TABLE OF CONTENTS
SECTION 2: ROADWAYS

2.1 GENERAL

This section specifies the requirements for designing, constructing and restoring roadways and driveways within the Town of Innisfil. Amendments to the Ontario Provincial Standards are contained within these standards and should be read carefully to ensure compliance during construction.

2.2 DESIGN

2.2.1 Classification

All roadways shall be classified in accordance with the Town's Official Plan and the classification of each roadway shall be confirmed with the Town prior to the commencement of engineering design.

All roadways are to be designed to urban standards unless specific approval is received from the Town. For land development projects, new roadways designed to rural standards may only be considered for estate residential or industrial developments and must be approved by the Town before the detailed design stage.

Rights-of-way shall be a minimum of 20 m for window streets and local streets, 26 m for minor and major collectors, and 30 m for arterial roadways. The Town recognizes that these standards may not coincide with the minimum right of way information contained within the Official Plan; however, these standards shall take precedence.

Where a development adjoins or incorporates an existing County Road or Town arterial roadway as per the Town's Official Plan, the Developer shall deed to the County or the Town the required widening, which may be in excess of 20 m.

2.2.2 Pavement Design

The minimum pavement structure for the various road classifications is provided in the table below:

Table 1A – Minimum Pavement Structure – Layer Thickness

Layer	Roadway Classification				
	Local	Minor Collector	Major Collector	Arterial	Industrial
Surface Course	40 mm	40 mm	40 mm	40 mm	40 mm
Upper Binder Course	-	-	50 mm	50 mm	50 mm
Lower Binder Course	60 mm	60 mm	50 mm	60 mm	60 mm
Granular Base Course	150 mm	150 mm	150 mm	150 mm	150 mm
Granular Subbase Course	400 mm	400 mm	450 mm	450 mm	500 mm

Table 1B – Minimum Pavement Structure – Layer Materials

Layer	Roadway Classification				
	Local	Minor Collector	Major Collector	Arterial	Industrial
Traffic Category (OPSS.MUNI 1151)	B or C	B or C	C or D	D	D
Surface Course	SP 9.5 or SP 12.5	SP 9.5 or SP 12.5	SP 12.5 or FC1	SP 12.5 FC1 or FC2	SP 12.5 or FC1 or FC2
Upper Binder Course	-	-	SP 19.0	SP 19.0	SP 19.0
Lower Binder Course	SP 19.0	SP 19.0	SP 19.0	SP 19.0	SP 19.0
Granular Base Course	Granular 'A'	Granular 'A'	Granular 'A'	Granular 'A'	Granular 'A'
Granular Subbase Course	Granular 'B' Type 'II'	Granular 'B' Type 'II'	Granular 'B' Type 'II'	Granular 'B' Type 'II'	Granular 'B' Type 'II'

Notes:

1. SP 9.5 Cat. "C" mixes may be used as a surface course on Local and Minor Collector Roads when approved by the Town. An asphalt mix design shall be provided to the Town for review prior to accepting any changes.
2. Changes to the asphalt lift thickness may be considered on a site-specific basis. Lift thickness will be confirmed based on the asphalt mix gradation and nominal maximum aggregate size (NMAS). Where thicker lifts are required, the Contractor may request to substitute a SP 19.0 mix for a SP 25.0.
3. Granular materials must conform to OPSS.MUNI 1010 and the Town of Innisfil Engineering Design Standards and Specifications Section 2.5.1.

Tables 1A & 1B identify the minimum pavement structures. However, the Town will require the geotechnical engineer to recommend the depth of granular base, and type and thickness of asphalt based on site conditions for each project.

The pavement structures identified above are a minimum and the actual pavement structure may need to increase as a result of the following:

- Local conditions such as soil type or water table;
- Anticipated traffic loading;
- To ensure that there will be no half load restrictions on collector, arterial, or industrial roadways; and
- Any other requirements identified in the geotechnical report.

The Town will consider, on a case-by-case basis, the use of geogrid products as a component of a pavement design strategy. Geogrid products shall be a minimum of a biaxial grid. All recommendations must be made and sealed by the geotechnical consultant with supporting design documentation provided to the Town. Alternatives to a specified design using a geogrid product will not be approved based on properties alone. Proposed design alternatives shall be sealed by a geotechnical professional with supporting design documentation provided

to the Town. Geogrid shall not be used as an attempt to remediate weak subgrade as a result of poor construction practices, including but not limited to, improper compaction procedures.

2.2.3 Geometric Elements

The following geometric standards shall be applied:

TABLE 3 - Geometric Standards for Road Design

ROAD CLASS (CROSS-SECTION)	ROW WIDTH (m)	MAXIMUM POSTED SPEED (km/h)	PAVEMENT WIDTH (m)	MIN./MAX. GRADE (gutter) (%)	MIN. HORIZONTAL C/L CURVATURE (m)	VERTICAL CURVATURE MIN. 'K' VALUE		MIN. TANGENT BETWEEN HORIZONTAL CURVES (m)
						Crest	Sag	
Arterial (Urban)	30	80	14.0	0.5/5	340	50	30	120
Collector (Major – Urban)	26	70	14.0	0.5/6	190	25	25	80
Collector (Minor – Urban)	26	60	12.0	0.5/6	190	15	8	80
Industrial (Urban)	26	50	10.0	0.5/6	40 (See Note 1)	15	12	50
Industrial (Rural)	26	50	8.0	0.5/6	40 (See Note 1)	8	12	50
Local (Urban)	20	50	8.5	0.5/7	20	8	6	50
Local (Rural)	20	50	7.0	0.5/5	30	8	12	50
Local (Rural)	18	40	8.0	0.5/5	30	8	12	50

Notes:

1. Shall provide pavement widening on horizontal curves as per *Geometric Design Standards for Ontario Highways.*
2. On rural roads, the cross-section will change to urban where centreline grades are equal to or greater than 5%.
3. "Sawtoothing" of a roadway is not acceptable and will require approval by the Town on a case-by-case basis.
4. K values less than those listed above may be considered for stop approaches with artificial lighting.
5. Minimum gutter grade along curved portion of the road shall be 0.7% where the road bend exceeds 45 degrees.
6. At 90 degrees bends, angled bends and road widening may be required on a case-by-case basis as directed by the Town.

2.2.4 Vertical Curves

For local streets, all changes in grade of 2% or more shall be accommodated through the use of a vertical curve.

For all other road classifications, a change in grade of 1% or more shall be accommodated through the use of a vertical curve.

2.2.5 Crossfall

Finished roadways shall have a minimum crossfall of 2%.

2.2.6 Curb Radii and Daylighting Requirements

The curb return radii, measured from edge of pavement, and daylighting requirements at intersections shall be in accordance with the table below:

TABLE 4 - Minimum Curb Radii and Daylighting Requirements

ROAD CLASS	INTERSECTING ROAD CLASS	MIN. CURB RADII (m)	DAYLIGHTING (m)
Local	Local	9	3
	Collector (Minor & Major)	9	5
	Arterial	9	10
Collector (Minor & Major)	Local	9	5
	Collector (Minor & Major)	12	10
	Arterial	15	10
Arterial	Local	9	10
	Collector (Minor & Major)	15	10
	Arterial	(See Below)[1]	15
Industrial	Any Other Class	18	15
Site Plan	-	9	N/A[2]

1.0 A compound curve shall be provided in accordance with TAC Geometric Design Guide for Canadian Roads and MTO Design Supplement to accommodate a Wb-15 vehicle.

