



**Engineering
and Parks
Standards
Manual**

Part 1

2026 - July

Right-of-Ways

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1.0 Table of Contents

1.1	<u>ROADS, BOULEVARDS, AND ACTIVE TRANSPORTATION</u>	7
1.1.1	GEOMETRIC ROAD DESIGN CRITERIA	7
TABLE 1.1	RIGHT-OF-WAY (ROW) DESIGN CRITERIA	7
TABLE 1.2	INTERSECTION CHARACTERISTICS	8
1.1.2	AUTOTURN ANALYSIS	9
1.1.2.1	GENERAL	9
1.1.2.2	ROUNDAABOUTS	10
1.1.3	ROAD CROSS-SECTIONS	10
TABLE 1.3	RIGHT-OF-WAY DESIGN/PARKING	10
1.1.4	WINDOW STREETS	11
1.1.5	LANEWAYS	11
1.1.6	ROUNDAABOUTS	12
1.1.7	PAVEMENT DESIGN	14
TABLE 1.4	MINIMUM PAVEMENT STRUCTURES	15
1.1.8	CURBS	16
1.1.8.1	DESIGN	16
1.1.9	SIDEWALKS AND CONCRETE STRIPS	17
1.1.9.1	LOCATION	17
1.1.9.2	DESIGN	17
1.1.10	ENHANCED AND RAISED CROSSWALKS	19
1.1.11	MULTI-USE PATHS (BOULEVARD/OFF-STREET)	19
1.1.11.1	DESIGN	19
1.1.12	BOULEVARD SODDING	20
1.1.12.1	DESIGN	20
1.1.13	CYCLING FACILITIES	20
1.1.13.1	BIKE LANES (ON-STREET)	20
1.1.13.2	CYCLE TRACKS (OFF-STREET)	20
1.1.14	RESIDENTIAL DRIVEWAYS	21
1.1.15	SITE ENTRANCES	22
1.1.16	TRAFFIC, PEDESTRIAN, AND BICYCLE CONTROL SIGNAGE	22
1.1.17	STREET LIGHTING	23
1.1.18	STREET TREES	23
1.1.18.1	DESIGN	24
1.1.18.2	GUARANTEE AND INSPECTION OF STREET TREES	26
1.1.18.3	STREET TREES INCORPORATED INTO LID FEATURES	26
1.2	<u>RESTORATION AND RECONSTRUCTION WORK</u>	27
1.2.1	GENERAL	27

1.2.2	CONSTRUCTION DATES AND TIMING	27
1.2.3	MORATORIUM	27
1.2.4	TRAFFIC CONTROL AND CONSTRUCTION MANAGEMENT	28
1.2.5	EXCAVATIONS.....	28
1.2.5.1	OPEN CUT EXCAVATIONS	28
1.2.5.2	PROTECTION OF EXCAVATIONS	29
1.2.6	BACKFILLING	29
1.2.6.1	BEDDING AND COVER.....	29
1.2.6.2	UNSHRINKABLE FILL.....	30
1.2.6.3	GRANULAR FILL	30
1.2.6.4	NATIVE FILL.....	30
1.2.7	ASPHALT RESTORATION	30
1.2.7.1	ROADWAYS	31
1.2.7.2	MULTI-USE PATHS.....	32
1.2.8	PAVEMENT MARKINGS AND TRAFFIC DETECTION	32
1.2.8.1	PAVEMENT MARKINGS.....	32
1.2.8.2	DETECTION LOOPS	33
1.2.9	ENTRANCES	33
TABLE 1.5	MINIMUM DRIVEWAY ENTRANCE CONSTRUCTION.....	34
1.2.10	CONCRETE.....	34
1.2.10.1	CURB AND GUTTER	35
1.2.10.2	SIDEWALK	35
1.2.10.3	ROAD BASE.....	36
1.2.11	BOULEVARDS	36
1.2.12	STORM SEWER CONNECTIONS.....	37
1.2.13	TREES	37
1.2.14	INSTALLATION OF AERIAL CABLES AT SIGNALIZED INTERSECTIONS	38
1.2.15	DIRECT BURIED SERVICE DROP INSTALLATION REQUIREMENTS (TELECOMMUNICATION CABLES)	41
1.3	<u>SIGNAGE AND TRAFFIC CONTROL DEVICES</u>	43
1.3.1	SIGNAGE.....	43
1.3.1.1	TEMPORARY STREET NAME SIGNS	43
1.3.1.2	PERMANENT STREET NAME SIGNS.....	43
1.3.1.3	PRIVATE STREET NAME SIGNS.....	45
1.3.1.4	RURAL STREET NUMBER SIGNS	46
1.3.1.5	STREET NAME SIGNS AT INTERSECTIONS WITH REGIONAL ROADS.....	46
1.3.1.6	DESIGN.....	46
1.3.1.7	STANDARDS AND SPECIFICATIONS.....	48
TABLE 1.6	SIGN AND LETTERING SIZES.....	50
1.3.2	PAVEMENT MARKINGS.....	50
1.3.2.1	DESIGN.....	50

1.3.2.2	STANDARDS AND SPECIFICATIONS	51
1.3.2.3	BIKE LANE MARKINGS	52
1.3.2.4	PEDESTRIAN CROSSEOVERS	52
1.3.2.5	REMOVAL OF PAVEMENT MARKINGS	52
1.3.3	TRAFFIC SIGNALS	52
1.3.3.1	DESIGN.....	52
1.3.3.2	STANDARDS AND SPECIFICATIONS.....	52
1.4	TRANSIT SERVICES	53
1.4.1	TRANSIT ROUTE LOCATIONS	53
1.4.2	TRANSIT STOP LOCATIONS	53
1.4.3	STANDARD TRANSIT STOP ZONES	54
1.4.4	CONTEXTUAL TRANSIT STOP ZONES	56
1.4.5	TRANSIT STOP PASSENGER AREAS	59
1.4.6	TRANSIT LANES	59
1.4.7	TRANSIT SIGNAL PRIORITY MEASURES	60

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1.1 Roads, Boulevards, and Active Transportation

1.1.1 Geometric Road Design Criteria

The geometric design of municipal roads shall conform to the criteria set out in the latest version of the “Geometric Design Guide for Canadian Roads” issued by the Transportation Association of Canada (TAC), or as otherwise amended herein.

Practitioners designing municipal roads shall appropriately consider all users of the road such as pedestrians, cyclists, and motorists in the context of the surrounding land use, patterns of movement, destinations of community interest, public safety, and accessibility for all users to select the appropriate road classification and combination of design elements. Design exceptions may be considered, at the sole discretion of the Town, if the practitioner explicitly evaluates the differences in road safety performance between the design alternatives as outlined in the TAC Manual.

All Plans of Subdivision and Condominium are to have at minimum, two points of access, both during construction and upon completion.

Table 1.1 Right-of-Way (ROW) Design Criteria

Geometric Detail	Laneway	Local	Collector	Arterial
Right-of-Way Width (m)	11 ⁽ⁱⁱⁱ⁾	16 or 18	22 or 26	35
Design Speed (km/h)	40	50	60	60 or 80
Min. Safe Stopping Sight Dist. (m)	45	65	65 or 85	85 or 140
Min. Visibility Curves in Sags (K)	4	6	6 or 9	9 or 16
Min. Visibility Curves on Crests (K)	4	7	7 or 13	13 or 36
Min. Horizontal Road Radius	N/A	90	90 or 130	130 or 250
Min. Longitudinal Grade (%) ⁽ⁱ⁾	0.5	0.5	0.5	0.5
Max. Longitudinal Grade (%) ⁽ⁱ⁾	5.0	5.0	5.0	5.0
Max. Longitudinal Grade for Through Roads at Intersections (%)	N/A	3.5	3.0	3.0
Max. Longitudinal Grade for Stop Roads at Intersections (%)	2.5	2.5	1.5	1.5
Required Intersection Angle (°)	85 to 90	80 to 90	90	90
Min. Tangent Length at Intersections	30	30	50 or 60	50 or 60

Notes for Table 1.1:

- i. Minimum and maximum longitudinal grade values refer to individual road segments, and are not intended to stipulate the 'average road grade.'
- ii. Where two values are shown (separated by 'or'), the first value is for 'minor' and the second value is for 'major' roads.
- iii. ROW widths of laneways may vary from 8.5 m to 11.0 m, subject to functional design review at the time of development application.
- iv. Vertical curves are required for grade changes in excess of 1.5%. Lengths of curves (m) shall not be less than design speed (km/h), however this is not applicable to local roads.
- v. Saw-toothing of collector and arterial roadways shall be minimized to the greatest extent possible, and allowance of any saw-toothing shall be fully at the Town's discretion.
- vi. Asphalt width to be expanded by 1.0 m on 90° bends. (Refer to TMSD 03.03-01.)
- vii. Any public road or laneway that will be maintained by the Town must provide a minimum clearance of 4.5 m through any choke point (face of curb to face of curb) to ensure adequate clearance for snow clearing.

Table 1.2 Intersection Characteristics

Intersection	Curb Radius	Daylighting	Intersection Spacing
Local / Laneway	8 m	5.0 m - Radius	Min. 60 m
Local / Local	8 m	5.0 m - Radius	Min. 60 m
Local / Collector	10 m	7.5 m - Triangle	Min. 60 m
Collector / Collector	10 m	10.0 m - Triangle	Min. 60 m
Arterial / Local	15 m	15.0 m - Triangle	Min. 400 m
Arterial / Collector	15 m	15.0 m - Triangle	Min. 400 m
Arterial / Arterial	15 m	15.0 m - Triangle	Min. 400 m

Notes for Table 1.2:

- i. Bus routes require a minimum curb radius of 13 m.
- ii. Industrial roads require a minimum curb radius of 15 m.
- iii. Intersection spacing for arterial roads is the same spacing whether the intersection is signalized or un-signalized.

- iv. Three-legged intersections may be spaced at a minimum of 40 m. (Refer to TAC Section 9.4.2.3.)
- v. When a Town road intersects a Regional road, Regional standards will apply.
- vi. Intersection spacing for Local/Laneway will be reviewed on case-by-case basis, and at the Town's discretion.
- vii. For ROW widening requirements where auxiliary lanes are introduced at Collector/Arterial intersections, refer to TMSD 02-02.01.
- viii. The road with the higher classification governs the daylighting requirements at the intersection.
- ix. Lay-by lanes are not permitted on arterial roads, subject to review.
- x. Roundabouts may require daylighting in excess of what is outlined in Table 1.2, which must be confirmed through detailed design, to the satisfaction of the Town.

1.1.2 AutoTURN Analysis

1.1.2.1 General

A swept path assessment is to be conducted for each subdivision/development application. AutoTURN analyzes the swept path of vehicle maneuvers to determine the appropriate roadway/driveway design to accommodate turning vehicles. AutoTURN should be used to simulate ingress and egress movements from driveways as well as maneuvers through the site for large vehicles, including but not limited to the following:

- Waste collection vehicles
- Emergency response service vehicles
- Loading vehicles
- Snow clearing and maintenance vehicles

The vehicles requested for inclusion in a swept path analysis may vary depending on the development, and will be subject further to Town approval, determined on a case-by-case basis. The vehicular circulation assessments should illustrate that access to relevant areas of the site (waste collection/loading areas, fire routes, etc.) based on the vehicles requested to be included in the assessment are functional. The swept path analysis is to be completed using the latest version of AutoTURN software package available.

1.1.2.2 Roundabouts

An AutoTURN swept path analysis must be submitted for each roundabout showing the appropriate design vehicle completing each type of manoeuvre (left turn, through, and right turn) from all approaches. The design vehicle will be confirmed by the Town's Traffic Division. An AutoTURN swept path analysis must also be submitted for driveways where a splitter islands may interfere with ingress and egress turning manoeuvres.

Refer to Section 1.1.6 (Roundabouts) for more design criteria pertaining to roundabouts.

1.1.3 Road Cross-Sections

All roads within the urban area of the Town of Milton shall be constructed to urban standards with asphalt pavement, concrete curb and gutter, sub-drains, storm sewers, and street lighting. This does not preclude the possibility of including additional features within the right-of-way, at the Town's discretion.

ROW widths in the area bound by Steeles Avenue, Ontario Street, Derry Road, and Bronte Street may not follow current ROW standards. A narrower ROW may be present for some roads resulting from older designs and construction. Reconstruction projects for these roads will be reviewed/designed on a case-by-case basis.

Road classifications, ROW widths, Town of Milton Standard Drawing (TMSD) numbers, and parking allowances shall be as provided in Table 1.3.

