City of Hamilton
Public Works Department
77 James Street North, Suite 320
Hamilton, ON L8R 2K3

# CONSTRUCTION AND MATERIALS SPECIFICATIONS MANUAL

## REVISION # 7 – October 2017

## NOTICE OF REVISION

**October 5, 2017**

**Email Contact Information:**

The City will only send notification of Manual revisions by email. If you would like to receive notifications of future revisions, send your email address to claudio.leon@hamilton.ca

**Access to Hamilton Standards:**

Each manual holder is responsible for determining implementation dates and directions for use of these revisions. It is recommended that you retain superseded versions of specifications for future reference.

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Here you will find the latest versions of the published standards, archives of the previously published standards and Revision Information Sheets for currently published standards.

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Public Works Department – Reception
77 James Street North, Suite 320
Hamilton, Ontario, L8K 6E9
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**Revisions to the Construction and Materials Specifications Manual:**

| Superseded / Cancelled (Remove) | | Revised / New (Insert) | | Comments |
|---|---|---|---|---|
| **Document** | **Dated** | **Document** | **Dated** | |
| Construction and Material Specification Manual Index | June 2017 | Construction and Material Specification Manual Index | October 2017 | Specification Dates Updated |
| Form 800, Specification for Hot Mix Asphalt | June 2013 | Form 800, Specification for Hot Mix Asphalt | October 2017 | Specification Revised |
| Standard Road Drawing Index | June 2017 | Standard Road Drawing Index | October 2017 | Drawings below added. |
| RD-124 | January 2006 | RD-124.01 | October 2017 | Former drawing RD-124 Superseded |
| | | RD-124.02 | October 2017 | |
| | | RD-124.03 | October 2017 | |

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# CONSTRUCTION AND MATERIAL SPECIFICATIONS MANUAL INDEX

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## .01 GENERAL

This specification covers the requirements for hot mix asphalt designed using the Superpave method, including warm mixes.

Unless otherwise amended herein, the design, materials, production and placement of hot mix asphalt shall conform to the following:

- OPSS 310 – Construction Specification for Hot Mix Asphalt, including Appendix C
- OPSS.MUNI 1003 – Material Specification for Aggregates – Hot Mix Asphalt
- OPSS.MUNI 1101 - Material Specification for Performance Graded Asphalt Cement
- OPSS.MUNI 1151- Material Specification for Superpave and Stone Mastic Asphalt Mixtures.

## .02 SUPERPAVE MIXES

Superpave types shall be as specified in the contract documents, shall be in accordance with Tables 1 and 2 of OPSS.MUNI 1151, and shall be approved prior to use.

The Performance Graded Asphalt Cement (PGAC) shall be in accordance with OPSS.MUNI.1101, as amended by this specification.

### .02.01 Design Requirements

#### .02.01.01 Submission and Design Requirements

The design of Superpave mixes shall be in accordance with the requirements of OPSS.MUNI 1151 Material Specification for Superpave and Stone Mastic Asphalt Mixtures, as amended by this specification.

#### .02.01.02 Mix Requirements for Design Purposes – Hot Mix and Warm Mix

1151.04.01 of OPSS.MUNI 1151 is amended by the addition of the following:

Asphalt cement shall be performance graded asphalt cement and shall be as described in section .02.02.02.

The Contractor shall design, produce and place asphalt in accordance with the following:

- All surface and binder course asphalt produced and placed on or after November 1 of any year shall be a Warm Mix;
- Where weather conditions at the time of paving prevent the placement of Hot Mix asphalt in accordance with OPSS temperature requirements, a Warm Mix shall be used.

Warm mix asphalt shall be in accordance with section 02.01.03.

**.02.01.03 Additional Design Requirements for Warm Mix Asphalt**

OPSS 310.04.01 of OPSS 310 - Appendix 310-C is hereby deleted and replaced with the following:

The Contractor shall be responsible for the following:

a) Using an approved WMA additive listed below:

i) Advera
ii) Evotherm
iii) Hyper Therm
iv) Sasobit
v) SonneWarmix

b) Preparation of the mix design and reporting of all testing results in accordance with test method LS-318 Practice for the Design of Superpave Warm Mix Asphalt (WMA).

c) Any WMA technology not listed in a) above shall be subject to review and approval by the City.

d) The WMA mix design and the job mix formula at the anticipated WMA production temperature, both of which shall be according to the requirements of this specification.

e) Ensuring that, during the development and verification of the WMA mix design, the WMA technology does not adversely affect the asphalt cement performance grade and the WMA mixture performance.

f) Moisture content of the aggregate coming from the dryers shall not exceed 0.5%.

**.02.01.04 Submission Requirements – Warm Mix Asphalt**

OPSS 310.04.02 of OPSS 310 - Appendix 310-C is deleted and replaced by following:

A minimum of 4 weeks prior to paving with WMA, the following information shall be submitted to the Project Manager, in writing:

a) The name of the supplier and the approved WMA technology selected.

b) All test results required under LS-318 and any other details on how the requirements of this specification shall be met.

c) If applicable, the type and dosage of WMA additives, how the additives are to be incorporated to produce the WMA, and the WMA technology supplier's established recommendations for usage.

e) Where a proposed technology is not currently approved, the Contractor shall submit the following information a minimum of 4 weeks prior to proposed paving dates for review and approval:

i) Name of process, manufacturer, type of process and the technology group;

ii) Manufacturer's recommendations including:

a) Process description and mix design recommendations;
b) Required plant modification and hauling recommendations;
c) Mixing and compaction temperatures;
d) Construction aspects, if any differences from conventional HMA paving besides temperatures.

iii) Projects where the process has been used including:

a) Client including contact information (telephone, email);
b) Mix designs;
c) Date and location of construction;
d) To date performance.