1. Daylighting is not required for site plan developments.

2.2.7 Cul-de-Sacs

Where cul-de-sacs are used, a minimum radius of 20.75 m at the property line and 15.0 m at the edge of pavement shall be applied.

Cul-de-sacs are to be provided at all dead ends, where there is no proposed connection to an existing street.

2.2.8 Community Mailboxes

Provisions shall be included in the design for community mailboxes. While the final locations are subject to approval by the Town and Canada Post, the designer must propose locations that are conducive to the pedestrian and vehicular movements anticipated in the area. As a result, placement on collector or arterial roads should be avoided. Further, mailboxes are to be located a minimum of 30.0 m from the edge of the road allowance at any intersection, preferably on a lot line and giving consideration to other aboveground features such as streetlights, fire

hydrants, transformers, etc. Community mailboxes must have direct sidewalk access and are to face the sidewalk (if present). In rural areas, where sidewalk is not present, access is to be provided from the roadway. All Mailboxes must conform to Canada Post's Standard Drawings and Specifications (Aug. 2014 or latest version).

2.2.9 Transitions

Where a new street is to connect to an existing street, whether the design includes an extension of the existing street or connects at an intersection, the design shall extend along all existing streets for a sufficient length to provide a satisfactory transition. In the case of an intersection, the distance must be equal to the greater of the required stopping sight distance or the turning lane development lengths, if applicable, for all legs of the intersection.

2.2.10 Curb and Gutter

For local streets, standard barrier curb as per OPSD 600.040 (single stage) or 600.070 (two-stage) is permitted. Semi-mountable curb as per OPSD 600.060 may be used provided full barrier curb is not required to convey stormwater within the road allowance. Curb cuts in residential areas shall be in accordance with OPSD 351.010.

For collectors, arterials, and industrial streets, standard barrier curb as per OPSD 600.040 (single stage) or 600.070 (two-stage) is required. Curb cuts in residential areas shall be in accordance with OPSD 351.010.

Concrete curb and gutter shall be in accordance with OPSS.MUNI 353, with the exception that all concrete shall be supplied in accordance with the "Performance Specification Alternative" of OPSS.MUNI 1350 and shall meet the requirements of CSA A23.1, Exposure Class C-2, with a minimum compressive strength of 32 MPa at 28 days.

Curb ramps shall be provided at all sidewalk intersections with curb line. The transition from curb ramp to full curb shall be carried out over a length of 0.6 m and the dropped curb shall extend 0.3 m beyond the width of the sidewalk. If the resulting full curb between two sections of dropped curb for a sidewalk will result in a full curb section less than 1.0 m in length, the dropped curb shall be continuous, and the sidewalk panel widened to be continuous along the curb line.

All curb ramps shall include tactile walking surface indicator plates (truncated dome type) which conform to the most recent versions of OPSS 351 and OPSD 310.039. Tactile walking surface indicators shall be set to final elevation according to the manufacturer's instructions. The lip between the concrete sidewalk surface and the tactile walking surface indicator plate shall not exceed 3.0 mm at any point.

Curb and sidewalk shall be extended across commercial and industrial entrances unless the entrance is signalized or is aligned with a municipal street on the opposite side of the street. Curb cuts in commercial and industrial areas shall be in accordance with OPSD 350.010.

Concrete deficiencies and surface defects including, but not limited to, scaling, mortar flaking, aggregate popouts, cracking, and heaving shall be removed and replaced at no cost to the Town.

2.2.11 Sidewalks

The requirements for a 1.5m wide concrete sidewalk shall be confirmed with the Town prior to commencing the roadway design. Sidewalks shall be constructed in the locations shown on the typical road cross-sections.

All sidewalks are to be constructed in a manner that provides maximum assistance to individuals with limited mobility and without creating hazards to individuals who are visually impaired. A maximum sidewalk grade of 7% and a maximum crossfall of 4% will be permitted. However, the designer should strive to limit the grade to no more than 5% and the crossfall to 2%, where possible.

Sidewalk construction shall be in accordance with OPSD 310.010.

Sidewalk contraction joints shall be sawcut, not formed. Contraction joints must be equally spaced at maximum 2.0 m intervals. Expansion joints to be constructed in accordance with OPSS 351 and spaced at maximum 12.0 m intervals, unless otherwise approved by the Town.

All sidewalks are to be constructed on a properly compacted foundation of a minimum of 150mm of Granular 'A' or approved equivalent compacted to a minimum of 98% Standard Proctor Density.

All sidewalks must have a minimum offset of 1.0m from edge of sidewalk to the side slope of the roadside ditch.

Concrete sidewalk shall be in accordance with OPSS 351, with the exception that all concrete shall be supplied in accordance with the "Performance Specification Alternative" of OPSS.MUNI 1350 and shall meet the requirements of CSA A23.1, Exposure Class C-2, with a minimum compressive strength of 32 MPa at twenty-eight (28) days.

Concrete sidewalk ramps shall be installed as per OPSD 310.030, 310.031, or 310.033, where applicable and OPSD 310.039 regarding tactile walking surfaces.

At the intersection of two sidewalks or where the sidewalk turns 90° to intersect the curb line, 1.0 m chamfering shall be provided.

Where sidewalk is provided adjacent to the curb and gutter, the sidewalk width is to be increased to 1.8 m.

At the discretion of the Town, wider sidewalks (1.8 m or greater) may also be requested to accommodate large pedestrian volumes or shopping carts, etc.

Concrete deficiencies and surface defects including, but not limited to, scaling, mortar flaking, aggregate popouts, cracking, and heaving shall be removed and replaced at no cost to the Town.

2.2.12 Grading within Right-of-Way

The boulevard area from the curb to the property line shall be graded to provide positive drainage toward the roadway at a minimum of 2% and a maximum of 8%.

For roads having a rural design cross-section (i.e. estate residential or industrial), the area between the edge of the road shoulder and the street line shall be graded and the ditches cut with slopes of 3.0 m horizontal to 1.0 m vertical from the edge of the shoulder to the bottom of the ditch and from the bottom of the ditch to the original ground. In fill areas over 1.5 m measured vertically from the edge of shoulder to the toe of slope, the fill slope shall not be steeper than 2:1. The ditch shall be located at the toe of the fill slope.

The height of sod located between the back of curb and the "forward" edge of the sidewalk should be installed at an elevation equal to or slightly less than the sidewalk surface.

In areas where erosion control is required, aesthetically pleasing options such as reinforced sod are to be used rather than rip-rap, where possible.

2.2.13 Road Crossing and Entrance Culverts

The minimum sizes for entrance and road crossing culverts are 400 mm and 500 mm, respectively.

The conveyance capacity of the culvert must be sufficient to ensure that the maximum depth of ponding as indicated in Section 4.6, Table 7 is not exceeded.

Where the conveyance capacity of the minimum size culvert is not sufficient, a larger diameter culvert is to be sized using the cross-sectional end area calculated by the rational design method. Detail drawings and calculations shall be submitted for approval by the Town.

The minimum length of culvert shall be that which is required to extend from centre of ditch to centre of ditch with matching slopes not exceeding 3:1.

The minimum length of entrance culverts shall depend on the width of the entrance but shall extend no less than 1.5m on either side of the entrance.

Headwalls or end treatments will only be permitted where a 3:1 slope cannot be achieved. Because the use of headwalls or end treatments will only be permitted in exceptional circumstances, their design must be approved by the Town on a case by case basis.

The minimum depth of cover for all culverts is 300 mm unless otherwise indicated by the Town.