Table 1.3 Right-of-Way Design/Parking

Road Classification	ROW (m)	TMSD No.	Parking Allowance
Laneway	11.0 ⁽ⁱⁱⁱ⁾	01-11.01	Prohibited
Minor Local	16.0	01-16.01 & 02	1 Side
Local	18.0	01-18.01	1 Side
Local	20.0	01-20.01, 02, & 03	1 Side
Minor Collector	24.0	01-24.01	1 Side
Major Collector	26.0	01-26.01	Site Specific
Minor Arterial	30.0	01-30.01	Prohibited
Major Arterial	35.0	01-35.02	Prohibited
Industrial Local	20.0	01-20.01	1 Side
Industrial Collector	26.0	01-26.01	2 Sides
Industrial Arterial	35.0	01-35.01	Prohibited

Notes for Table 1.3:

- i. Older areas of the Town (as defined above in Section 1.1.3) may not follow this table. Reconstruction works in these areas may require non-standard engineering solutions.
- ii. Refer to Part 6 - Standard Drawings for the TMSDs listed in Table 1.3.
- iii. ROW widths of laneways may vary from 8.5 m to 11.0 m, subject to functional design review at the time of development application.

1.1.4 Window Streets

The standard for boulevard treatments for areas separating a window street from an arterial or collector road are as follows:

- a. While maintaining visibility of the window street, boulevard treatments must be designed with landscaping and/or berms to ensure that opposing headlights from adjacent streets are blocked, where possible. The height and placement of these materials will be designed on a case-by-case basis. The Town has specific design requirements for window streets that address roads of interest such as Main Street, Tremaine Road, Louis Saint Laurent Avenue, etc. Design criteria will be determined by the Town.
- b. Sidewalk connections are to be made through window streets, with every effort made to minimize the amount of grade transition required. Should the grade transition not be achievable within the Town's standard ROW cross-section(s), a grading buffer block shall be provided.
- c. Where a window street 'fronts' a utility corridor a Post and Cable Fence (TMSD 10-04.01) is to be installed along the corridor's property line. The fence is to be located 10 cm off property line (within the Town's ROW). Where applicable, a 2.0 m gap is to be left in the fence for any sidewalk connection to the utility corridor.
- d. Where sidewalks or multi-use paths provide connection to/from a window street, AODA standards for longitudinal slope, cross slope, rest areas, etc., shall be met.

1.1.5 Laneways

The location of public laneways, where supported by the Town, shall be labelled on the Draft Plan of Subdivision and the submission shall include/adhere to the following:

- a. Justification that the laneway is required to achieve an overall benefit to the community's active transportation network or other such benefit as deemed appropriate by the Town (e.g., mitigating requirement for noise attenuation barriers).
- b. Operations and Maintenance Plan for winter maintenance, to the Town's satisfaction, including but not limited to, the locations of appropriately sized snow storage

facilities within the vicinity of the laneway, snow removal equipment requirements, and an AutoTURN assessment of snow clearing and emergency services vehicles.

- c. The maximum laneway length shall be 120 m, as measured from the intersection of one connecting public road to the other.
- d. 90° bends will not be allowed in laneways. Exceptions to this will be considered for locations in direct proximity to Collector/Arterial intersections.
- e. The width of the ROW shall be determined based on review of the municipal servicing, utilities, and transportation requirements at the time of Draft Plan of Subdivision review, at the discretion of the Town and Region of Halton (as applicable).
- f. Laneways are not permitted to intersect with Collector or Arterial Roads.
- g. If a Laneway intersects another Laneway, the shorter of the two shall have a greater width, to be determined on a case-by-case basis, at the time of Draft Plan of Subdivision review.
- h. Below-grade utilities may be permitted in the laneway.
- i. Location(s) of privacy/acoustic fences shall be shown.
- j. Street lighting to be municipally owned in accordance with Town standards. Exterior lighting affixed to buildings shall not be included in the overall street lighting assessment.
- k. Laneways shall be designed in such a way to provide positive overland drainage to the surrounding Local Roads. Localized low points or saw-toothed longitudinal road profiles will not be permitted along Laneways.
- l. Exterior doors shall not open into the road allowance obstructing use of municipal property.
- m. Fire hydrant coverage shall be provided for Laneways.
- n. Location of landscaping areas shall be provided.

1.1.6 Roundabouts

At intersections where traffic signals, all-way stops, or traffic calming are deemed warranted by the Town, a Roundabout Feasibility Study must be completed. The Roundabout Feasibility Study would be required to be included as part of a Transportation Impact Study.

All roundabouts are to be designed by a qualified P.Eng licensed in the Province of

Ontario. Roundabout design is generally developed following the latest editions of the TAC Canadian Roundabout Design Guide in conjunction with the National Cooperative Highway Research Program (NCHRP) Report 672. The initial screening for the size of a roundabout can be determined by analyzing the entry flow and circulating flow which will determine the number of entry lanes and lane configurations within the proposed roundabout.

Each approach to a proposed roundabout must be analyzed independently and all traffic forecasts (a.m., mid-day, p.m., and weekend peak hours) should be assessed. The inscribed diameter of a roundabout will be dictated by the number of lanes within it. Centreline alignments on the approach to a roundabout are preferred to be offset left which will control the entry/exit curvatures which, in turn, affect the speed and safety of vehicles and pedestrians within the roundabout, particularly at roundabout exits.

The following five radii for a roundabout must be assessed for each approach:

R1 = entry path radius, R2 = circulating path radius, R3 = exit path radius, R4 = left turn path radius and R5 = right turn path radius.

The entry path radius is the most important to review as it dictates the entry speed of the vehicle into the roundabout. The radii within a roundabout are best represented and measured by a spline as the spline best represents the natural driving paths of a driver.

For a single lane roundabout, the fastest path entry speed should be 30 km/h to 45 km/h. This is increased to 40 km/h to 50 km/h for a two lane roundabout. The speeds between conflicting traffic streams should be no more than 25 km/h. Proper roundabout design should achieve acceptable speed control and speed consistency through the roundabout, accommodate the design vehicle, accommodate all expected users of the roundabout while creating natural driving paths, maintaining good sightlines and achieve sufficient vehicle capacity through number of lanes and lane balance.

Local road roundabouts must be able to accommodate an aerial fire truck design vehicle.

Collector road roundabouts must be designed to accommodate Milton Transit buses and must allow the transit bus to manoeuvre through the roundabout without having to mount the truck apron.

Arterial road roundabouts must be able to accommodate a WB-20 design vehicle. The front wheels of the design vehicle should not have to use the truck apron, which is reserved for the trailer wheels.

All roundabouts under Town jurisdiction (owned and maintained by the Town), require a minimum clearance of 4.5 m through any choke point (face of curb to face of curb) to ensure adequate clearance for snow clearing.

All roundabouts must be designed with a minimum 0.3 m (preferably 0.6 m) clearance

between the outside edge of the design vehicle's wheel path and any curb face.

Accommodation of these vehicles dictates the design of the roundabout, particularly a single-lane roundabout. The minimum turning radius and the swept path of the design vehicle determines what the minimum size of the circle can be. For multi-lane roundabouts, trucks may claim both lanes while entering and navigating through the roundabout.

The design of roundabouts shall include a property line setback from the back of the curb with adequate space to locate utilities in their standard location. Roundabouts may require daylighting in excess of what is outlined in Table 1.2 which must be confirmed through detailed design, to the satisfaction of the Town.

All roundabouts shall be designed with bicycle by-pass ramps where on-street cycling facilities are present. The bicycle by-pass ramps must be a minimum of 1.5 m wide and be at a 25° to 30° angle from the curb. The sidewalk/path that the by-pass ramp merges into must have a minimum width of 2.5 m, preferably 3.0 m. The boulevard width between the sidewalk/path and the live lane of the roundabout is to be a minimum of 1.0 m in which case coloured impressed concrete (125 mm thick, random field stone pattern) is to be used as surface treatment. Colour shall be in accordance with Section 7.2.4 (Impressed Coloured Concrete Apron). Topsoil and sod shall be used as surface treatment when the separation is greater than 1.0 m.

Level 2 - Type D Pedestrian Crossovers are to be installed on each approach of a roundabout. The latest version of the Ontario Traffic Manual Book 15 must be adhered to, including minimum setback requirements. Setbacks are to be measured from the edge of the splitter island.

For curb types and surface treatments within roundabout, refer to TMSD 15-04.01.

Where roundabouts are provided, a Roundabout Details Plan shall indicate detailed design dimensions including radius, lane width, etc. The roundabout shall be in accordance with the TAC Geometric Design Guide for Canadian Roads and Ontario Traffic Manual Book 15. The drawing must be stamped by a qualified P.Eng licensed in the Province of Ontario.

1.1.7 Pavement Design

All roads are to be asphalt over granular base in accordance with the minimum pavement structure design. Alternative pavement options to facilitate LID features may be considered in select locations, at the discretion of the Town.

Table 1.4 below describes the minimum pavement structure design to be used for each road classification. Refer to Table 1.3 above to determine road classification.

Table 1.4 Minimum Pavement Structures

Road Classification	Minimum Pavement Structure	
Laneway (8.5 to 11 m ROW)	40 mm HL3 Asphalt 50 mm HL8 Asphalt 150 mm 19 mm Limestone ⁽ⁱ⁾ 300 mm Granular 'B' Type II ⁽ⁱⁱ⁾	Surface Course Binder Course Base Sub-base
Local - Minor (16 m ROW)	40 mm HL3 Asphalt 80 mm HL8 Asphalt 150 mm 19 mm Limestone ⁽ⁱ⁾ 300 mm Granular 'B' Type II ⁽ⁱⁱ⁾	Surface Course Binder Course Base Sub-base
Local - Major (18 m ROW)	40 mm HL3 Asphalt 100 mm HL8 Asphalt 150 mm 19 mm Limestone ⁽ⁱ⁾ 375 mm Granular 'B' Type II ⁽ⁱⁱ⁾	Surface Course Binder Course Base Sub-base
Collector - Minor and Major (22 and 26 m ROW)	40 mm HL3 HS Asphalt 100 mm HL8 HS Asphalt 150 mm 19 mm Limestone ⁽ⁱ⁾ 375 mm Granular 'B' Type II ⁽ⁱⁱ⁾	Surface Course Binder Course Base Sub-base
Arterial (35 m ROW)	50 mm HL1 Asphalt 100 mm HL8 HS/HDBC Asphalt 150 mm 19 mm Limestone ⁽ⁱ⁾ 550 mm Granular 'B' Type II ⁽ⁱⁱ⁾	Surface Course Binder Course Base Sub-base

Notes for Table 1.4:

- i. Granular 'A' (pit/crushed) may be used as a substitute for 19 mm Limestone⁽ⁱⁱⁱ⁾.
- ii. Granular 'B' Type I may be used as a substitute for Granular 'B' Type II⁽ⁱⁱⁱ⁾.
- iii. The above substitutions may be used, subject to Town approval and providing the following requirements are met:
 - A letter from a Geotechnical Engineer is provided that indicates favourable ground conditions. (i.e., water table, native sub-base, etc.)
 - The following minimum sub-base depths are provided:
 - 375 mm for Local/Laneway
 - 450 mm for Collector
 - 500 mm for non-residential Local/Collector
 - 550 mm for Arterial

The above are minimum design requirements. The Owner is required to engage a qualified Geotechnical Consultant to confirm the minimum design

based on results of local soils tests.

- iv. Recycled Asphalt Product (RAP) will be permitted in accordance with OPSS 1150. The Town or Town's Consultant (Engineer) reserves the right to visit the asphalt plant during production to confirm the percentage of RAP being used during Hot Mix production. Refer to Section 7.2.1 (Hot Mix Asphalt).
- v. Industrial and arterial roadways require a 150 mm thick, 500 mm wide concrete 'kill strip' with a 150 mm thick Granular 'A' base. Where concrete sidewalk is ≤ 1.0 m from back of curb, the 'kill strip' should be widened to meet the sidewalk, complete with expansion joints, and consist of 50 mm thick HL3 asphalt with a 150 mm thick Granular 'A' base.
- vi. The application of in-depth preservative asphalt sealant (Reclamite Rejuvenating Agent) may be required with the construction of Town roads, at the Town's sole discretion. Refer to Section 7.2.3 (In-Depth Preservative Asphalt Sealant).

1.1.8 Curbs

All new roads are to be constructed with concrete curb and gutter. Curb depressions are required at each driveway apron, intersection, pedestrian crossing, and park/open space entrance, and must be consistent with AODA-DOPSS and OPSS/OPSD. Where the curb depression for sidewalk at an intersection radius is not a continuous apron and the barrier section of curb between curb depressions is less than 3.30 m, that section of curb shall also be depressed.

Saw cutting an existing concrete curb (i.e., 'cut-outs') to create a new curb depression is not permitted.

All curb depressions related to pedestrian routing, bicycle circulation, and trail implementation are to be shown on the Active Transportation Plan and the Traffic Control Plan (in addition the any other plans that would illustrate curb depressions). Refer to Section 2.2 (Drawing Requirements).

