestrians to private driveways or to crossings without a receiving curb ramp shall not be permitted.

The sidewalk shall conform in details and dimensions to the current City and OPSDs and shall be installed at locations as shown on the typical road cross sections. The width of sidewalks for streets is 1.50 m along Local Road and, where feasible, 2.0 m along Collectors and Arterials Roads

The sidewalks shall be increased in thickness at all driveway locations as shown on the OPSD 310.010. In cases where the sidewalk has been constructed prior to the establishment of an entrance to other than a residential dwelling then the existing sidewalk shall be removed and shall be replaced with a thickened sidewalk section (min. 200 mm) in accordance with OPSD 310.010.

City of Orillia

Engineering Design Criteria: Transportation

At street intersections the curb and the sidewalk shall be depressed to meet the roadway elevation as shown on OPSD 310.030.

When a sidewalk is constructed adjacent to a curb and gutter a keyway shall be provided along the back of the curb to support the sidewalk, all in accordance with the details shown on OPSD 310.020.

The City requires all concrete sidewalks to be constructed as indicated on the approved Engineering Drawings.

For new subdivisions, the sidewalks shall be constructed as per engineering drawings prior to the release of the first conditional or unconditional Occupancy Certificate in accordance with the City's Subdivision Agreement, and in any event no later than one year after the completion of base course asphalt.

5.15.1.1 Location

Sidewalks shall be constructed at locations as shown on the City's Road Cross-Section Standards. Where there are no other determining factors dictating location, sidewalks shall generally be placed on north and east sides of the street. Streetlight poles, when not staggered, should be located on the same side as the sidewalk. Local roads shall have, as a minimum, a sidewalk constructed on one side of the right-of-way and Arterial/Collector Roads shall have sidewalk on both sides.

5.15.1.2 Specification

Sidewalks shall be constructed according to OPSD 310.010, 310.020, 310.030, 350.010, 351.010 and OPSS MUNI 351. Concrete sidewalks shall be placed on a minimum 150 mm compacted granular A base.

5.15.2 Trails

The Developer may be required to design and construct a local trail systems or pathways and linkages to existing trail systems. Trails shall be required as identified in the City's Official Plan Schedule G Pathways will be required adjacent to parkland, in general. Walkway easements adjoining parallel roads or acting as service access shall be fenced, gated, signed and landscaped in accordance to City standards. The provision of new trails shall support a City-wide trails network.

The City's trails network will comply with Official Plan 4.3 Trails and shall generally be comprised of the following:

- Multi-use e trails, 3.0 m width (hard surface, multiple user)
- Snowmobile trails –will be a minimum of 4.0 metres wide and separate from pedestrian sidewalks and/or pathways. Snowmobile trails will be located outside the right of way of Provincial Highways, except as approved by the Ministry of Transportation.
- Road-based cycle routes may be located within the right-of-way of the municipal street system, but where possible, will be separated from the asphalt by a landscaped buffer.

Proposed trails should link together local points of interest, all open space amenities, and civic institutions and connect to the regional trails network. To the extent possible the route should

City of Orillia

Engineering Design Criteria: Transportation

utilize public open spaces, unopened right-of-ways, blocks and easements away from roadways. In the event trails are located along roadways additional right-of-way width may be required by the City.

Trails connecting through urban areas located within the road right-of-way should be paved multi- purpose cycle ways.

Trails through sensitive natural features should be designed as soft surface paths and located to avoid fragile areas.

Entrance points to the trail system should be marked with signage coordinated with the City.

- The minimum standard for the multi-use urban trail shall be:
- 3.0 m width of 60 mm asphalt
- Centreline painted white, directional arrows painted at 100m intervals, stop bars at all road crossings.
- 200 mm compacted granular base

5.16 Parking

On street parking stalls design shall be in accordance with OTM Book 11 and Transportation Association of Canada Guidelines. Refer to the City's Zoning By-law for private parking standards.

5.17 Cycling Facilities

Cycling facilities shall be designed in accordance with the City of Orillia Multi-Modal Transportation Master Plan (MTMP), as well as to the latest edition OTM Book 18 and TAC Bikeway Traffic Control Guidelines.

When practical, cycling infrastructure should be included in all new collector and arterial roads, as well as in any existing roads that are being redesigned or repaved, unless otherwise approved by the City.

Refer to the Typical Cross Sections included in this City manual for further guidance on location. Signage and pavement markings are to be incorporated in accordance with OTM Book 18 and TAC Bikeway Traffic Control Guidelines for Canada, latest edition.

5.18 Utilities

5.18.1 General Requirements

The appropriate utility company or their approved contractor shall install the services for Bell, Hydro, Gas, and Communications. The Developer must bear the cost of any surcharges for underground installation made and must grant any necessary easements for their services.

Utility crossings for new roads shall be placed prior to placement of granular road base material. Utility crossings for existing roads shall have the asphalt surface saw cut and removed for a width of the trench plus a minimum of 0.5 metres out from each side of the trench walls.

Compaction of backfill for utility trenches shall be 95% Standard Proctor Dry Density.

City of Orillia

Engineering Design Criteria: Transportation

5.18.2 Electrical Design Requirements

Electrical distribution systems shall generally be designed as buried systems. All requirements for the design of the electrical distribution and street lighting system shall be agreed upon with Hydro One.

5.18.3 Electrical Services Plan

It is the Developer's responsibility to make direct arrangements with Hydro One to design and construct the primary and secondary electrical distribution system, together with all necessary plans.

The Developer is responsible to engage a qualified electrical consultant to design the streetlight electrical distribution system and submit plans to the City for approval by the City. The Developer is responsible to arrange and perform the installation of the streetlight system in accordance with Hydro One requirements.

Where Site Plan proposals abut County or Provincial roads, lighting level plans with supporting computer printouts shall be submitted to the respective road authorities for their approval, if required.