Culverts shall be constructed with granular bedding and backfill in accordance with OPSD 802.014 or 802.034.

Refer to Appendix B for a list of approved materials.

2.2.14 Driveway and Entrance Design

2.2.14.1 Grades

The maximum grade for driveways and entrances shall be 7% except in site-specific cases that receive written approval from the Town. This maximum grade is not recommended and should be employed only in exceptional cases where conditions prohibit the use of lesser grades. The minimum grade permitted is 2%. Maximum grade change shall be 4% at curb or sidewalk and 1% per 2.0 m average.

2.2.14.2 Location

Urban

All residential driveways shall be located in accordance with the setbacks as identified in the Zoning By-law and the offsets as identified in Appendix C – Minimum Offset Matrix.

On corner residential lots, the edge of the driveway is to be a minimum of 4.5 m from the end of the daylight triangle.

Non-residential entrances shall not be located within 15.0 m of any intersection and any ramps shall have a minimum level stopping distance of 6.0 m provided between the ramp and the street.

Rural

On rural roadways, the end of the driveway culvert shall not be closer than 1.5 m from the extension of the side yard property line.

The same conditions apply for rural non-residential entrances as those listed for urban non-residential above.

For both urban and rural situations where frontage or other limitations interfere with standard locations, site-specific solutions shall be provided for review and approval by the Town.

2.2.14.3 Driveway Pairing

Pairing of driveways is required for all residential lots with a frontage of less than 14.0 m and where the road grade does not exceed 2.5%.

2.2.14.4 Existing Road Classification and Access Point

The entrance from a new development must align with the road classification of the existing public roadway to which it connects. If the driveway links to an existing local roadway, it shall be designed with local roadway standards.

A single entrance shall be provided for new site plan developments, unless otherwise directed by the Town. The entrance location shall be coordinated with Town staff and supported by a traffic analysis completed by the consultant.

2.2.14.5 Driveway Width

For a residential driveway, the minimum width is 3.0 m and the maximum width shall be equal to 60% of the lot frontage to a maximum of 9.0 m between the street line and the curb line.

For a non-residential and high-density residential, two-way entrance, the minimum width is 7.0 m measured at street line. Site-specific zoning regulations apply.

Water service/curb stops are to be a minimum of 1.0 m from the edge of the driveway.

2.2.14.6 Radius

For non-residential entrances and high-density residential, the minimum curb radius is 9.0 m, but may need to be greater to accommodate truck traffic and emergency service vehicles. The end of the curb radius at street line should not extend beyond property line.

2.2.14.7 Driveway Edging

For residential driveways, raised edging using concrete curbing or other materials along the sides of the driveway is not permitted within the Town road allowance, but may be constructed on private property.

2.2.14.8 Medians/Islands

The use of medians or islands at intersections and entrances for signalization, entrance/exit control, or aesthetics will be considered by the Town on a case by case basis.

2.2.14.9 Driveways and Parking Areas

For residential driveways, between the back of curb and property line, the driveway entrance shall have a minimum of 150 mm of Granular 'A' and 50 mm HL3 surface asphalt or another hard surface as approved by the Town.

For non-residential entrances and commercial parking areas, the minimum pavement structure shall be 300 mm of Granular 'B', 150 mm of Granular 'A', 50 mm HL4, and 40 mm HL3. For fire routes, the minimum pavement structure shall be 400 mm of Granular 'B', 150 mm Granular 'A', 60 mm HL8 and 40 mm HL3.

A more stringent pavement structure may be required and must be confirmed by the Geotechnical Engineer.

2.2.15 Walkways

The Town has various types of walkways and different requirements for each. It is recommended that the requirements for walkways be discussed with the Town prior to commencing the engineering design. The following provides general requirements for three typical walkways.

Pedestrian Walkways and Park Maintenance Pathways

Where the walkway block is to serve only pedestrians or where it is to be used as an entrance to an Open Space Block or Park Area and may be used by maintenance equipment, the walkway is to be 3.0 m wide with a 1.5 m high chain link fence along each side of the walkway block. The walkway shall be concrete for the full 3.0 m width with no crown or reverse crown. In general, the sidewalk standards under Section 2.0 shall apply. No bollards or entrance gates will be required at street line. (See TOISD 404).

Walkway/Service Corridor

Where the walkway block also incorporates watermains, sanitary sewers, or storm sewers, it shall have a minimum width of:

- 9 metres for one sewer (sewer centered on the easement)
- 12 metres for dual sewer installation
- 6 metres for a watermain (watermain centered on the easement)
- 10 metres for one sewer with a watermain (3m easement limit to watermain, 2.5m clearance between watermain and sewer and 4.5m sewer to easement)
- 12 metres for dual sewer installation with a watermain

The above easement widths are minimum requirements and may be increased depending on the depth and size of the pipes within the easement and/or soil conditions, topography, or operational needs. The Town may consider a reduced easement width on a case-by-case basis, provided the applicant presents adequate justification for the reduction. Please see Section 5.13 for additional information.

A maximum of 2 ha of major flow drainage area can be conveyed through a walkway or service corridor. The corridor shall have a 1.5m high chain link fence along each side. It shall include a 3.0m wide concrete walkway and landscape strips along each side.

The depth of the services beneath the walkway is to be approved by the Town. If excavation for maintenance would impact on the footings of adjacent homes or buildings, then an easement is to be provided adjacent to the walkway or the footings of those buildings is to be extended or a combination of the two (2) measures. This impact will be assessed by a qualified geotechnical engineer and the proposed solution described in the "Geotechnical Report".

The spacing of the trunk services shall also be considered and, if necessary, the walkway block is to be widened to accommodate all services. The horizontal separation of services is to meet the recommendations of the MECP and the centreline of the service must not be closer than 1.5 m from the limit of the walkway block. (See TOISD 401).

SWM Pond Maintenance Access/Walkway

Where the walkway is intended to be used by pedestrians but the main objective is for maintenance access to SWM pond features such as sediment forebays, spillways, or outlet structures, the access/walkway from the street into the facility is to be 8.0 m wide, including a 4.0 m wide asphalt surface equivalent to that of a local street, including granular base, or other hard surface as approved by the Town, and a 2.0 m wide landscaped strip will be provided along each side. Once inside the facility, the access/walkway width is to remain at 4.0 m and a 3.0 m buffer strip is to be provided between the access/walkway and private property. (See TOISD 401). For industrial developments, the Town may consider an alternative pavement structure for the SWM Pond maintenance access route.

A pedestrian access gate shall be provided at street line, with a minimum clearance as noted in the detail drawing.

The minimum and maximum grades permitted for maintenance access/walkways are 0.5% and 3.0%, respectively except the portion of the access/walkway in a SWM Facility that extends down into the forebay. A maximum grade of 10% can be used for this purpose.

2.2.16 Multi-Use Trails

Multi Use trails shall be created as identified in the Town's Trails Master Plan. Location and width of the trails must be discussed with the Town during pre-consultation stage. Trail signage to include TOISD 815, Rb-71 and Rb-73.

2.2.17 Fencing

Standard 1.5 m galvanized chain link fence with top rail shall be placed along all walkways, steep slopes, adjacent to commercial properties, between stormwater management facilities and private property, and elsewhere as required by the Town. Fencing of 1.2m height will be considered on a case-by-case basis.

Standard 1.8 m galvanized chain link fence with top rail shall be placed adjacent to institutional properties, open spaces, and in parks. The mesh shall be placed facing Town property.