1.1.8.1 Design

- a. Minimum curb grade is 0.50% except on cul-de-sac bulbs and the outside curb on road elbows where minimum grade is 0.75%.
- b. Two-stage three-key curb is preferred. (TMSD 03-01.01)
- c. Two-stage curb and gutter (OPSD 600.070) is acceptable.
- d. One-stage curb (OPSD 600.040) may be considered. (Written request by Owner required.)
- e. Concrete shall adhere to OPSS 1350, with a minimum specified 28-day compressive

strength of 32 MPa, Class C-2 Exposure in accordance with CSA. A23.1.

- f. Construction shall adhere to OPSS 353 and 904.
- g. Semi-mountable (roll-over) curb, where required, shall be as per OPSD 600.060.

1.1.9 Sidewalks and Concrete Strips

Sidewalks are to be constructed within the municipal ROW, per OPSDs, on all road types excluding laneways, on both sides, or as justified by the Pedestrian Routing Plan and/or Transportation Impact Study.

For capital projects, the contract unit price for concrete sidewalk, boulevard and concrete strip, and median, shall include all necessary excavation in earth to contain the volume of the sidewalk, boulevard and concrete strip, and median and the granular bedding, except that, no deduction will be made from the excavation of material quantities where there is an overlap.

1.1.9.1 Location

Where sidewalk is installed only on one side of the road, it should be opposite the fire hydrants. Sidewalks to be located on the inside of curved/looped streets (crescents) except where external connections are present or as otherwise determined by the Town.

1.1.9.2 Design

- a. Sidewalks shall be placed on undisturbed ground or on engineered fill material compacted to 98% Standard Proctor Dry Density (SPDD).
- b. Concrete shall adhere to OPSS 1350, with a minimum specified 28-day compressive strength of 32 MPa, Class C-2 Exposure in accordance with CSA. A23.1.
- c. Construction shall adhere to OPSS 353 and 904.
- d. Coarse aggregate for concrete shall have a maximum nominal size of 19 mm as specified under OPSS 351.
- e. A 50 mm to 100 mm levelling course of compacted 19 mm crusher run limestone (CRL) is to be used to correct subgrade irregularities.
- f. Standard sidewalk thickness is 125 mm.
- g. Sidewalk through residential driveways and sidewalk that is adjacent to curb (curb-face sidewalk) shall be 150 mm thick.
- h. Sidewalk through commercial and industrial driveways shall be 200 mm thick. Where the sidewalk or 'kill strip' crosses a commercial or industrial entrance, a

welded wire mesh (WWM) fabric (152 mm x 152 mm MW 18.7 x MW 18.7) shall be placed 50 mm above bottom of concrete. The WWM fabric shall conform to CAS standard specification G30.5-1972 (or as amended).

- i. Where a curb depression is provided, it must have a maximum running slope of 1:20 and be aligned with the direction of travel.
- j. Curb ramps must have a minimum clear width of matching that of the approaching sidewalk (1.83 m recommended), exclusive of any flared sides. The running slope of the curb must be a maximum of 1:8 where its elevation is less than 75 mm and be a maximum of 1:10 where its elevation is 75 mm or greater and 200 mm or less. The maximum cross slope of a curb ramp must be no more than 1:50, and the maximum slope on the flared side of the curb ramp must be no more than 1:10.
- k. Curb ramps are to be separated by direction and pedestrian crossings should not meet at a common curb ramp. The curb ramps are to be in accordance with OPSD 310.030, 310.031, 310.033, 310.039, and OTM Book 15. This is to comply with AODA wayfinding requirements.
- l. Curb ramps and sidewalks acting as access points to parks shall be 3.0 m wide.
- m. Crosswalks and curb ramps must be laid out in a manner such that the pedestrians are not forced outside of the lines of the crosswalk due to the angle between curb ramps and the crosswalk. Crosswalks must line up with proposed or existing curb ramps and should also line up with proposed or existing sidewalks.
- n. 'Dummy joints' shall not be constructed. All joints shall be in accordance with OPSD 310.010.
- o. Concrete sidewalks, boulevard strips, and medians shall have a course textured broom finish. For sidewalks, broom strokes shall be perpendicular to the direction of travel. For boulevard strips and medians, broom strokes shall be parallel with the direction of travel.
- p. Tactile walking surface indicators (tactile plates) are to be installed at all curb depressions (except those used exclusively by cyclists) in accordance with OPSD 310.030, 310.031, 310.033, 310.039, and OTM Book 15.

All tactile plates are to have raised tactile profiles, be located at the bottom portion of the depressed curb that is flush with the roadway, be set back 50 to 200 mm from the curb edge, be a minimum of 610 mm in depth, line-up parallel to the curb radius and cover the length of the curb depression.

Tactile plates must be cast iron, powder coated dark grey, and removable. Tactile plates shall be of uniform quality and free from surface defects. Manufacturers include Neenah Foundry Company, Advantage Cast Iron, TufTile, Cedar Infrastructure, or another manufacturer approved by the Town of Milton. Tactile

plates must be installed in fresh concrete, flush with the adjacent sidewalk/walkway, resulting in a snug fit between tiles to limit water infiltration around the perimeter of the system and between tiles. Installation procedures shall be according to the manufacturer's specifications.

In addition to tactile plates, and where feasible, directional lines shall be installed to provide directional guidance. Directional lines shall be installed behind the tactile plates, 900 mm long, spaced 300 mm apart, 10 mm x 10 mm, and made with a grooving tool having a 15 mm radius. Directional lines are only to be installed for protected crossings.

- q. Expansion joints of bituminous fibre material shall also be used abutting rigid objects or other concrete works. (OPSD 310.040)

1.1.10 Enhanced and Raised Crosswalks

The Town requires the installation of raised crosswalks at school PXOs along collector roadways, at locations to be determined by the Town, when crosswalk locations are known prior to road construction, and can be incorporated into the road design and initial construction. Refer to TMSDs 03-06.01 and 03-06.02.

For retrofit situations (i.e., installation on an existing road), cushioned crosswalks are to be installed. Refer to TMSDs 03-05.01 and 03-05.02

The requirement for enhanced crosswalks at any other location shall be at the sole discretion of the Town.

For illumination of PXOs, refer to Section 1.1.17 (Street Lighting).

1.1.11 Multi-Use Paths (Boulevard/Off-Street)

Multi-use paths (MUPs) shall be in accordance with the Town's Transportation Master Plan, as revised. All circulation within the ROW is to be included in both the Active Transportation Plan and the Traffic Control Plan. Refer to Section 2.2.7 (Traffic Control Plans). The installation of all MUPs and bicycle circulation systems is to include approved regulatory by-law signage. The Town may require bicycle pathways including associated signage and pavement markings.

1.1.11.1 Design

MUPs in boulevards or park areas shall follow TMSD 09-01.03 at the Town's discretion. Where tactile plates are required, the MUP shall be constructed of concrete to meet all applicable standards, from the subject curb depression to a minimum of 1.2 m beyond the tactile plates. Where MUPs cross asphalt driveways or site entrances they are to be constructed of concrete. Refer to TMSD 04-01.01.

1.1.12 Boulevard Sodding

Boulevards on all municipal roads are required to be finished with topsoil and sod. Alternative boulevard designs to facilitate LID features may be considered in select locations, at the discretion of the Town.

1.1.12.1 Design

- a. Boulevards shall be graded between 2.0% and 6.0% away from private property.
- b. Subgrade shall be compacted to 98% SPDD.
- c. 300 mm of horticultural grade topsoil per Section 5.17.5.7 (Planting Materials) shall be placed, then sodded per Section 5.17.6 (Sodding) with No.1 nursery sod from back of curb to property line. Refer to TMSDs (Road Cross-Sections) for boulevard locations. Topsoil shall be tested, with results submitted to the Town. Frequency and amount of testing required to be determined prior to construction.
- d. Newly sodded areas are to be rolled and watered when installed.
- e. Finished sod shall match flush with the top of sidewalks and curbs, where present.

1.1.13 Cycling Facilities

All new Collector and Arterial roads shall be constructed with off-street cycle tracks as dictated by the Standard Road Cross-Sections. The implementation of cycle tracks in retrofit and reconstruction projects requires evaluation on a case-by-case basis with Town staff.

The final design, timing, and provision of bicycle circulation signage and markings will be determined by the Town.

1.1.13.1 Bike Lanes (On-Street)

On-street bike lanes are to have the same pavement structure as the road with a minimum lane width of 1.5 m designated by appropriate pavement markings, including buffers, in accordance with OTM Book 18. Where bike lanes are curb adjacent, the gutter may be counted towards the required 1.5 m lane width.

1.1.13.2 Cycle Tracks (Off-Street)

Location of Cycle tracks within the right-of-way shall be per TMSDs (Road Cross-Sections), or, in the case of retrofit scenarios, determined on a case-by-case basis.

Construction of cycle tracks shall be per TMSD 09-01.07. Refer to TMSD 04-01.02 for

treatment across site entrances. Pavement markings and signage are to be in accordance with OTM Book 18, and as directed by the Town.

For the configuration of cycle tracks at roadway intersections refer to the following:

- TMSD 15-03.03: Cycle Track Layout at Thru-Ride Locations
- TMSD 15-03.04: Cycle Track Layout at All-Way Stop Intersections
- TMSD 15-03.05: Cycle Track Layout at Signalized Intersections (Layout 1)
- TMSD 15-03.06: Cycle Track Layout at Signalized Intersections (Layout 2)

The selection of signalized intersection layouts shall be completed in consultation with Development Engineering and Transportation Planning staff.

The configuration of cycle tracks at roundabouts shall be designed in accordance with OTM Book 18, in consultation with the Town.

For illumination of cycling infrastructure, refer to Section 1.1.17 (Street Lighting).

1.1.14 Residential Driveways

Residential driveway entrances providing access across the boulevard within the Town's right-of-way must comply with the following:

a. Urban Roads

- Surface treatment to be asphalt.
- Driveway widths shall be per Town of Milton Zoning By-Law (as amended).
- Curb depression must match driveway width.
- Curb depression to be formed and cast-in-place. (i.e., Cut-outs are not permitted)

b. Rural (Ditched) Roads

- Granular or other hard surface (at the Town's discretion).
- 5.0 m minimum throat width.
- Driveway throat width and culvert length may vary based on site conditions.

c. Spacing and configuration of driveways shall comply with the TAC Manual.

d. Individual driveway installations for houses, that are accepted as part of the design for a Plan of Subdivision, do not require Entrance Permits for initial construction.

e. Residential driveway pavement structure shall be per Table 1.5.

f. The second pavement lift shall be placed prior to placement of top course asphalt in road.

- g. In ditched sections of a road, a culvert may be required for access. Culverts shall be installed per TMSD 04-02.01.
- h. The minimum setback from the edge of driveway to any above ground street furniture, utility box, light standard, etc. shall be 1.2 m. Where a utility or service provider requires greater setback, their requirement(s) shall govern.
- i. Driveway slope between a sidewalk (or other active transportation facility) and the curb depression shall be as required.
- j. Driveway slope on private land shall be per Section 4.5.1.2 (Lot/Surface Grading Design).

For the design of residential driveways, as it relates to on-street parking, refer to Section 2.1.8 (On-Street Parking).

1.1.15 Site Entrances

The minimum setback from the edge of entrance curb to any above ground street furniture, utility box, light standard, etc. shall be 1.5 m. Where a utility or service provider requires greater setback, their requirement(s) shall govern.

Where curbing is installed in conjunction with an access and there is municipal sidewalk, cycle track, and/or a multi-use path, the entrance curbing shall terminate on either side of the sidewalk, cycle track, or path with portions installed flush to grade.

Refer to TMSD 04-01.01 and 04-01.02 for urban site entrances.

Refer to TMSD 04-02.01 for rural site entrances.

Signalized Site Entrances:

When a site entrance is to be signalized, that leg of the intersection is to be designed to adhere to the standard design criteria for signalized intersections. Sidewalks, cycle tracks, and multi-use paths are to terminate with a curb ramp (complete with tactile plates) and appropriately painted crossing(s) to be installed. Curb and gutter is also not to be continued across that leg of the intersection and is to continue around the corner radii and into the site.

1.1.16 Traffic, Pedestrian, and Bicycle Control Signage

The Owner is responsible for supplying and installing all traffic, pedestrian, and bicycle control signage where required as per applicable Municipal and Provincial guidelines/standards. (i.e., Ontario Traffic Manual, TAC MUTCDC, TMSDs, etc.)

Refer to Section 1.3 (Signage and Traffic Control Devices).

1.1.17 Street Lighting

Refer to TMSDs for Lighting.

Locations of street lights within Town ROWs are illustrated on the TMSDs for Road Cross-Sections.

Illumination of roadways is to be designed by a P.Eng. who is specialized in streetlighting and shall be in conformance with all applicable standards.

Illumination levels for cycling infrastructure shall be in conformance with OTM Book 18 (as amended).

Illumination levels for PXOs shall be in conformance with OTM Book 15 (as amended).

1.1.18 Street Trees

The Town requires street tree planting (TMSD 18-01.01) within public ROWs for all development and redevelopment, including but not limited to subdivisions, consents, and site plans. With respect to site plans, the requirement for street tree planting will apply to development and redevelopment subject to Site Plan Control in the Town of Milton.

The Town requires the installation of street trees along all road frontages. Location of street trees must be coordinated with driveway locations, as well as underground and above ground services and utilities. Trees are to be placed in the grass boulevard so as to not interfere with underground services and utilities, intersection and driveway sight lines, overhead wires, and light standards.

For subdivision applications, street trees must be shown on the Composite Utility Plans. Those street trees, which cannot be accommodated in a subdivision due to utility conflicts or subdivision design, will be planted on nearby parkland or other nearby ROW locations within the subdivision or draft plan.

The final planting location is to be staked on site for approval in the field by the Town in conjunction with the Owner's Landscape Architect prior to installation. It is the Owner's responsibility to obtain utility locates prior to staking final planting locations.

Street trees are to be planted in the spring from May 1 through June 30 and from September 1 through October 31. Trees planted after October 31 will be inspected between May 1 and June 30 of the following year.

a. Protection of Existing Street Trees:

Existing street trees located within a public ROW may not be removed or damaged in any way. Owners shall make every effort to protect existing street trees and

maintain the optimum growing conditions during construction. Where development or re-development of a site impacts existing street trees, the Town may undertake remedial measures, including the removal of the street tree, if so required. All costs will be borne by the Owner. In addition, the Owner shall be required to replace the damaged or removed street trees with an equivalent total diameter at breast height (DBH) or, at the discretion of the Town, provide an equivalent value in funding to the Town for street tree planting.

b. Provision to have Town install Street Trees:

In such instances, where the installation of street trees must be delayed beyond the anticipated timeframe of the development or re-development, or other circumstances which make the installation of the street trees in a timely manner difficult, the proponent may, at the discretion of the Town, provide funds to the Town to have the Town install the street trees at such time that the Town deems appropriate. In these instances, the funding requirement for the street trees shall include all costs of the street tree planting, including but not limited to supply, installation, guarantee, site restoration, as well as any fees per tree required under any applicable User Fee By-Law.

1.1.18.1 Design

a. Spacing:

The Owner is required to supply and install a minimum of one tree per 9.0 m of roadway property line measured along both sides of the ROW, to generally consist of one tree per residential lot frontage or one tree for every two townhouse units and two trees per flankage.

Industrial and commercial developments are also required to provide a minimum of one tree per 9.0 m of roadway property line measured along both sides of the road allowance. Tree spacing requirements may vary with unique site conditions and will be reviewed by the Town on a case-by-case basis. Spacing must reflect the ultimate size of the tree. Smaller ornamental trees require closer spacing.

b. Setbacks:

The following suggested setbacks from Town regulated structures apply:

- 1.0 m from storm/sanitary service laterals and rear-yard catchbasin leads
- 1.0 m from curbs and walkways
- 1.5 m from driveways
- 3.0 m from fire hydrants

- 3.0 m from pad-mounted transformers (door side)
- 1.0 m from pad-mounted transformers (all other sides)
- 5.0 m from streetlights (shade species)
- 3.0 m from streetlights (ornamental species)
- 5.0 m from regulatory signs (shade species)
- 3.0 m from regulatory signs (ornamental species)
- 10.0 m from stop signs (local and collector roads)
- 15.0 m from stop signs (arterial roads)

c. Species Selection:

The selection and layout of proposed street trees should reflect an understanding that a variety of species types are required to reduce the incidence of pest and disease associated with over-planting of one or two species types. Trees of the same species and cultivar are to be clustered in groups ranging in number from 5 to 9 trees per grouping. No tree type is desired to make up more than 15% of the trees within any phase of a subdivision.

Species are to be selected with consideration for the specific conditions of the proposed location. Consideration should include proximity to road, proximity to natural areas including watercourses and woodlots, available area for root growth, availability of water, exposure to salt spray drift and snow storage, air quality and likelihood of soil compaction.

Refer to Table 5.3 for a list of recommended deciduous parkland tree species. The Town encourages the use of a variety of species types and the tree list is to be used as a guide only.

The use of species native to Halton Region is required on streets adjacent to parkland, woodlots, watercourses and other natural areas.

d. Standards:

Minimum caliper size for street trees is 60 mm. All trees are to be wire basket or balled and burlap wrapped. Bare root plantings are not acceptable.

Where possible, medium to large shade trees are to be selected. Medium to small ornamental trees shall be in front of narrow lots, such as townhouse lots.

The Owner must supply a planting plan prepared by a professional Landscape Architect, complete with a plant list and notes, for approval by the Town. Refer to Sections 5.17.1 through 5.17.6.

1.1.18.2 Guarantee and Inspection of Street Trees

All street trees must be planted a minimum of one year prior to the commencement of the Maintenance Period for the Subdivision. For other development applications (consents, site plans, etc.), the Owner shall guarantee street tree plantings for a period of two years from Preliminary Acceptance by the Town.

With the request for the commencement of the Maintenance Period for the Subdivision or development and prior to any Town inspection for landscaping, the Owner must provide an Excel spreadsheet listing all street trees planted in the development, identifying street names, house and lot numbers, date(s) of planting and species as per sample spreadsheet. The Owner shall provide certification by the Landscape Architect that all street tree planting and landscape works within the subdivision have been completed in accordance with the approved plans and approved stake-out locations.

Street trees will be inspected prior to and at the end of the Maintenance Period. Plant material will only be accepted if it is in vigorous and healthy growing condition, and in full leaf with no more than 20% dieback. Street trees found to be dead, defective, or not in a healthy growing condition shall be replaced during the next planting season. All replacements and corrections must be completed prior to the commencement of the Maintenance Period and again prior to Assumption of the Subdivision. A 75 mm deep layer of mulch, must cover the root ball at the time of Final Acceptance or Subdivision Assumption. Bare soil or homeowner built structures around street trees within the road allowance will not be accepted and will be removed by the Owner's forces prior to Assumption of the subdivision.

Delaying replacements may result in delays in the reduction of securities and Final Acceptance by the Town or Subdivision Assumption. At the time of Subdivision Assumption, all street tree replacements must have been installed for a minimum of one year. The Town and the Owner may negotiate a cash-out quantity in lieu of the original and/or extended warranty.

Inspections will only be carried out during the growing season from May 1 through October 31. Inspections must be requested by the Owner and are scheduled according to staff availability. Inspections are only valid for the calendar year in which they are completed. If the inspections are not followed by security reductions or if Maintenance and/or Assumption are held up until the next calendar year, the street trees will need to be re-inspected by the Town prior to granting a Maintenance Period and/or Subdivision Assumption. The Town, at its discretion and at the cost of the Owner, may delegate inspection duties to a qualified person working on behalf of the Town.

1.1.18.3 Street Trees Incorporated into LID Features

Street trees may be incorporated into the installation of LID features, subject to review and approval by the Town, on a case-by-case basis.

Refer to Section 4.5.9 (Low Impact Development) for additional information.

1.2 Restoration and Reconstruction Work

1.2.1 General

Section 1.2 (Restoration and Reconstruction Work) is intended to provide restoration and reconstruction requirements associated with Road Occupancy Permits, new driveway construction, servicing connections, etc. within Town right-of-ways. All restoration and reconstruction works shall be in accordance with this section as well as Part 7 (Standard Specifications). For works taking place within a Regional road, refer to Halton Region's standards. (<https://www.halton.ca/The-Region/Regional-Planning/Planning-Applications/Download-Engineering-Design-Guides-Manuals>)

Inadequate restorations following permit expiration will be rectified by the Town. All costs incurred by the Town related to construction or rectification of poor repairs will be recovered by direct invoicing to the Applicant including fees to cover the Town's overhead and administration costs as per the Town of Milton User Fee By-Law.

All specifications required for restoration work within the Town's right-of-way must be certified by a P.Eng or P.Geo in the form of a sealed, signed, and dated letter addressed to the Town of Milton.

1.2.2 Construction Dates and Timing

Open cutting of the roadway is not permitted November 1 through April 1 (winter months). All proposed construction during winter months shall be subject to Town Approval.

All temporary restorations completed during the winter months must be fully restored by May 31 of each year, unless otherwise approved by the Town.

Applicants who complete temporary restorations during winter months will be granted an extension to the Road Occupancy Permit for final restoration upon application to revise dates.

1.2.3 Moratorium

To ensure the long-term sustainability of the Town's infrastructure, a 5-year moratorium is enforced on all newly improved roads. The moratorium ensures that the integrity of the pavement structure is protected and also serves to minimize the disruptions and inconvenience to the public resulting from repeated construction activity.

The moratorium applies to the enhancement, maintenance, repair, or replacement of existing plant and construction of new plant which may undermine the integrity of the newly improved street infrastructure. Unless otherwise stated by the Town, the moratorium applies to the whole street, from property line to property line. The expiry of

the moratorium shall be measured from December 31 of the calendar year in which the improvement was performed.

Exemptions may be made, at the discretion of the Town, provided that the Applicant has investigated and evaluated all other options and can demonstrate that they are not feasible or practical.

When such exemptions are granted, the Applicant shall exhaust all trenchless methods available to minimize the number and size of cuts in the road. The Town, acting reasonably, may require more extensive site restoration than would normally be expected, at the Applicant's expense, in order to mitigate the concerns of public inconvenience, premature degradation, and aesthetics of newly improved roads.

1.2.4 Traffic Control and Construction Management

The applicant will be required to submit a Traffic Control Plan to the Town's satisfaction that meets all guidelines as stipulated in the Ontario Traffic Manual Book 7 - Temporary Conditions, and any further Municipal Consent Permit Conditions.

All excavations within 50 m of a signalized intersection, and at any other locations deemed necessary by the Town, shall have paid duty police officer(s) present to control traffic. All expenses and accommodations related to this are the sole responsibility of the applicant.

It shall be the duty of the Applicant or any person working, cutting, or conducting excavation in or upon any public place to establish and maintain barriers and warning devices necessary for the safety of the workers and the general public. Town staff may review the Applicant's placement of these barriers and warning devices on site. When, in the judgment of the Town, additional barricades or warning devices are necessary, the Town shall inform the Applicant and the Applicant shall take prompt action to comply. Bicycle lanes are considered legal travel lanes herein and must be accommodated as such.

A Construction Management Plan may be required, at the Town's discretion, that describes, in sufficient detail, the project activities that will or are likely to occur during construction, to ensure that construction activities do not adversely affect public health and safety, the public road allowance, and/or adjacent properties.

1.2.5 Excavations

1.2.5.1 Open Cut Excavations

On all traveled portions of surfaced road or driveways, cutting must be completed by full depth saw cutting to leave a clean, straight edge with vertical sides unless otherwise approved in writing by the Town. Diagonal cuts are not permitted.

Any road cuts located less than 1.0 m from edge of pavement shall be extended to remove full depth asphalt up to the edge of pavement. (TMSD 03-07.02)

Trenching/tunneling under curbs and/or sidewalks is not permitted. Curb and/or sidewalk shall be removed a minimum of 1.0 m beyond the trench. Refer to Section 1.2.10 (Concrete).

1.2.5.2 Protection of Excavations

All excavations that cannot be immediately backfilled must be properly protected at the end of each working day. Boulevard excavations must be secured using adequate temporary fencing and plywood covering the pit.

Identity tags must be placed on the temporary fencing.

When temporary steel plating is used to maintain vehicular, bicycle, and pedestrian traffic flow, the plates shall have a skid resistant surface treatment and shall be fastened down to prevent moving. The plates shall be counter-sunk and set flush with the surface of the pavement. The recessed plates should overlap the cut by no less than 300 mm on all sides. Asphalt mix shall be used to fill the voids on the outside edges of the plates. Refer to TMSD 03-07.02.

Plates shall be used only as a temporary measure during construction and shall not be used for more than 24 hours, unless otherwise approved by the Town.

The use of steel plating is not permitted during winter months.

1.2.6 Backfilling

All backfilling activities shall be as per OPSS 401 and compaction shall be in accordance with OPSS 501, unless otherwise stated by the Town.

If ground loss occurs during excavation/backfilling activities, outside the limits of the road cut, the pavement, curb, and/or gutter will be removed as directed by the Town to ensure proper compaction.

Where temporary shoring/bracing is used to support adjacent infrastructure, it shall be removed in a safe manner, continuously as backfilling proceeds.

The use of high-performance bedding (HPB) will not be permitted.