The Town will require that a 1.8 m high wood privacy fence be installed between development property/lots and existing residential properties, between residential and agricultural, between residential and commercial properties, between residential and institutional properties, or between commercial and institutional properties. Where the residential lot is fronting on travelled road the wood fences must terminate at the front line of the house, and if fencing is required, continue to the front property line as a chain link fence (maximum height of 1.2m) so that it does not impact the visibility of the front yard to drivers.

Gates for access from private property to municipal or EA property are not permitted to be installed in any fence. Further, no gates shall be permitted in an acoustical fence, unless written approval is received from the Town.

The requirement for, location, and extent of acoustical fence shall be defined in the noise and vibration study and must be accepted by the Town. The maximum height of an acoustical fence shall be 2.15m. Structural drawings, along with all relevant load calculations, must be prepared and stamped by a licensed professional engineer.

If the noise and vibration study concludes that additional height must be added to the acoustical fence to achieve the required noise levels, this must be accomplished by installing the fence atop a berm. Requests for fence heights exceeding 2.15m and alternatives to the use of a berm will be evaluated on a case-by-case basis, and must be supported by adequate technical justification from the applicant.

Acoustical fences that are maintained, repaired, and replaced by the Town shall require a minimum 2.0m easement for the Town's access.

Where an open space block, park, or stormwater management facility is adjacent to a municipal road allowance, a fence will not be required unless necessary as part of a park development plan or as a result of slopes in excess of 3H:1V.

Generally, fences are to be placed at a 0.15 m offset from the common property line on the development property side, unless otherwise specified on TOISD411 and/or approved by the Town.

Refer to TOISD 401 to TOISD 411 for fencing and gate details.

In rural areas, and only where written approval is received from the Town, the installation of highway fence (farm fence) as per OPSD 971.101 and OPSS.MUNI 771 may be permitted.

2.2.18 Signs and Pavement Markings

2.2.18.1 Street Name Signs

Double unit street name signs of an approved design, green in colour (high intensity Scotchlite grade) with high intensity white Highway Gothic lettering, shall be erected on 3.6 m (1.2 m lower channel and 2.4 m upper channel), double-slide, "U-Channel" galvanized steel posts, embedded 0.9 m in the ground. Street name signs are not to be mounted on

stop sign posts, but may be strapped to streetlight poles using aluminum brackets if the poles are properly positioned and upon receiving written approval from the Town.

Street name signs installed on posts must be installed using a breakaway system.

Street name signs are to include “911” emergency address ranges, as provided by the Town.

2.2.18.2 Traffic Signs

Signs of the standard type approved by the Ontario Ministry of Transportation Ontario Traffic Manual shall be mounted on 3.6 m (1.2 m lower channel and 2.4 m upper channel), double-slide, and “U-Channel” galvanized steel posts, embedded 0.9 m in the ground. All signage must be installed using a breakaway system. The signs shall be located as required by the Town after a By-law is passed for their installation.

2.2.18.3 Pavement Markings

Upon completion of the final asphalt and upon notification by the Town, pavement markings shall be painted conforming with the Standards of the Ontario Ministry of Transportation, Ontario Traffic Manual Book 11 (Pavement, Hazard and Delineation Markings) at all intersections, school crossings, walkways, bike lanes and railway crossings to clearly indicate the proper traffic zones, lanes and stop lines.

Durable pavement markings complete with glass beads are to be utilized unless otherwise stated in the Contract Documents. Pavement markings applied to new asphalt may require two applications. The second application shall not be applied until the first is tack free. Pavement markings are to conform to OPSS 710 and OPSS 1712 to 1715, inclusive.

All pavement marking removal required to prepare the area for final pavement marking shall be done by abrasion, unless otherwise stated in the Contract Documents.

Local streets do not require centreline pavement marking, but stop bars are required with a minimum of 15.0 m of centreline marking.

2.2.19 Public Transit

The designer shall confirm with the Town if there will be any requirements for the provision of public transit facilities within the development prior to the commencement of the engineering design.

At a minimum, arterial and collector roads are to be designed to accommodate the potential installation of 9.0 m long concrete bus stop waiting pads between the sidewalks and curb. These bus stop areas are to be provided on both sides of the street, with a maximum spacing and distance from intersections as provided by the Town.

2.2.20 Bicycle Lanes

The requirements for bicycle lanes are to be discussed at the planning stage and within the Traffic Impact Study.

At a minimum, on any street where the average daily traffic volumes in one direction of travel exceed 5,000 vehicles, bicycle lanes must be provided. This can be accomplished by providing an exclusive 1.5 m wide bicycle lane on both sides of the street or by providing a minimum 3.0

m multi-use trail on one side of the street. All bicycle infrastructure whether on the road or off the road shall be in accordance with *Ontario Traffic Manual* Book 18.

For major collector or arterial streets with average daily traffic volumes less than 5,000 vehicles in one direction, the Town may still require the provision of bicycle lanes in accordance with the overall Transportation Master Plan and Trails Master Plan.

Dedicated bicycle lanes are generally not required on local streets unless noted in the Transportation Master Plan and Trails Master Plan.

The design for the bicycle lanes shall be in accordance with the Transportation Association of Canada (TAC) *Urban Supplement to the Geometric Design Guide for Canadian Roads*.

The designer shall confirm with the Town if there will be any requirements for the provision of bicycle lanes prior to the commencement of the engineering design.

2.2.21 Other Site Plan Considerations

2.2.21.1 Parking Design

When designing the layout of parking lots, the designer shall consider the turning requirements for delivery vehicles and emergency vehicle access. They should also take into account queue development at the entrance, pedestrian flow through the parking area, and dropped curb with ramps at convenient locations for wheelchair accessibility.

The designer shall meet the parking requirements identified in the Town Zoning By-law as well as setbacks from property line.

2.2.21.2 Grading

The grading of parking areas should not be less than 1.0% and not more than 5.0% . Grades perpendicular to parked vehicles should not exceed 4%. The grading shall provide for an overland flow route to an adequate drainage outlet without exceeding a ponding depth of 0.3 m anywhere on the parking lot.

The minimum pavement structure for parking lots shall be in accordance with Section 2.2.4.11.8.

2.2.21.3 Parking Spaces and Laneways

The standard parking space dimension, perpendicular to the direction of traffic, shall be 6.0 m long by 2.75 m wide. Laneways between rows of parking shall be 6.0 m wide for two-way traffic and 4.0m wide for one-way traffic, subject to any approved changes to the Town's Zoning By-law. The 6.0 m parking stall length can be reduced to 5.7 m if there is suitable overhang at the curb line. The parallel parking stalls shall be a minimum of 7.0 m long and 2.75 m wide (excluding the width of the gutter).

Internal private condominium roadways shall have a minimum width of 6.0 m edge of asphalt to edge of asphalt.

Barrier-free parking spaces are to be provided at a ratio of 1:30. Where the application of this ratio results in a fraction of a parking space, the required number of spaces shall be increased to the next whole number. Each space is to be 3.0 m wide with a 1.5 m access

aisle. All barrier-free parking spaces are to be signed with the accessible parking symbol painted on the asphalt of each space and with the By-Law sign posted in front of each space.

All access ramps to sidewalks shall be located so that they are in line with the access aisle and not obstructed by any parking space.

Parking spaces are to be delineated with 0.1 m wide yellow paint lines.

2.2.21.4 Layout

The parking lot layout shall provide an area for snow storage that does not impact accessible parking; does not reduce the total parking spaces by more than 5%; and has consideration for the features of the landscaping plan.

Where monolithic curb and sidewalk is used in a parking area, the minimum width of the sidewalk is to be increased to 1.8 m if a car bumper may overhang the curb.