1.2.6.1 Bedding and Cover

All bedding and cover material shall be placed in accordance OPSS 501, unless otherwise accepted by the Town.

a. Storm Sewers and Service Connections:

Bedding material shall be 19 mm crusher run limestone, compacted to 98% SPDD or HL6 clear stone. Covering material shall be sand. The use of unshrinkable fill may be considered on a case-by-case basis, at the discretion of the Town of Milton. The use of high performance bedding (HPB) will not be permitted.

b. Others:

Bedding and covering material shall be compacted to 98% SPD.

1.2.6.2 Unshrinkable Fill

Excavations and trenches within the paved surface of a road, that are at least 1.5 m deep, may be backfilled with unshrinkable fill up to the underside of granular base.

Unshrinkable fill specifications and placement shall conform to OPSS.MUNI 1359 specifications.

Unshrinkable fill is not permitted for backfilling in boulevards and/or grassed areas.

1.2.6.3 Granular Fill

Excavations and trenches backfilled with granular material shall be in accordance with Section 4.5.4.7 (Standards and Specifications), or as otherwise directed by the Town.

Granular shall be placed in 300 mm lifts up to the bottom of the road pavement structure, and each lift shall be compacted using mechanical tampers or vibrators to 100% SPD.

A Geotechnical Consultant will be required in order to carry out sufficient testing to certify to the Town that the installation and compaction is in compliance with Town Standards. Test results including a signed cover letter from the geotechnical consultant indicating that all the test completed for the project are in compliance with Town Standards shall be submitted to the Town.

1.2.6.4 Native Fill

Native trench backfill material is only permitted in the grassed area of the boulevard and shall be compacted to 95% SPD.

1.2.7 Asphalt Restoration

All asphalt placed must be in accordance with OPSS 310 and Town of Milton Standards.

Under no circumstance shall a cut be left with a granular surface.

Where multiple cuts/excavations have occurred in the same vicinity, they will be grouped together for full surface restoration at the discretion of the Town in order to minimize asphalt joints.

Minimum pavement structure requirements for restoration works shall be in accordance with Section 1.1.6 (Pavement Design) and the following additional notes:

1. Should the existing pavement structure exceed these minimum requirements, restoration work shall match existing depths.
2. Ontario Street, between Steeles Avenue and Derry Road, which may include up to 50 m of any intersecting streets, consists of a granular base, approximately 150 mm of 30 MPa concrete, 40 mm of HL8 base asphalt, and 40 mm of HL3 top course asphalt.

1.2.7.1 Roadways

During summer months, permanent asphalt restorations shall be made immediately with the exception of excavations backfilled with unshrinkable fill.

The minimum length of asphalt trench restoration shall be 2.5 m to facilitate machine placement (measured parallel with the road). (Refer to TMSD 03-07.02.)

a. Temporary Restorations:

Excavations backfilled with unshrinkable fill must be permanently reinstated with hot mix asphalt no more than 24 hours following the placement backfill, unless otherwise approved by the Town.

During winter months, all cuts must be repaired with hot mix asphalt immediately after backfilling.

b. Permanent Restorations:

Prior to placement of asphalt, the mix design must be submitted and approved by the Town, no less than 2 weeks prior to the scheduled paving.

Prior to permanent pavement repairs, surface asphalt shall be removed by saw cut and cold plane the full width of the disturbed lane, in accordance with TMSD 03-06.01.

The application of a bonding agent (SS1 emulsion) shall be applied to all cold asphalt joints and exposed concrete faces as per OPSS 1103.

Rout and Seal is required on all asphalt joints as per OPSS 341.

c. Borehole Restorations:

Borehole excavations shall be backfilled with unshrinkable fill followed by hot mix asphalt. Refer to Section 1.2.6.2 (Unshrinkable Fill).

1.2.7.2 Multi-Use Paths

a. Temporary Restorations:

During summer months, temporary asphalt repairs shall be made no more than 24 hours after completion of the work taking place below the surface.

During winter months, all cuts must be repaired immediately with hot mix asphalt, unless otherwise approved by the Town.

b. Permanent Restorations:

Paths in boulevards or parks are to be restored as per TMSD 09-01.03.

Regardless of the impact on the path, all cuts are to be restored a minimum of 1.0 m across the full width of the path.

1.2.8 Pavement Markings and Traffic Detection

1.2.8.1 Pavement Markings

In the event that pavement markings have been damaged or removed, restoration is to be done by qualified persons and to the satisfaction of the Town.

Thermoplastic pavement markings shall comply to all standards as per OPSS 1713, Field Reacted Polymeric (Coldplastic) pavement markings as per OPSS 1714, and traffic paint as pavement markings as per OPSS 1712.

Pavement markings must be pre-marked. The dot method by measurement and cable extension is the only method permitted. Pre-marking must be completely covered by the pavement marking application. Roadways must be thoroughly flushed prior to any application. Pavement markings shall be applied only on dry pavement when the temperature is above 10° C for traffic paint and above 5° C for durable materials. Pavement markings must be applied within 5 days of top asphalt installations.

Any work that does not comply with the requirements of OPSS 710 shall be corrected at the applicant's expense. It shall be the applicant's responsibility to ensure that newly applied lines are not tracked or smeared by the public, by protecting the lines with appropriate traffic control measures, and to promptly correct any tracking situations that may occur.

1.2.8.2 Detection Loops

Traffic detection equipment at signalized intersections must be operational at all times. Should the applicant require to cut/damage or block existing traffic detection equipment the Town's Traffic Division must be notified a minimum of 5 business days in advance.

Temporary deactivation of detection loops or similar equipment will require a detection camera to be installed during the entire duration of the work. The temporary detection camera must be in place and operational prior to any in-road detection loops being damaged. All detection loops shall be re-installed following completion of the work to the satisfaction of the Town.

All work shall be performed only by the Town's traffic signal maintenance contractor. All costs related to the above are the sole responsibility of the applicant.

1.2.9 Entrances

Driveway crossings are to be bored. Open cutting of driveways is not permitted unless approved in writing by the Town. Driveways that are cut shall be restored to match the following minimum standards or to match the original depths, whichever is greater.

Where the driveway area between the curb and sidewalk has been impacted due to construction activities, the entire area will be resurfaced to match existing. If there is no sidewalk, or the reinstatement is behind the sidewalk, the joint shall be saw cut in a neat straight line. No ponding is allowed on the finished surface. If ponding occurs, the entire surface shall be removed and redone.

Table 1.5 Minimum Driveway Entrance Construction

Driveway Type	Minimum Pavement Structure/Construction Notes
Residential	75 mm HL3A (placed in 2 lifts) ⁽ⁱ⁾ 200 mm 19 mm Crushed Type II ⁽ⁱ⁾ Surface Course Base
Commercial	40 mm HL3A 50 mm HL8 200 mm 19 mm Crushed Type II ⁽ⁱⁱ⁾ Surface Course Binder Course Base
Heavy Industrial	40 mm HL3A 100 mm HL8 300 mm 19 mm Crushed Type II ⁽ⁱⁱ⁾ Surface Course Binder Course Base
Paving Stones	2 mm to 5 mm joint widths with mortar sand. ⁽ⁱⁱ⁾ 30 mm to 40 mm compacted depth mortar sand bedding. ⁽ⁱⁱ⁾ 150 mm compacted depth Granular 'A' base.
Concrete	Removed to the next closest joint. ⁽ⁱⁱⁱ⁾ Replaced with no less than 150 mm of class C-2 concrete (CSA. A23.1) and 150 mm compacted depth 19 mm crushed type II granular base, compacted to 98% SPD. Non-residential driveways shall have a minimum concrete thickness of 200 mm. Work shall be per OPSS 351 and all related OPSDs.

Notes for Table 1.5:

- i. Any required padding must be asphalt.
- ii. Limestone screenings will also be accepted.
- iii. Where there is no joint, a straight line is to be neatly saw cut.

1.2.10 Concrete

All concrete sidewalk, concrete strips, and concrete curb and gutter constructed within the municipal right-of-way shall be in accordance with OPSD 310.010, OPSS 353, OPSS 351, and shall utilize class C-2 concrete (CSA. A23.1).

All concrete tickets must be submitted to the Town of Milton Permit Inspector following placement.

When the air temperature is below 5° C or likely to fall below this limit within 24 hours of placing, or when the air temperature is at or above 27° C or is likely to rise above this limit during concrete placing, the temperature control requirements of OPSS 904 shall be followed.

1.2.10.1 Curb and Gutter

When curb and gutter is constructed adjacent to concrete pavement, the transverse joint spacing of the curb and gutter shall coincide with that of the concrete pavement. When curb and gutter is constructed adjacent to asphalt pavement the transverse joints shall have a uniform spacing not exceeding 5.0 m.

Curb and gutter restoration shall extend a minimum of 1.0 m beyond the trench limits up to the nearest expansion joint, unless otherwise approved by the Town.

1.2.10.2 Sidewalk

Removal/cutting of sidewalk bays with tactile walking surfaces installed shall not be permitted during winter months.

a. Temporary Restorations:

During summer months, temporary asphalt sidewalk repairs shall be made immediately or within no more than 24 hours, and permanent sidewalk repairs shall be made within no more than 7 days.

During winter months, all sidewalk bays must be filled **immediately** with hot mix asphalt. Permanent restorations shall be completed in accordance with Section 1.2.2 (Construction Dates and Timing), unless otherwise approved by the Town.

All temporary asphalt sidewalk repairs must be finished in a smooth, consistent, and safe manner. The temporary asphalt must be flush with any existing hard surface and the Applicant shall be responsible to maintain these temporary restorations until permanent concrete is placed.

b. Permanent Restorations:

All concrete sidewalk, curb and gutter constructed within the municipal right-of-way in accordance with OPSS 351, OPSD 310.010, and shall utilize class C-2 concrete (CSA. A23.1).

Tactile walking surfaces shall be installed as per OPSD 310.030, 310.031, 310.033, and 310.039 and must:

- have raised tactile profiles
- be cast iron
- be powder coated, dark grey in color
- be removable
- be located at the bottom of the curb ramp
- be set back between 150 mm and 200 mm from the curb edge

- extend the full width of the curb ramp (excluding flared sides)
- align parallel to the curb radius
- be a minimum of 610 mm in depth

In the event a sidewalk bay which previously consisted of directional lines is disturbed and/or needs to be replaced, it shall be reinstated in accordance with the current standards at no expense to the Town.

Where a sidewalk bay is removed, damaged, or cut due to construction activities, the full bay shall be replaced. Concrete shall be placed, consolidated, and finished in a consistent manner. Any excess concrete beyond the sidewalk edge shall be removed and disposed of off-site. Sidewalk bays will be replaced if defaced prior to curing.

Sidewalk shall be installed on undisturbed ground or on fill material compacted to 98% SPD. A leveling course of compacted Granular 'A' may be used to correct subgrade irregularities.

The minimum sidewalk thickness shall be 125 mm. Sidewalk through residential driveways and adjacent to curb shall be increased to 150 mm concrete. At non-residential driveways, concrete thickness shall be 200 mm.

1.2.10.3 Road Base

All concrete placed in roadway base shall utilize 35 MPa high early strength concrete as per OPSS 1350. Existing concrete base must be saw cut a minimum of 300 mm wider on each side of the excavated trench.

Concrete restoration shall not be open to vehicular traffic it has reached 75% of the 28-day strength.

Concrete road base in composite pavements shall be restored per OPSD 509.010.

1.2.11 Boulevards

a. Temporary Restorations:

All sodded boulevard damaged or excavated during the winter months shall be temporarily backfilled with native material, compacted flush to existing grade until permanent repairs are completed in the spring. The Applicant shall be responsible to maintain these areas until permanent restoration is completed.

b. Permanent Restorations in Rural Areas:

Trenches shall be backfilled with native material to the original grade to a minimum of 95% of the maximum Standard Proctor Density.

Surface shall be reinstated to match existing condition.

c. Permanent Restorations in all Other Areas:

Trenches shall be backfilled with native material to the original grade to a minimum of 95% of the maximum Standard Proctor Density. Topsoil shall be screened and shredded fine enough to accept sod. The topsoil shall be free of stones, subsoil refuse, or other extraneous material and be capable of sustaining healthy plant growth.

The Applicant shall place 300 mm minimum of approved topsoil, then sod with No. 1 Grade nursery sod. Where new sod abuts existing sod, the Applicant shall countersink the new sod to match the existing sod. Match lines shall be straight and square. Slopes greater than 3:1 shall be pegged in accordance with OPSD 218.01.

Sod shall be maintained for 3 months following the completion of placement. Should the sod be placed during winter months, the 3-month maintenance period shall commence upon the first day following the winter months. Refer to Section 1.2.2 (Construction Dates and Timing).

During the maintenance period, the sod shall be kept healthy, actively growing and green in leaf colour.

Sodded areas shall be watered in sufficient quantities and at frequency required to maintain soil under sod continuously moist to depth of 75 to 100 mm.

1.2.12 Storm Sewer Connections

Where a new connection to the municipal storm sewer system is made, CCTV video of the storm sewer main, from one maintenance hole upstream of the connection to one maintenance hole downstream of the connection will be required upon completion of the works. Prior to completing the CCTV video, the storm sewers must be flushed and cleaned in accordance with OPSS.MUNI 409.

It is recommended that CCTV video of the same extents be completed prior to the commencement of the works to ensure no undue responsibility for repairs or cleaning is put onto the Applicant.

A Certification Letter, prepared by a qualified professional, stating that all works associated with the new connection have been completed in accordance with Town and Provincial standards and the storm sewer main at the connection are clean and free of debris.

1.2.13 Trees

Trimming or removing trees owned by the Town of Milton requires written approval by the Town and once such approval is granted, shall only be completed by a certified

Arborist. Compensation for any trees to be removed will be determined by Town Forestry and Horticulture staff on a case-by-case basis

Trees in boulevards shall not be damaged and shall be protected from all construction activities. (Refer to TMSD 10-01.02.) Equipment, machines, and vehicles shall not be operated within the drip-line of a Town owned tree and shall not be refueled anywhere near the drip-line of a Town owned tree. Construction materials or earth shall not be placed or stored anywhere near the drip-line of a Town owned tree.

Trenching is not permitted within the drip-line of a tree.

Tree hoarding (offset 1.0 m from the tree drip-line) shall be in place prior to commencing any site alteration in the areas deemed for restoration, construction, or reconstruction. Where a clearance zone of 1.0 m cannot be established between the tree hoarding and the drip-line, the hoarding may be placed within the drip-line, subject to Town approval.

The applicant responsible for the potential tree trimming or removal works must provide a letter (approved by Town Forestry and Horticulture staff) to adjacent property owners that states the work to be done and cites Town approval of any tree trimming or removals and the approach to any tree compensation, as approved by Town Forestry staff.

The Town's Tree Protection Standards, found in Section 1.1.16 (Street Trees), and OPSS 801 must be followed.

1.2.14 Installation of Aerial Cables at Signalized Intersections

This section was prepared based on information from the following sources:

- Ontario Traffic Manual - Book 12 (March, 2012)
- Ontario Provincial Standards - Municipal Construction Specifications - OPSS.MUNI 620 - Traffic Signal Equipment and Electrical Traffic Control Devices
- Ontario Provincial Standard Drawings - OPSD 2245.020 and OPSD 2501.010
- Region of Halton - Uniform Traffic Signal Standards Drawings - UTS 620.060 and UTS 620.061
- Canadian Standards Association C22.3 (CSA C22.3 No. 1-15)

The purpose of this Municipal standard is to ensure that clear unobstructed sight lines are provided to the travelling public on the roadway approaches to the Town of Milton traffic signal controlled intersections.

Existing signalized intersections are to be reviewed and assessed to confirm that all

existing traffic signal heads are unobstructed. If the signal heads are deemed to be unobstructed, however the utilities are not in compliance with these standards, said intersections shall be 'grandfathered' until such time that planned utility maintenance or upgrades occur. At such time when planned utility maintenance or upgrades occur, improvements shall be made by the utility to ensure compliance with this standard.

For non-arterial road intersections (e.g., collector/collector), the Town of Milton's Traffic Division shall be consulted regarding the potential of future signalization of the intersection where new aerial Milton Hydro/utility crossings are planned.

- a. For **new** Milton Hydro/utility aerial crossings of all Arterial intersections, either currently signalized or with likelihood of future signalization:
 - Where possible, a plan layout should be developed by allowing a minimum of 5.0 m between horizontal centres of electrical pole lines and traffic signal poles. (Hydro Authorities typically require a minimum of 3.0 m)
 - With the exception of the electrical span wire neutral, all overhead low voltage conductors shall be insulated with sun resistant jacketed cables.
 - The Hydro Authority neutral shall be raised locally from the standard 8.0 m above grade to 9.5 m above grade (one pole length increment of 1.5 m) across any approaches of the signalized intersections. The placement of the any third party street lighting or secondary feeds would be placed 1.0 m below the neutral and any third party communication conductors be mounted 2.0 m below the neutral so conductors are located above the tops of the 7.5 m signal poles in accordance with the Ontario Traffic Manual (OTM Book 12).
 - No Third Party Communication aerial splices or taps shall be permitted between hydro poles supporting span crossing an intersection.
 - Traffic signal heads are typically mounted at the minimum height of 5.0 m (measured from the bottom of the backboard) over travelled lanes when mounted on traffic signal arms and 5.8 m (measured from the bottom of the backboard to the highest part of the roadway) over travelled lanes when mounted on span wire. In Industrial settings, the minimum height of the traffic signal head may be increased to 5.8 m (measured from the bottom of the backboard to the highest part of the roadway) over travelled lanes when mounted on traffic signal arms at the discretion of the Town of Milton. The height of the traffic signal head is dependent on the traffic signal requirements/movements of the intersection (i.e., potentially more than 3 signal indications).

Arterial intersections shall include Arterial/Arterial, Arterial/Collector, and Arterial/Local public roadways.

b. For **existing** Milton Hydro/utility aerial crossings of all Arterial intersections, either currently signalized or with a likelihood of future signalization:

- Milton Hydro shall set the neutral height to a minimum of 8.0 m on the pole.
- Aerial Third Party Communication attachments shall be set at a minimum 7.0 m height on the hydro pole.

If Third Party Communication attachment height cannot be installed at minimum 7.0 m height at the traffic signal location, the Third Party Communication shall investigate alternative arrangements for crossing of the intersection such as:

- Dip/underground crossing of the intersection
- Aerial realignment around the intersection to ensure that traffic signal heads are not obstructed from a distance of 100m from the intersection.
- No Third Party Communication aerial splices or taps shall be permitted between hydro poles supporting span crossing an intersection.
- Traffic signal heads are mounted at a minimum height of 5.0 m (measured from the bottom of the backboard to the highest point of the roadway) over travelled lanes when mounted on traffic signal arms and 5.8 m (measured from the bottom of the backboard) over travelled lanes when mounted on span wire. In industrial settings, the minimum height of the traffic signal head may be increased to 5.8 m (measured from the bottom of the backboard to the highest part of the roadway) over travelled lanes when mounted on traffic signal arms at the discretion of the Town of Milton. The height of the traffic signal head is dependent on the traffic signal requirements/movements of the intersection (i.e., potentially more than 3 signal indications).

Arterial intersections shall include Arterial/Arterial, Arterial/Collector, and Arterial/Local public roadways.

c. For **mid-block** aerial crossings (minimum 100 m beyond intersections):

- All aerial crossings of roadways shall be set at a minimum of 4.7 m over the highest point of the travelled roadway under maximum sag conditions as per CSA C22.3 No. 1-15 and OPSD 2245.020.

1.2.15 Direct Buried Service Drop Installation Requirements (Telecommunication Cables)

The purpose of this Municipal standard is to ensure that direct buried service drop telecommunication cables located within the municipal right-of-way are consistent and do not generate maintenance conflicts with Town infrastructure.

Direct buried cables shall be a minimum 0.5 m offset from back of curb or edge of sidewalk at a minimum depth of 150 mm.

All driveway crossings must be completed by trenchless methods (e.g., torpedo or directional drill) at a minimum depth of 300 mm.

Any disturbed driveways shall be reinstated in accordance with Town Standards.

Where a direct buried cable must cross the sidewalk, it shall be perpendicular to the sidewalk and placed in line with the side lot line of the fronting property.

Sidewalk crossings shall be by trenchless methods where possible. Tunneling is not permitted.

Sidewalk bays removed or disturbed shall be reinstated in accordance with Town Standards.

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1.3 Signage and Traffic Control Devices

The Owner is responsible for supplying, installing, and maintaining all regulatory, warning, and information signage (including street name and rural street number signs) in accordance with the approved Traffic Control Plan (TCP) and Town standards. All traffic control signs shall be aluminum.

The Owner **may not** install any regulatory, warning, or information signage that is not on the approved TCP unless otherwise directed by the Town. Temporary signage shall be installed prior to the issuance of building permits.

1.3.1 Signage

1.3.1.1 Temporary Street Name Signs

Temporary street name signs to be constructed based on the following:

- a. Minimum 10 mm (3/8") thick plywood, 15 cm high, painted white.
- b. Lettering for street names to be 10 cm tall, and lettering for suffix to be 7.5 cm high.
- c. Lettering colour shall be black and on both sides of sign.
- d. Font shall be Helvetica Medium using upper-case and lower-case.

1.3.1.2 Permanent Street Name Signs

Permanent street name signage must be installed prior to the commencement of the Maintenance Period. All other signage, including temporary street name signs and 'No Parking' signs must be installed prior to the release of building permits.

Local/Collector Street Name Signs:

- a. Style:
 - Blue engineering grade background, white reflective lettering
 - Helvetica Medium Font, using upper-case and lower-case lettering, lettering on both sides of the sign
 - May include an approved logo on both sides of the sign before (left of) the street name
- b. Size:
 - 15 cm tall (length to suit)
 - 10 cm letter size

- 7.5 cm letter size for suffix (e.g., Rd., St., Ave., etc.)

c. Material:

- Extruded aluminum

Decorative Local/Collector Street Name Signs:

a. Style:

- Blue engineering grade background, white reflective lettering Helvetica Medium Font, using upper-case and lower-case lettering, lettering on both sides of the blank
- Name of Hamlet, Neighbourhood, or District shown above street name using Century Schoolbook Bold Font in black
- The word “Hamlet”, “Neighbourhood”, or “District” included under the street name using Century Schoolbook Bold Font in black
- 1.9 cm white border

b. Size:

- 25.4 cm tall (length to suit)
- Additional 2.5 cm on top and bottom of sign for capping purposes
- Additional 3.8 cm on end of sign for end-mounting purposes
- 10.0 cm letter size for street name
- 5.0 cm letter size for suffix (e.g., Rd., St., Ave., etc.)
- 3.2 cm letter size for name of Hamlet, Neighbourhood or District above street name (uppercase)
- 2.0 cm letter size for word Hamlet, Neighbourhood or District under street name (upper-case and lower-case)

c. Material:

- 3.1 mm (1/8”) thick aluminum

Refer to TMSD 16-03.01.

Decorative Street Name signs shall be installed by the Owner. An Owner wishing to install decorative street name signs in a new subdivision must contact the Infrastructure Division (Traffic Section) for approval. This must be established through the Engineering Submission stages. The Town will advise the Owner of what ‘neighbourhood’ their development is in. Street name signs must be manufactured in accordance with the Town’s standards and follow these procedures:

- a. Submit an Application for Decorative Street Name Signs to the Infrastructure Division (Traffic Section) and include a map indicating locations of the proposed street name

sign installations as well as a sample of each of the proposed decorative street name signs.

- b. Once approved, the Town will require the sign manufacturer's name, address, phone number, and contact person. A sample of the completed sign with artwork and/or symbol must be submitted for review/approval and will be retained by the Town.
- c. The Town will also require a contribution to a reserve fund for the replacement of these street name signs. This amount is included in the User Fee Report and By-Law schedule. This is to ensure that if/when these decorative street name signs need replacing, they can be replaced with the same type of sign.
- d. The Town will inspect these signs as part of the subdivision assumption inspection. Any deficiencies must be corrected by the Owner prior to the subdivision being assumed by the Town.

Roundabout Street Name Signs:

Refer to TMSD 16-03.02.

Mast Arm Street Name Signs:

- a. Style:
 - Blue engineering grade background, white reflective lettering, 2.4 cm white border
 - Helvetica Medium Font, using upper-case and lower-case lettering
- b. Size:
 - 45 cm x 214 cm blank
 - 26 cm minimum letter size
- c. Material:
 - 3.1 mm (1/8") thick aluminum

1.3.1.3 Private Street Name Signs

Street name signs for private roads shall conform to the Town's standards, however, the background colour shall be white and the lettering colour shall be blue.

1.3.1.4 Rural Street Number Signs

- a. Style:
 - Green engineering grade background
 - White reflective lettering
- b. Size:
 - 13 cm blank
 - 10 cm lettering
- c. Material:
 - Extruded aluminum

All rural street number signs are to be mounted on galvanized steel U-channel posts at a height of 1.0 m and set back 1.0 m onto private property.

1.3.1.5 Street Name Signs at Intersections with Regional Roads

Where a Town road intersects with a Regional Road the following shall be applied, however, Regional Standards govern:

- a. At signalized intersections, the developer shall install Mast Arm Street Name Signs (green blanks with white lettering).
- b. At unsignalized intersections, the developer shall install a set of decorative street name signs that will include the name of Hamlet, Neighbourhood, or District shown above street name and the word Hamlet, Neighbourhood, or District included under the street name.