2.2.21.5 Security and Lighting

Parking areas are to be located in highly visible areas of the site. For illumination of parking spaces, aisles, and driveways, the lighting shall be arranged to divert the light away from adjacent properties and streets and shall be downcast. See Section 3.3.2.2 for additional design criteria.

2.2.21.6 Fire Routes

A 6.0 m wide fire route, measured edge of asphalt to edge of asphalt, with a clear radii of 9.0 m (inside), 12.0 m (centreline), and 15.0 m (outside) must be provided and shall have a minimum pavement structure of 450 mm Granular ‘B’, 150 mm of Granular ‘A’, 80 mm of HL8, and 40 mm of HL3. The fire route is to be signed and no parking signs installed as required.

The fire route must also be designed to meet any and all requirements under the Ontario Building Code.
The Town's largest emergency vehicle must be able to safely perform ingress and egress maneuvers to and from the development site without any conflicts or obstructions
The fire route design is subject to approval by the Town and the Fire Department.

2.2.21.7 Landscaping

All landscape plans shall be prepared by an accredited professional Landscape Architect in good standing with the Ontario Association of Landscape Architects (OALA). The Landscape Architect shall coordinate and liaise with all other consulting professionals to ensure accurate representation of the site and the proposed development.

Existing vegetation should be incorporated where grading, drainage, and species allow for continued health of the vegetation. Existing vegetation which provides screening between residential areas and commercial/industrial/institutional and collector/arterial roads should be prioritized for retention. All healthy perimeter trees, defined as those immediately on the shared property boundary or on adjacent property with a canopy overhanging the property boundary, must be protected, unless written approval is provided by adjacent landowners for removal or unless it is deemed to be a road safety issue by the Town.

Landscaping shall be provided for the control of noise, wind, erosion, glare, and aesthetics. Natural features such as trees should be preserved and incorporated as much as possible into the design.

Refer to Section 8.0 for additional information.

2.2.22 Roadway Surface Maintenance and Rehabilitation

For the surface maintenance and rehabilitation of rural roadways, and only where approved by the Town, single or double surface treatment as well as cold in-place recycling with expanded asphalt may be permitted.

Surface treatment is to be completed in accordance with OPSS.MUNI 304 and OPSS.MUNI 1103. Cold in-place recycling with expanded asphalt is to be completed in accordance with OPSS.MUNI 335. At the discretion of the Town, surficial cracking of an asphalt roadway may be temporarily sealed through traditional route and seal methods (OPSS MUNI 341). Other methods may be recommended by a Geotechnical Engineer.

Upon completion of the Town of Innisfil asphalt inspection, a course of remedial action may be provided which may include, but not limited to, the utilization of asphalt reinforcement geosynthetics for pavements.

Crossings made on an existing roadway should be reinstated with fill materials approved by a geotechnical engineer, or unshrinkable fill up to sub-grade followed by the existing adjacent pavement structure. Where the existing pavement structure cannot be mimicked, or where unshrinkable fill extends into the frost penetration zone, frost tapers should be incorporated. Frost tapers should be a minimum of 10H: 1V in the direction of the roadway (parallel to road centerline). The existing asphalt should be milled to allow the new asphalt to be lapped at least 0.3 m with a tack coat.

2.3 SCHEDULING OF WORK

The contractor shall provide the Town with a detailed work schedule prior to the start of construction. The schedule should include all major project tasks, start date & task duration, and updates should be provided to the Town regularly, and during any significant scheduling changes. The schedule should also reference any project restrictions including; but not limited to, Reduced Load Periods, the limitations of the Town's Noise By-law, including no weekend work (unless a Saturday Noise Exemption Permit has been obtained), preventing unnecessary disruption to public traffic, deadlines for temperature sensitive work such as hot mix asphalt paving and concrete placement, etc.

The contractor shall schedule temporary restoration of the roadway to follow closely behind trench backfilling. Unless otherwise noted, permanent restoration may be delayed until all trenching has been completed.

All work should be scheduled in a way that excavations are not left open when adjacent to, or on an open lane of traffic at night, or when work is inactive.

The Contractor shall notify the Town within 48 hours prior to the start of construction, placing granular material, concrete, or hot mix asphalt.

2.4 MAINTENANCE

The contractor is responsible for maintenance of all Services in order to ensure the safety of vehicle traffic and pedestrians during construction, as well as during the maintenance period outlined in the contract.

In this section a Service is defined as; roads, curbs, gutters, sidewalks, buried infrastructure, drainage works, lighting, landscaping, erosion and sediment control measures, and any other works outlined in the project contract or plans and specifications.

Maintaining Services includes but is not limited to the following;

- Rectify, replace, or repair any Service not constructed in accordance with the approved plans and specifications.
- Maintain roads in a mud and dust free condition and free of debris and obstructions.
- Ramp all maintenance holes and catch basins with hot mix asphalt as required.
- Maintain adequate and safe traffic control measures to ensure the safety of workers, vehicles and pedestrians.

2.5 MATERIAL SPECIFICATIONS

2.5.1 Granular Material & Soils

The requirements of OPSS.MUNI 1010 shall apply for all granular material used to construct, restore, and maintain roadways and driveways except where amended herein.

The contractor shall provide to the Town the confirmed source of granular material or materials, a minimum of two weeks prior to construction. A sample of each material should be obtained and tested in order to confirm conformance with the contract and plans and specifications.

2.5.1.1 Granular A

OPSS.MUNI 1010.05.02 (amended) – The Contractor shall supply Granular A produced by:

a) Crushing quarried bedrock (100% crushed).
b) Crushing quarried bedrock (100% crushed) including Reclaimed Asphalt Pavement (RAP) up to 30% by mass.

The blending of RAP with granular material shall only occur with the use of cold feed bins or a procedure approved by the Town. Prior to using granular material with RAP, QC/QA samples shall be obtained to determine the amount of asphalt-coated particles using MTO Test Method LS-621.

Granular A produced from naturally deposited sand, gravel, and cobbles may be permitted subject to receiving written permission by the Town.

2.5.1.2 Granular B

OPSS.MUNI 1010.05.03 (amended) – The Contractor shall supply **Granular B Type II** produced by:

a) Crushing quarried bedrock (100% crushed).

Granular B Type I produced from naturally deposited sand, gravel, and cobbles, or quarried bedrock may be permitted subject to receiving written permission by the Town.

OPSS 1010 for Granular B Type I is amended as follows:

TABLE 5 - Amendment to OPSS.MUNI 1010

Sieve	Percent Passing by Mass
4.75 mm	20 – 90
1.18 mm	10 – 80
300 μm	2 – 55
150 μm	0 – 25

2.5.1.3 Recycled Materials

In some cases, the Town may permit the use of granular materials produced from Reclaimed Concrete Material (RCM). RCM may contain RAP up to a maximum of 30% by mass. Prior to using RCM, the contractor must receive written approval from the Town. Prior to using materials that contain RAP, QC/QA samples shall be obtained to determine the amount of asphalt-coated particles using MTO Test Method LS-621.

The Town does not permit granular products that contain glass or ceramic material.

Granular material shall not contain more than a combined total of 0.5% by mass of deleterious material. Deleterious materials include but are not limited to, wood, clay, brick, clay tile, gypsum, gypsum plaster, and wallboard.