1.3.1.6 Design

A TCP must be submitted for approval, showing the locations of all signage to be installed in the subdivision. The TCP must be coordinated with the street tree planting plan in order to reduce potential conflicts between signage and street tree plantings. Additional traffic signage and/or pavement markings outside of what is shown in the approved TCP may be required if deemed warranted by the Town. The Owner is responsible for all costs associated with the implementation of all traffic signage and pavement markings.

General:

- a. Where possible, signs shall be mounted on street light poles.

- b. Where a side street intersects the school's street within 150 m of the school property, additional information and/or signage may be required.
- c. Parking will be prohibited on both sides of laneways and roads with a width of less than 8.6 m (curb face to curb face).
- d. Parking will be prohibited on one side (adjacent to fire hydrants) on roads with a width of 8.6 m to 10.6 m (curb face to curb face).
- e. Rb-51 'No Parking' signage must be implemented in areas where there is horizontal curvature in the roadway.
- f. Rb-51 'No Parking' signage to be installed ahead of approaching street trees to avoid obstruction.
- g. 15.0 m intersection parking prohibitions ('No Parking Any Time' signs) are to be installed at all local to collector intersections.
- h. Collector/Collector, Collector/Arterial, and Arterial/Arterial intersections shall have parking prohibitions up to 50 m as determined by Traffic Division.

Stop Signs:

- i. Ra-1 'Stop' signs are to be used where required on local roads.
- j. Ra-101 'Stop' signs are to be used where required on collector and arterial roads.
- k. Street name signage shall not be mounted above stop signs.

No-Parking Signs:

- l. Rb-1 'No Parking' signage must begin 15 m to 20 m from each intersection with additional signs every 45 m to 50 m.

No-Stopping Signs:

- m. Rb-55 'No Stopping' restrictions, school zone flashers, speed limit information signs to be installed near elementary schools (TMSD 15-02.01). Owner to contact Town's Traffic Division to obtain further information.
- n. Rb-55 'No Stopping' signage opposite school areas to specify: 8:00 am - 5:00 pm, Monday - Friday, September 1 to June 30.
- o. Rb-55 'No Stopping' signage within 15 m of either side of a signed bus stop.

Speed Limit Signs:

- p. Rb-2 'Maximum 50' and 'Begins' tab (where applicable) to be installed on all roads leading away from arterial roads, unless otherwise directed by Town staff.
- q. 'Maximum 40 Area' and 'begins'/'ends' signs are to be installed as directed by Town staff. Refer to TMSD 16-04.04.

Heavy Truck Signage:

- r. Rb-62 'No Heavy Trucks' signage to be installed on all local and collector roads leading away from arterial roads.

Pedestrian Crossover Signage:

- s. A Level 2, Type D Pedestrian Crossover (PXO), in accordance to the latest version of Ontario Traffic Manual Book 15, shall be installed on each approach of every roundabout. Furthermore, each approach of all roundabouts are to have two 'PXO Information Signs' (Refer to TMSD 16-05.01) implemented (one on each side of all crosswalks). The PXO information signs are to be installed below and parallel to the Ra-5L/R and Ra-4t signs (where present) facing towards where pedestrians would be waiting to cross (i.e., where the tactile plates are located). PXO information signs are not required on median island sign posts.
- t. When a Level 2 Type C PXO is required, all equipment is to be obtained through a Town approved supplier. Contact the Town's Traffic Division for more information and approved suppliers."

1.3.1.7 Standards and Specifications

High-intensity and/or diamond grade sheeting will be used where required in accordance with the Ontario Traffic Manuals or where required by the Town. All sheeting will conform to the most recent 3M specifications.

Street Name Signs:

- a. Street name signs (excluding those mounted on a mast arm) are to be mounted on 76 mm diameter hot dipped galvanized tubular steel posts.
- b. Length of Street Name Sign posts to be 3.65 m, of which 0.9 m is to be underground after installation, (i.e., visible post to be 2.75 m) with a 23 mm cleat welded to the bottom. Street name signs to be mounted on top of the post.
- c. Street name signs to be installed on the opposite corner from the intersection traffic control sign. Except at all-way stop-controlled intersections.
- d. Roundabout street name signs to be mounted on two telespar posts and are to be

located on the splitter islands of each approach.

- e. Street name signs to have hi-intensity sheeting (blue) with white lettering except roundabout street name signs which are to have hi-intensity sheeting (green) with white lettering. (TMSD 16-03.03)
- f. Font shall be Helvetica Medium, using upper-case and lower-case letters, on both sides.

Sign Posts:

- a. Sign posts on roundabout splitter islands with three or more signs are to be 3.3 m tall base mounted aluminum poles. Manufacturer "Traffic Hardware & Design" or "Sentinel Pole & Traffic" part number TP10-423A-AB-150 (for both), "Aluminous Lighting Products" part number ATP10-423A-AB-150 or approved equivalent.
- b. All other road signs to be mounted on two-piece U-channel posts. (TMSD 16-01.01)
- c. Posts to be 64 mm x 32 mm deep U-channel design with 4.2 mm (0.165") thick steel.
- d. Posts to be hot-dipped galvanized after fabrication ensuring all exposed surfaces are coated. Posts to be roll-formed and pierced with 11 mm (7/16") diameter holes on 50 mm (2") centres.
- e. Base (anchor) section of U-channel post to be 1.5 m long, of which 1.0 m must be in ground.
- f. Sign post (upper) section of U-channel post to be bolted by three galvanized bolts to base anchor section, with length as required such that the bottom of the sign(s) being mounted is(are) 1.5 m - 2.5 m above the roadway, unless otherwise directed by the Town.
- g. Sign posts are to be a minimum of 1.2 m away from electrical transformers to avoid conflict with grounding pads.

Table 1.6 Sign and Lettering Sizes

Road Type / Sign Type	Size of Aluminum Blank	Lettering Size	
		Name	Suffix
Local	150 mm	100 mm	75 mm
Local (Decorative)	250 mm	100 mm	50 mm
Mast Arm	450 mm x 2140 mm	250 mm	150 mm
Collector / Arterial	250 mm	100 mm	50 mm
Rural Street Number	120 mm	100 mm	N/A

Notes for Table 1.6:

- i. See TMSD 16-03.03 for Roundabout Street Name sign specifications.

1.3.2 Pavement Markings

The Owner is responsible for supplying, installing, and maintaining all pavement markings required by the Town, in accordance with the approved TCP and Town standards. The TCP must be submitted for approval, showing the locations of all pavement markings proposed in the subdivision.

The Owner may not install any pavement markings that are not on the approved TCP unless otherwise directed by the Town.

Painted pavement markings must be installed on base course asphalt prior to the release of building permits and reapplied annually.

1.3.2.1 Design

Pavement markings include the following (See TMSD 15-01.01):

- a. **Stop Bars** (60 cm wide) at all stop-controlled approaches except local/local intersections and local/laneway approaches. Stop bars to be installed at all signalized intersections. Stop bars are to be installed 1.0 m away from crosswalks unless determined otherwise by the Town.
- b. **Pedestrian Crossing Lines** (10 cm wide with 2.5 m separation) on all stop-controlled approaches with intersecting sidewalks, except local/local and local/laneway intersections.
- c. **Lead-In Centrelines** (10 cm wide and 15.0 m long) at all intersection approaches except local/local and local/laneway intersections.

- d. **Ladder Crosswalk** (horizontal lines 20 cm wide extending from edge of pavement to edge of pavement, with vertical bars 60 cm wide with 60 cm separation between bars and a minimum length of 2.5 m) at all PXOs, signalized intersections, and where crosswalks are paired with cyclist crossrides.
- e. **Elephants Feet** (40 cm x 40 cm at 40 cm spacing) used for cyclist crossrides across site entrances and intersections where cycle tracks are present, subject to consultation with the Town.
- f. On collector roadways where parking is permitted on one side only, offset yellow paint lines are to be installed, as per approved TCP.
- g. Longitudinal edge lines through horizontal and vertical curves and in areas susceptible to fog or other visibility constraints.
- h. Directional arrows as per OTM Book 11 for designated turn lanes.
- i. Supervised school crossings are required where directed by the Town.

1.3.2.2 Standards and Specifications

The Owner shall contact the Town for approval prior to commencing the first application of pavement markings.

- a. All pavement markings shall be durable prior to assumption. Thermoplastic as per OPSS 1713 or Field Reacted Polymeric (Cold plastic) as per OPSS 1714 must be used.
- b. Roads to be thoroughly flushed prior to each application.
- c. Not to be applied between 3:30 pm Friday and 10:00 pm Sunday.
- d. Only to be applied on dry pavement when temperature is above 10° C.
- e. Paint to be applied at a wet film thickness of 16 mm and dry to a film thickness of no less than 13 mm.
- f. Lane lines shall be applied at a minimum rate of 1 L per 20 m of line length.
- g. Painted pavement markings to be applied with retro-reflective glass beads, applied via overlay method at a rate of 0.60 kg per L of paint on all lines and symbols.
- h. Pavement markings must be pre-marked. The dot method by measurement and cable extension is the only method permitted. Pre-marking must be completely covered by the paint application.

Any work that does not comply with the requirements of OPSS.MUNI 710 shall be

corrected at the Owner's expense. It shall be the Owner's responsibility to ensure that newly applied lines are not tracked or smeared by the public, by protecting the lines with appropriate traffic control measures, and to promptly correct any tracking situations that may occur.

1.3.2.3 Bike Lane Markings

All bike lane markings including symbols must be installed as per TAC Bikeway Traffic Control Guidelines for Canada (2nd Edition, 2012-February). (Refer to TMSD 15-03.01.)

1.3.2.4 Pedestrian Crossovers

All Pedestrian Crossover (PXO) pavement markings are to be installed as per the latest edition of OTM Book 15. All minimum setbacks shall be adhered to.

1.3.2.5 Removal of Pavement Markings

Where the removal (obliteration) of pavement markings is required, it shall be carried out by use of a soft abrasive blast cleaning system (e.g., soda blasting). Grinding of pavement markings will not be permitted.

1.3.3 Traffic Signals

The Owner is responsible for designing, supplying, installing, maintaining, and operating for a minimum warranty period of 1 year, all temporary and permanent traffic control signals required by the Town. The installation of traffic signal controls is based on the Traffic Signal Warrant Matrix Procedure (TAC, 2005) or as directed by the Town.

1.3.3.1 Design

The Owner shall contact the Town's Manager, Traffic to confirm the process and requirements for traffic signal design and construction in the Town.

1.3.3.2 Standards and Specifications

All works are to be in accordance with the latest edition of the Uniform Traffic Signal Specification for Operating Authorities within the Region, except where superseded by specifications in Section 7.4 (New Traffic Signal Construction) and/or as otherwise directed by the Town.

1.4 Transit Services

The Town of Milton provides fixed-route conventional, specialized, and on-demand/microtransit services. Transit oriented development policies and best practice design guidelines have been incorporated into the design standards outlined in this section.

All transit design standards are subject to revision and can be reviewed and/or clarified with the Transit Division. The location of transit routes, transit stops, and associated passenger amenities shall be determined, authorized, and approved by the Transit Division.

On-street transit infrastructure is the primary customer interface when accessing a transit service. Transit infrastructure is to be designed for barrier-free pedestrian access and sited with safety and security considerations.

An accessible transit stop is defined as providing a barrier free connection between the transit vehicle and surrounding pedestrian network (including a flat, level, hard surfaced landing area, with necessary connections), and providing passenger amenities that are user friendly to persons with disabilities.

1.4.1 Transit Route Locations

The Transit Division shall identify all potential transit routes, services, frequencies, and availability. Municipal roads that are designed for potential transit routes shall incorporate design standards to accommodate bus typology, size, service frequency, and passenger load factors.

Designated transit routes shall have the following standards:

- Binder course asphalt thickness increased to a minimum of 100 mm for local roads
- A minimum curb lane width of 3.5 m (excluding parking lane/lay-by)
- A minimum curb radius of 13.0 m

1.4.2 Transit Stop Locations

Transit stop location refers to the placement of a transit stop relative to the nearest intersection. The types of transit stop placement include:

- Far side of the intersection
- Near side of the intersection
- Mid-block between intersections

Far side and near side stops are preferred over mid-block transit stops as they provide pedestrians increased access and safety when crossing the road. However, transit stop locations depend on environmental context, vehicular and pedestrian patterns at the intersection, right-of-way availability, transit routing, roadway conditions, pedestrian facilities, and other site features. Transit stops are typically located in pairs (one on each side of the road along two-way route segments). It is recommended that transit stop pairs be positioned close together along the route to ensure trip planning simplicity.

a. Far side transit stop locations shall be used if:

- The near side of the intersection includes a right turn lane (not used as a transit queue jump)
- The primary trip generator is upstream from the intersection
- Transit amenities are better accommodated (i.e., land availability) compared to near side stops
- There is a high volume of right turns on the near side of the intersection
- The intersection is a complex intersection with multi-phase signals or dual turn lanes
- The transit stop is part of a Bus Rapid Transit (BRT) or express service
- Pedestrian movements are safer than on the near side
- Vehicular traffic is heavier on the near side of the intersection

b. Near side transit stop locations shall be used if:

- The primary trip generator is downstream from the intersection
- Transit amenities are better accommodated (i.e., land availability) compared to far side stops
- Pedestrian movements are safer than on the far side
- The route requires a right turn at the intersection
- The route has a Queue Jump Lane (subject to configuration of transit priority measures)
- Vehicular traffic is heavier on the far side of the intersection

c. Mid-Block transit stop locations shall be used if:

- There is insufficient curbside space or vehicle travel lane capacity at adjacent intersections
- The stop is serving a key trip origin or destination
- A signalized and/or marked pedestrian crossing is available

1.4.3 Standard Transit Stop Zones

The area along the street where a transit bus stops for passenger boarding and alighting is referred to as a Transit Stop Zone. These zones differ depending on transit stop location. However, certain factors are taken into consideration for every transit route.

The Transit Stop Zone is the space needed for a transit bus to safely stop at a transit stop. The distances include maneuvering space required for the bus with a fully extended bicycle rack to:

- Enter the Transit Stop Zone
- Position parallel to the curb to load and unload passengers
- Exit the Transit Stop Zone to re-enter traffic

All conventional Milton Transit buses are equipped with a bicycle rack for customers to place their bicycles while riding. Each bicycle rack can hold a maximum of two bicycles. When fully deployed, the bicycle rack adds an additional 1.5 m to the front of each bus. This measurement is accounted for in all Transit Stop Design Standards.

a. Far Side Transit Stop Design Specifications:

To accommodate a standard conventional bus, transit stop locations shall be positioned on the departure side of intersections, with a minimum installation dimension of 25.0 m from the curb radius with the following distance allocations:

- 7.8 m transit stop entrance from the intersection
- 12.2 m standard conventional bus length + 1.5 m bicycle rack deployment
- 5.0 m minimum maneuver length for negotiating parked vehicles (marked with 'No Stopping' signage)

b. Near Side Transit Stop Design Specifications:

To accommodate a standard conventional bus, transit stop locations shall be positioned on the arrival side of intersections, with a minimum installation dimension of 5.0 m from the curb radius with the following distance allocations:

- 5.0 m transit stop entrance from the intersection
- 16.8 m minimum entry maneuver length for negotiating parked vehicles (marked with 'No Stopping' signage)
- 12.2 m standard conventional bus length + 1.5 m bicycle rack deployment

c. Mid-Block Transit Stop Design Specifications:

To accommodate a standard conventional bus, transit stop locations shall be positioned with the following distance allocations:

- 16.8 m transit stop entrance and maneuver length from parked vehicles, where applicable (marked with 'No Stopping' signage)
- 12.2 m standard conventional bus length + 1.5 m bicycle rack deployment
- 5.0 m minimum maneuver length for negotiating parked vehicles (marked with 'No Stopping' signage)

d. Multi-Bus Transit Stop Design Specifications:

For transit stops at which more than one conventional bus may be stopped at a given time, additional stopping distance is required so that buses are not waiting to access the Transit Stop Zone. Each additional conventional bus requires stopping distance that includes:

- 12.2 m standard conventional bus length + 1.5 m bicycle rack deployment
- 5.0 m minimum maneuver length between buses

1.4.4 Contextual Transit Stop Zones

a. Adjacency to Driveways:

To accommodate a 12.2 m standard conventional bus, transit stops shall be located on the far side of the adjacent driveway (where possible) with the following distance allocation:

- 15.0 m minimum from a driveway entrance (where possible)

b. Adjacency to Pedestrian Crossings:

To accommodate a 12.2 m standard conventional bus, transit stops shall be located on the far side of the adjacent dedicated pedestrian crossing (signalized and/or marked) with the following distance allocation:

- 15.0 m minimum from the far side of a pedestrian crossing

c. Adjacency to Roundabouts:

A transit stop adjacent to a roundabout shall be located and positioned to avoid traffic queuing while maintaining pedestrian safety and access. When a transit stop is in the vicinity of a roundabout, a near side location provides an advantage of being in a potentially lower speed environment where vehicles are entering the roundabout (compared to a far side location where vehicles may be accelerating as they exit the roundabout).

A bus stopped at a near side stop will not obstruct sightlines to and from pedestrians crossing in a crosswalk at a roundabout. At multilane roundabout approaches, a near side stop can be included in the travel lane (bump out design) with a set-back of:

- 15.0 m minimum from the approach side of a pedestrian crossing

Near side transit stops should be situated far enough away from the splitter island so that a vehicle overtaking a stationary conventional bus does not strike the splitter

island, especially as the bus departs the stop location.

Where necessary, far side transit stops adjacent to roundabouts shall be located beyond the crosswalk and splitter island to not obstruct pedestrian sightlines while crossing. To accommodate a standard conventional bus on the far side adjacent to a roundabout, requirements shall follow the Mid-Block Stop Design Specification, where applicable.

d. Adjacency to Bike Lanes:

Typically, bike lanes are positioned on the right-hand side of the pavement adjacent to the curb, or separated from the curb by a parking lane, transit bay, or turning lane. Key considerations for this arrangement are:

- Transit stops are to be a minimum 3.0 m wide next to a bike lane
- Transit stops in a transit bay or parking lane adjacent to a bike lane require longer pull-in and pull-out taper distances (due to added lane width):
 - 6:1 pull-in (entry) taper ratio
 - 3:1 pull-out (exit) taper ratio

Subject to site-specific and right-of-way availability conditions, the following transit stop conditions adjacent to a bike lane may also be considered:

- At a location where the available right-of-way is not sufficient to provide a 3.0 m wide transit stop next to a bike lane, the bus may partially encroach on the bike lane at the transit stop.
- A minimum combined width of 4.3 m shall be provided for the transit stop and bike lane to provide sufficient clearance for a cyclist to safely pass a stopped bus without the need to enter the adjacent travel lane.
- At a location where a separated bike path (one-way or two-way) is provided between the travel lane and the sidewalk, and where sufficient right-of-way is available, an island bus stop with the separated bike lane between the sidewalk and the transit stop may be considered:
 - To follow customer desire lines, a raised crosswalk may be placed across the bike path with 9.0 m minimum width to provide access to bus entry/exit doors.
 - Crosswalk markings, crosswalk signage, and supplementary 'Yield to Pedestrians' signs would be required.

e. Transit Bump Outs:

A transit bump out is a widening of the pedestrian sidewalk/pathway to extend the Transit boarding and alighting area into the roadway. Bump outs are utilized to improve loading/unloading of the transit bus and shorten dwell time at a transit stop.

Dwell time refers to the time used to discharge and take on passengers at a transit stop and includes time for the opening and closing of doors. A bump out may conserve curbside space for parking relative to a Transit Stop Zone without a bump out.

Bump outs are used where pedestrian volumes are high, or where the sidewalk is narrow and additional waiting space is required. The bump out provides a larger waiting area for passengers (i.e., to accommodate a shelter), lessens interference with pedestrians using the sidewalk, and can serve as a pedestrian amenity by shortening the crossing distance. Bump outs provide an ideal balance between traffic flow, vehicular parking, and transit services since the condition eliminates traffic re-entry by the bus.

f. Transit Bays:

A transit bay (or lay-by) is a location outside of the lane of traffic (also known as off-line) with respect to the traffic travel lanes. It is a modified curb configuration for bus pull-ins (entries) and pull-outs (exits).

Transit bays allow general traffic to pass a loading bus, mitigating impacts with right-turning vehicles at an intersection. They can be effectively incorporated into a site design where unusually high volume loading (and associated layovers) are anticipated.

Advantages are presented when using this configuration where an intersection presents a particular hazard or conflict with transit operations.

The Town of Milton discourages the use of transit bays because of delays and hazards when buses re-enter the traffic stream. Transit bays are only warranted under specific environmental conditions and are recommended under the following conditions:

- High speed arterial roads (posted of 60 km/h or higher)
- High volume passenger boardings and alightings
- Operational layovers
- High-Order, Bus Rapid Transit conditions

The location of transit bays shall be determined, authorized, and approved by the Transit Division.

To accommodate a 12.2 m standard conventional bus, transit stop locations with a

transit bay design shall include the following distance allocations:

- 15.5 m transit stop pull-in (entry) taper
- 12.2 m standard conventional bus length + 1.5 m bicycle rack deployment
- 13.0 m transit stop pull-out (exit) taper for negotiating parked vehicles (marked with 'No Stopping' signage)

Consideration shall be given to future needs of multiple buses serving a transit stop with a transit bay, requiring additional distances (i.e., bus length and separation).

Refer to TMSD 14-05.01

1.4.5 Transit Stop Passenger Areas

The Transit Stop Zone includes a passenger area that allocates space for customers to waiting for, board, and alight transit buses. The passenger area is bounded by the curb face and the adjacent property line or boulevard before the property line. The following features shall be incorporated into a passenger area to provide a minimum level of universal accessibility:

- Passenger landing pad
- Wheelchair pad
- Shelter with bench (where feasible and warranted)

1.4.6 Transit Lanes

Since transit buses carry more passengers than other vehicles relative to road space utilization, transit priority measures can support the efficiency of the transportation system by:

- Maximizing the carrying capacity of the road system
- Minimizing overall travel times

However, it is important to maintain an appropriate balance in the design so that the overall service level is acceptable to both transit buses and other road users. The purpose is to achieve an overall net gain in the performance of the transportation system. Types of transit priority configurations include:

- Exclusive Bus Lanes
- Queue Jump Lanes
- Traffic Signal Priority Measures

a. Exclusive Bus Lanes:

Exclusive bus lanes include the reservation of road space exclusively for transit buses over long distances to by-pass congested travel lanes. The design of an exclusive bus lane is dependent upon several factors that include:

- Availability of adequate right-of-way
- Roadway geometry and alignment
- Cross street access and access to adjacent developments
- Traffic volumes
- Bus operating speeds

An exclusive bus lane shall have the following allocations:

- 3.5 m minimum lane width for single lane operation
- 7.0 m minimum for two lane (bi-directional) operation

b. Queue Jump Lanes:

A queue jump lane refers to a dedicated lane for transit buses to by-pass the regular traffic queue, usually at a location where queues frequently form. In designing a queue jump lane, it is important to ensure that the entry to the lane is not obstructed by the traffic queue in the adjacent travel lane and that it is long enough to accommodate anticipated transit bus volumes. In some cases, a queue jump lane is provided for transit buses through the regulation of 'Buses Excepted' on an exclusive right-turn lane for transit buses to proceed through the intersection.

A queue jump lane at an intersection can be facilitated by a bus-only traffic signal phase (i.e., a bus-activated phase) so that buses using the queue jump lane can leave the lane safely and access the travel lane on the far side of the intersection ahead of regular traffic. Sufficient intersection clearance time is required for the transit bus to clear the intersection before opposing traffic signals turn green.

A queue jump lane shall have the following allocations:

- 3.5 m minimum lane width
- 15.0 m minimum distance from the stop bar
- Appropriate entry taper, based on traffic volumes and vehicle stacking conditions

Refer to TMSD 13-04.01.

1.4.7 Transit Signal Priority Measures

Traffic control measures, that give transit preferential treatment in the general traffic flow through traffic management schemes, include:

- Bus-Only Signals
- Bus-Actuated Signals
- Transit Signal Priority

a. Bus-Only Signals:

Bus-Only Signals are typically used in conjunction with an exclusive bus lane or a queue jump lane on the near side of the intersection. Under this treatment, transit buses are given an exclusive traffic signal phase (i.e., protected movement) to clear a congested intersection ahead of the regular traffic stream.

At locations where there is no travel lane or exit taper to receive the bus on the far side of the intersection, a bus-only signal phase is used to allow transit bus to pull out of a queue jump lane and then enter the regular travel lane safely and ahead of other vehicles.

b. Bus-Actuated Signals:

Priority for transit buses turning onto a major street from a minor street can be provided through traffic signals that can only be actuated a bus. The actuation may be achieved by physical loop detectors, video detectors, or wireless detectors that communicate with a transmitter on the bus. When the presence of an approaching bus is detected, a special protected signal phase is activated, allowing the transit bus to proceed safely through the intersection.

c. Transit Signal Priority (TSP):

TSP is an operational treatment that assists transit buses through signalized intersections utilizing passive (non-bus-activated) or active (bus-activated) measures.

Passive TSP involves re-optimization of signal timing and adjustment of phases, splits, and/or, off-sets to provide a green band that reflects the travel time of buses along the transit corridor.

Active TSP is based on the presence of transit buses with priority only provided when a bus is detected on an intersection approach.

The location of all TSPs shall be determined, authorized, and approved by the Traffic Division and Transit Division.

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