2.5.1.4 Testing and Sampling

The contractor must provide the source of granular materials no later than two weeks prior to the start of construction. The contractor will be responsible for Quality Control (QC) testing unless otherwise noted in the contract documents. The Town may retain a Materials Testing & Inspection firm to conduct regular sampling and Quality Assurance (QA) testing on all materials from both the source, and project sites. Granular material shall be sampled and tested to confirm gradation, as well as the Maximum Dry Density, and Optimum Moisture Content at a minimum frequency of one sample for every 1,000 tonne of material placed, unless otherwise approved by the Town. Additional sampling and testing may be required due to changes to the supplier, or inconsistency of the imported material.

Sampling procedures shall be in accordance with the Ministry of Transportation Laboratory Testing Manual, Test Method LS-625 Guidelines for Sampling of Aggregate Materials.

Testing procedures should conform to the Ministry of Transportation Laboratory Testing Manual and / or the applicable CSA, ASTM, or AASHTO specifications.

2.5.2 Hot Mix Asphalt & Warm Mix Asphalt

The requirements of OPSS.MUNI 1150 and OPSS.MUNI 1151 shall apply to Hot Mix Asphalt (HMA) and Warm Mix Asphalt (WMA) materials used to construct, restore, and maintain roadways and driveways except where amended herein.

The contractor shall provide the Town with the confirmed source of hot mix asphalt materials a minimum of two weeks prior to construction. A sample of each material should be obtained and tested to confirm conformance with the contract, plans and specifications.

2.5.2.1 Asphalt Cement

Performance Graded Asphalt Cement (PGAC) shall be supplied from an MTO Designated Source for Materials supplier and meet the requirements of OPSS.MUNI 1101 as amended herein.

Asphalt cement shall meet the Performance Grade PGAC 58-34XJ for local and collector streets, as well as non-commercial driveways.

Asphalt cement shall meet the Performance Grade PGAC 64-34XJ for arterial and industrial roads, as well as commercial driveways.

Reference *Town of Innisfil Engineering Design Standards and Specifications Manual Appendix E: Asphalt Special Provisions* for detailed specifications regarding asphalt cement, sampling and testing.

2.5.2.2 Asphalt Aggregates

Asphalt aggregates shall conform to OPSS.MUNI 1001 and OPSS.MUNI 1003.

The use of steel slag or blast furnace slag in asphalt mixtures is not permitted.

2.5.2.3 Asphalt Mix Designs

Mix designs shall be completed in accordance with OPSS.MUNI 1150 and OPSS.MUNI 1151. Superpave mixes shall be used unless otherwise specified and/or approved by the Town. The Town may choose to perform an Independent Check of any submitted mix design in accordance with OPSS.MUNI 1151 and LS-316 or LS-318 (WMA), prior to approving the submitted mix design. At the discretion of the Town, a plant-produced trial batch of the proposed mix may be required prior to the approval of the submitted mix design.

Mix designs shall be submitted to the Town a minimum of two weeks prior to the start of paving. Unless otherwise stated in the contract documents, the mix design submission shall include, at a minimum, the following:

a) A letter from the project Geotechnical or Materials Engineer confirming that the proposed mix conforms to the Town specifications.
b) All documents listed in OPSS.MUNI 1150.04.02.03 and OPSS.MUNI 1151.04.05.
c) Laboratory testing results that confirm the physical and Superpave consensus properties of the aggregates are in conformance with OPSS.MUNI 1001 and OPSS.MUNI 1003, except as amended in this document.
d) Warm Mix Asphalt mix designs shall include additional documentation on the warm mix additives including the name and location of the supplier, PGAC test results confirming the materials will meet the Town's PGAC specifications, type and dosage of the warm mix additives, and any additional recommendations from the supplier on mixing and compacting the warm mix asphalt.

OPSS.MUNI 1150 is amended as follows:

TABLE 6 - Amendment to OPSS.MUNI 1150

Mix Type	Asphalt Cement Content (Min. %)	RAP (Max. %)
HL-1	5.2	15
HL-2	6.0	15
HL-3F	5.8	15
HL-3	5.3	15
HL-3HS	5.3	15
HL-4	5.3	20
HL-8	5.0	20
MDBC	5.0	20
HDBC	5.0	20

Note: Marshall mixes are only to be used when the Contractor receives written permission from the Town. Marshall mixes will generally be accepted in areas without regular traffic including but not limited to, driveways, walkways, maintenance roads, and parking lots.

OPSS.MUNI 1151 is amended as follows:

TABLE 7 - Amendment to OPSS.MUNI 1151

Mix Type	Asphalt Cement Content (Min. %)	RAP (Max. %)
SP 9.5	5.6	15 (Note 1)
SP 12.5, FC1, FC2	5.1	15
SP 19.0	4.9	20
SP 25.0	4.5	20

Note 1: SP 9.5 may contain up to a maximum of 20% RAP when used for HMA padding, or curb infill during two stage curb construction.

OPSS.MUNI 1151 is amended by the addition of the following:

The amount of Reclaimed Asphalt Pavement (RAP) allowed in a mix shall be calculated using the Binder Replacement Method as noted below:

$$\text{Binder Replacement, \%} = \frac{(\text{\% Asphalt Cement Content of RAP} \times \text{\% RAP by Mass in Mix})}{\text{\% Total Asphalt Cement Content of Mix}}$$

Unless otherwise stated in the Contract Documents, a maximum of 15% RAP is allowed in Surface Courses, and a maximum 20% RAP is allowed in Binder Courses, by Binder Replacement.

Processed RAP which is ready for use shall be tested in accordance with LS-282 or LS-292 to determine the average asphalt cement content and average gradation of the extracted aggregates.

The Contractor shall allow access to the Town or their representatives to monitor the production of asphalt mixtures. If requested by the Town, the Contractor shall supply copies of the asphalt mix production records that will identify the proportions of RAP added to the mix.

2.5.2.4 Asphalt QA/QC Testing

The requirements of OPSS.MUNI 310, OPSS.MUNI 1150, and OPSS.MUNI 1151 for Hot Mix Asphalt sampling and testing shall apply except where amended herein.

The contractor shall, upon request, allow the Town, contract administrator or their representatives to enter upon the premises of any of the material manufacturers, suppliers, plants, laboratories, or equipment for purposes pertaining to the work, to carry out such inspection, sampling and testing as specified or requested by the Town, contract administrator or their representatives.

Prior to the start of production of HMA, the QA Technician must sample each aggregate identified in the approved mix design, including RAP, to conduct Aggregate Density Testing. Additional samples shall be taken immediately after the completion of 10,000 tonnes of HMA. Voids in Mineral Aggregate (VMA) shall be calculated based on the combined Bulk Relative Density (Gsb) of the blended aggregates tested by the QA Laboratory, and the Bulk Relative Density (BRD) of the HMA samples obtained on site.

Frequency of HMA sampling shall be in accordance with OPSS.MUNI 310 Table 6.

Bulk samples of loose hot mix asphalt shall be obtained from the paving operation and divided utilizing an on-site splitting device such as a “Quartermaster” or similar product. The split samples shall meet the minimum mass requirements stated in OPSS 310.
Core samples shall be a minimum of 150mm in diameter. Coring shall only be completed when written permission is provided by the Town.

Any disturbed area due to sampling procedures must be repaired immediately after sampling. HMA and compaction requirements for filling sample holes shall be the same as the adjacent undisturbed pavement. Sample holes shall be clean and dry prior to filling and shall be compacted using a mechanical self-powered compactor.

Samples shall be tested by a Canadian Council of Independent Laboratories (CCIL) certified laboratory to confirm that the HMA conforms to the Town specifications;

a) For Marshall mixes, samples shall be used to determine compliance of asphalt cement content, aggregate gradation, air voids, flow, voids in mineral aggregate, and stability requirements.
b) For Superpave mixes, samples shall be used to determine compliance of asphalt cement content, aggregate gradation, and Superpave mix properties in accordance to AASHTO M323.

OPSS.MUNI 310 is amended as follows:

All Acceptable results will remain as Acceptable. Borderline results will be reviewed on a project specific basis, however in most cases will be considered Rejectable and warrant removal of the asphalt or a payment reduction as instructed in writing by the Town.

2.5.2.5 Track Coat

Tack coat materials shall meet the requirements of OPSS.MUNI 1103.

The Contractor shall provide safety data sheets (SDS) and additional documentation describing the type of emulsion, supplier, and applicator, to the Owner at least 5 business days prior to the first use of tack coat.

Tack coat shall be applied continuously and uniformly to the entire pavement width using a self-propelled or tow-along pressure distributer at the application rates specified in OPSS.MUNI 310. Tack coat shall be applied to concrete curb faces using a handheld pressure applicator acceptable to the Owner.

Acceptance of tack Coat shall be based on the following:

a) Visual Observation of Application
b) Laboratory Testing:
    i. Residue by Distillation (LS-216 and ASTM D6997)
    ii. Penetration of Bituminous Materials (LS-200 and ASTM D5)

2.5.3 Concrete

The requirements of OPSS.MUNI 1350 shall apply to ready mixed concrete materials used to construct, restore, and maintain any concrete object located within Town property or R.O.W. including but not limited to curb, sidewalk, and structures.

The contractor shall provide to the Town with the confirmed ready mixed concrete supplier a minimum of two weeks prior to construction.

Concrete suppliers shall provide a valid Certificate of Ready Mixed Concrete Production Facilities as issued by the Ready Mixed Concrete Association of Ontario (RMCAO).

The Town requires a minimum of 24 hours notice prior to placing concrete.

2.5.3.1 Concrete Mix Design

Mix designs shall be submitted to the Town a minimum of two weeks prior to concrete placement. The mix design submission shall include the following:

a) A valid Certificate of Ready Mixed Concrete Production Facilities as issued by the Ready Mixed Concrete Association of Ontario (RMCAO).
b) A summary of all materials, and sources used in each mix including, but not limited to; cement, supplementary cementing materials (slag, fly ash), coarse and fine aggregate, water, chemical admixtures, and air entrainment.
c) A certificate or letter verifying the compatibility of the admixtures to be used in the concrete, if admixtures are supplied from different manufacturers.
d) Target air content (%) and slump range (mm).
e) Test data confirming the scaling resistance of concrete surfaces when the concrete mix is used to construct curb or sidewalk. Testing shall be in accordance with CSA A23.2-22C or MTO LS-412.

The Town may request additional documentation of the materials used in any concrete mixture before placement, or any time during the maintenance period. When requested in writing from the Town, the contractor shall supply testing results that confirm the gradation, physical requirements, and scaling resistance of the materials conform to OPSS.MUNI 1002.

2.5.3.2 Concrete QA/QC Testing

Concrete sampling and testing should be in accordance with CSA A23.1:19/CSA A23.2:19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete. QC/QA sampling and testing shall only be performed by a Canadian Council of Independent Laboratories (CCIL) or American Concrete Institute (ACI) certified technician. Laboratory testing shall only be completed by a CCIL certified lab.

The contractor shall arrange for on-site quality control testing which shall conform to the **minimum** frequencies below:

a) **Compressive Strength** – Not less than one set of three cylinders for every 100m^3 of concrete placed, with no less than one test for each class of concrete placed on any one day.
b) **Slump** – Not less than the first five loads per mix per day, plus one test for every air test that is completed.
c) **Air Content** – All concrete mixes should be tested for air content (whether air entrained or not). For classes C-2, C-1 and C-XL, the first five consecutive loads shall be tested to confirm consistency. Thereafter, testing may be performed every third load.
d) **Temperature** – Temperature readings should be recorded every time a sample is taken for any of the aforementioned testing requirements. Temperature should be recorded to the nearest 0.5^{o}C.

2.6 ROADWAY CONSTRUCTION

The contractor shall construct all Town roadways and driveways in accordance to the specifications in this section. This section contains amendments to the OPSS and should be read carefully to ensure compliance during construction.

2.6.1 Grading

Grading shall conform to OPSS.MUNI 206 except where amended herein.

Grading shall conform to the Town of Innisfil Standard Details (TOISD), and project drawings and specifications.

Grading tolerances are as follows:

a) Subgrade / Trench Backfill +/- 20mm of proposed elevation.
b) Granular Subbase (Granular B) +/- 15mm of proposed elevation.
c) Granular Base (Granular A) +/- 10mm of proposed elevation.

2.6.2 Subgrade Preparation and Trench Backfilling

The use of site excavated inorganic soil is generally acceptable for use as a trench backfill, providing:

a) Backfilling operations are carried out in a strict conformance with the requirements of OPSS.MUNI 401, using earth compacting equipment of appropriate type, size, and weight;
b) The minimum compacted density within 1.0 metre of the final subgrade is to be compacted to 98% of the Standard Proctor Maximum Dry Density (SPMDD), with in-situ moisture content within 2% of the optimum value; and,
c) Soil moisture content higher than the optimum value, is better suited for trench backfilling below the upper 1.0 metre of subgrade, as the degree of compaction required at this depth may be relaxed to 95 % SPMDD. The addition of water may be required, particularly during dry summer conditions, subject to the discretion of the Geotechnical Consultant and/or Town Inspector.

During construction, a geotechnical consultant must inspect the condition of the roadway subgrade and supervise the installation of pipe bedding/embedment and the backfilling of all trenches within road allowances and easements.

The Geotechnical Consultant shall be present during trench backfilling and consolidation operations, ensuring that OPSS.MUNI 401 is strictly adhered to. The Geotechnical Consultant is to certify that he/she, or his/her designate, has conducted a sufficient number of tests to obtain a comprehensive summary of the degree of compaction achieved, and that all works were constructed in accordance with OPS.MUNI 401.

The Geotechnical Consultant’s personnel must be on site at all times when two mainline or service construction crews are working. When there are more than two crews working on the site at the same time, additional personnel may be required.

The Town of Innisfil requires a compaction test on every fill layer placed. Testing of the roadway subgrade, granular materials, and asphalt shall be performed at a frequency not exceeding 20 linear metre intervals, utilizing a “Z” pattern which will ensure the testing of the entire roadway width. As a minimum, one compaction test on every fill layer within lateral service trenches is required. Backfill shall be placed to a minimum depth of 900 mm above the crown of the pipe before power operated tractors or rolling equipment shall be used for compacting. Fill layers placed shall not exceed 300 mm in thickness (loose). The results of all field density tests obtained shall be plotted on plan and profile drawings and provided to the Town.

Prior to placing granular materials, the road subgrade shall be heavily proof rolled to ensure uniform support for the pavement structure. Other elevations of the roadway may also be subject to proof rolling when requested by the Town. For proof rolling, a 20-tonne gross mass vehicle with pneumatic tires shall be used. The vehicle shall make a minimum of three separate passes to subject every point of the surface being inspected. Each pass shall not exceed an offset of more than one tire width and the speed of the vehicle shall be within 2 km/h and 5 km/h. Where elastic movement in excess of 25 mm that does not exhibit significant cracking is observed, the surface shall be scarified and allowed to dry prior to re-compaction. Once the material has dried and is re-compacted, another proof roll shall be completed. Where permanent rutting in excess of 25 mm is observed, or where elastic movement in excess of 25mm with significant cracking is observed, the surface shall be deemed as defective. Defective areas shall be removed and replaced as specified below.

All soft areas shall be excavated and backfilled with similar site available material and compacted to the required density specified in the approved drawings and / or geotechnical report. When on site material cannot be utilized, imported granular material such as Select Subgrade Material (SSM) or Granular B as per OPSS.MUNI 1010 may be substituted if approved by the Town. Frost tapers shall be provided at the perimeter of all repaired areas where site similar material was not utilized. Frost taper slopes shall be no steeper than 10H:1V in the longitudinal direction (parallel to the road centreline), and 4H:1V in the transverse direction (perpendicular to the road centreline).

All sub-excavated areas within the roadway should be clearly noted on the as-recorded drawings. The records should include the limits of excavation (length, width, and depth), what material was used as replacement, and if any subgrade stabilization methods were utilized (geogrid, geotextile, lime treatment, etc.).

The subgrade shall be shaped to conform to the required longitudinal grade and cross-section and shall have a cross-fall of 3% from the centreline of roadway to each side unless otherwise approved by the Town. If considered necessary by the Town, the subgrade shall be re-compacted with suitable mechanical compaction equipment as required to produce a solid base for the road granular.

The final subgrade certification is to confirm that the final subgrade condition is equal to or better than that anticipated in the preparation of the pavement design. The certification letter is to display the Professional Engineer’s Stamp for the Geotechnical Consultant.

The findings of the compaction reports and the aforementioned certification, in a form acceptable to the Town, shall be forwarded to, and acknowledged by the Town, prior to placement of the granular road materials.

2.6.3 Road Subdrains

Subdrains shall be a minimum 100 mm diameter and installed as per OPSS.MUNI 405. Subdrains shall be provided on both sides of the roadway for the purpose of draining the granular road base to a suitable outlet. Refer to Materials List in Appendix B for approved materials.

In general, the subdrains are to be connected to catch basins. When a subdrain is extended to discharge above grade, the last 3.0 m section shall be rigid pipe with a rodent grate and marker provided.

The connection of other piping and drainage systems such as sump pumps to the subdrain system is not permitted.

The Town may, at their sole discretion, order that all or any portion of the installed subdrains be inspected using CCTV equipment according to OPSS.MUNI 405.07.08 and OPSS.MUNI 409.

2.6.4 Placing Granular Materials

The requirements of OPSS.MUNI 314 shall apply for the placement of granular material except where amended herein.

The requirements of OPSS.MUNI 501 shall apply for compaction except where amended herein.

Granular materials shall only be placed on a properly prepared subgrade that has been inspected and approved by the geotechnical engineer and the Town. Prior to placing granular material, the contract administrator shall confirm that the prepared subgrade meets the aforementioned grading tolerances.

Remove and replace any areas where the materials have become segregated prior to compacting. For roadway base or subbase construction, lift thickness shall not exceed 150mm. Granular material shall be compacted to 100% SPMDD, unless otherwise specified in the approved plans and specifications.

2.6.5 Asphalt Pavement Construction

The requirements of OPSS.MUNI 310 shall apply for constructing, repairing, or replacing hot mix asphalt pavements except where amended herein.

Paving of both binder and surface asphaltic concrete courses is not permitted within the Town from November 15 through to March 31 of the following calendar year, inclusive, without prior written permission by the Town. In all cases, no paving shall be carried out when ambient temperatures at the surface are below those noted in OPSS.MUNI 310 for both binder and surface courses.

Prior to paving works, the contractor shall schedule a site meeting with the Town, Contract Administrator, and the Project Materials Testing Consultant. During the site meeting the existing surface conditions shall be inspected and the Contractor shall provide a detailed work plan to ensure the quality of materials and workmanship.

Saw cut existing asphalt full depth in neat, consistent, parallel lines and at 90^{o} angles. Diagonal or meandering cuts are not permitted. Ensure saw cut edges are clean and vertical. Where the edge of a trench or cut is within 1.2 m of the edge of existing pavement, the asphalt shall be removed to said edge of pavement. This provision applies to all asphalt surfaces.

All abutting edges of existing pavement shall be prepared and coated with tack coat prior to placement of new asphalt. Tack coat shall be placed by the use of a mechanical (pump driven)

spray wand that is capable of being heated for cold weather operation and applying the tack coat in a consistent uniform application. All longitudinal joints and transverse joints shall be tack-coated prior to placement of the adjacent pass of asphalt. No asphalt shall be placed on the tack-coated surface until the tack coat has cured. Tack Coat Materials, Sampling, and Application shall be in accordance with OPSS.MUNI 310 and OPSS.MUNI 1103.

The use of a Material Transfer Vehicle (MTV) is required when placing any asphalt mixture on a roadway. Where the use of an MTV is not practical due to physical constraints, the hot mix asphalt must be delivered with live bottom trailers. The physical restraints shall be identified at the pre-pave meeting and the Contractor shall receive written permission by the Town prior to eliminating an MTV from the scope of work.

The Contractor shall construct durable longitudinal and transverse joints. Any joint cracking occurring within the Warranty Period shall be deemed to be a deficiency and all costs associated with remedial work shall be the responsibility of the Contractor.

At all cold longitudinal and transverse joints in the new HMA pavement under-compacted material at an unconfined edge of the new asphalt mat shall be removed (a minimum 150mm from the unconfined edge) and a straight, clean vertical face constructed.

Longitudinal joints in the surface course shall be parallel to the demarcation between the driving lanes (i.e. line paint), wherever feasible, at an offset of 100 mm to 150 mm from the centerline of the demarcation (approximately 1.5 m away from the inner wheel path). The joint shall not be placed in the wheel paths. The compacted asphalt density at any joint shall be at least 91% Maximum Relative Density (MRD) when measured using a nuclear densometer or by checking percent core compaction.

After final compaction, each course of HMA shall be of uniform texture and shall be free of segregation, fat spots, oil spills or any other defects. Defective areas shall be removed and replaced by the Contractor with acceptable hot mix of the same type and compacted to the satisfaction of the Town. When segregation is observed, the Contractor shall be immediately notified verbally, and shall take immediate corrective action. If the segregation continues, the Town may then issue a Stop Work Order until the problem is corrected.

Daily compaction tests for quality control purposes, using a nuclear densometer shall be performed at a minimum frequency of once per road, and no less than one test per twenty (20) linear metres. Daily compaction results shall be provided verbally to the on-site Inspector, followed by an email copy of the report to the Contract Administrator, and the Town within twenty-four (24) hours.

Compaction testing of the placed HMA shall meet the requirements of OPSS.MUNI 310 Table 10. Percent compaction shall be determined by comparing the density obtained using the nuclear densometer with the Maximum Relative Density (MRD) of the respective mix sample.

2.6.6 Gravel Surfaces

Gravel surfaces shall be constructed and restored as shown on the Contract Drawings or specified in the Special Provisions.

Granular material shall be placed in layers not exceeding 150 mm and compacted to 100% SPMDD. Prior to compaction each layer shall be graded to ensure a smooth surface.

A geotechnical consultant must be presented to confirm the degree of compaction during construction.

2.6.7 Surface Treated Areas

Surface treated areas shall be constructed or restored as shown on the Contract Drawings, or as directed by the Contract Administrator.

Surface treatment shall conform to OPSS.MUNI 304.

Hot mix asphalt may be used to patch surface treated roads.