Where the proposed technology is not approved, the Contractor shall be required to supply and place an approved technology.

**.02.01.05 Superpave Mix Verification**

1151.04.02.02.02 of OPSS.MUNI 1151 is amended by the addition of the following:

After receiving the asphalt mix design from the Contractor's own laboratory or from a hired firm's laboratory, the Contractor shall provide asphalt mix verification test results in accordance with the following criteria:

a) The tests must be performed by a laboratory independent from the firm producing the asphalt mix design.

b) The laboratory performing verification testing must have a valid "Certificate of Conformance" issued by the Canadian Council of Independent Laboratories (CCIL) Asphalt Laboratory Certification Program and be qualified under the following categories:

i) Asphalt Mix Design – Marshall and Superpave Methods (Type A)

ii) Asphalt Mix Compliance – Marshall and Superpave Methods (Type B)

All verification testing must be reviewed and accepted by the City of Hamilton prior to the start of any paving operations.

The mix design shall be submitted for acceptance at least 4 weeks before construction. The mix design shall be reviewed and approved by the City. Prior to construction, a trial batch shall be submitted to the Project Manager for verification and approval.

The submitted mix design shall include the JMF and the documents listed in Section 1151.04.05 of OPS 1151 MUNI. The mix design that does not include the required documents will not be reviewed and accepted.

**.02.01.06 Asphalt Cement Requirements**

The asphalt cement content of the approved JMF shall be equivalent to or greater than those shown in Table 800-1.

**TABLE 800-1**
**Superpave Minimum Asphalt Cement Content**

| Mix Type | Asphalt Cement Content for Bid Purposes | Minimum Asphalt Cement Content for JMF |
|---|---|---|
| Superpave 9.5 | 5.5 | 5.3 |
| Superpave 12.5 | 5.0 | 4.8 |
| Superpave 19mm | 4.8 | 4.6 |
| Superpave 25mm or greater | 4.6 | 4.4 |

**.02.02 Materials**

**.02.02.01 Aggregate**

Aggregates used shall be in accordance with OPSS.MUNI 1003 Material Specification for Aggregates – Hot Mix Asphalt.

**.02.02.02 Performance Graded Asphalt Cement (PGAC)**

Performance Graded Asphalt Cement shall be in accordance with OPSS.MUNI 1101 - Material Specification for Performance Graded Asphalt Cement, as amended by the following:

1101.05 of OPSS.MUNI 1101 is amended by the addition of the following:

The basic grade of asphalt cement shall be PG 58–28.

In accordance with ASTM M332 standard, the dynamic shear, T 315, G*sinδ carried out on the residue from pressurized aging vessel (PAV), shall be maximum 5,000 kPa for 58S-28 and 6,000 kPa for 58H,V, E -28.

**1101.08.03 of OPSS.MUNI 1101 is amended by the addition of the following:**

A sample of asphalt cement shall be taken at the beginning of the asphalt paving project. At the discretion of the Project Manager, more samples may be required, for instance to represent 1,000 tons of a particular asphalt mix.

**Table 1 of OPSS.MUNI 1101 is deleted in its entirety and replaced with the following:**

**Table 800-2**
**Additional testing requirements and acceptance criteria for PGAC grades**

| Property and Attributes (Unit) | Test Method | Results Reported Rounded to the Nearest | Acceptance Criteria | Rejectable |
|---|---|---|---|---|
| Ash Content, % by mass of residue (%) | LS-227 | 0.1 | ≤ 0.6 | >0.6 |
| Non-recoverable creep compliance at 3.2 kPa (Jnr-3.2) (kPa-1) when PGAC 58S-28 is specified | Multiple Stress Creep Recovery (MSCR) testing according to AASHTO T 350 testing conducted at a temperature of 58 °C | 0.01 | ≤ 4.5 | > 4.5 |
| Non-recoverable creep compliance at 3.2 kPa (Jnr-3.2) (kPa-1) when PGAC 58H-28 is specified | | 0.01 | ≤ 2.0 | > 2.0 |
| Non-recoverable creep compliance at 3.2 kPa (Jnr-3.2) (kPa-1) when PGAC 58V-28 is specified | | 0.01 | ≤ 1.0 | > 1.0 |
| Non-recoverable creep compliance at 3.2 kPa (Jnr-3.2) (kPa-1) when PGAC 58E-28 is specified | | 0.01 | ≤ 0.5 | > 0.5 |
| Average percent recovery at 3.2 kPa (R3.2) (%) | | 0.1 | > the lesser of [(29.371) (Jnr-3.2)$^{-0.2633}$] or 55 | ≤ the lesser of [(29.371) (Jnr-3.2)$^{-0.2633}$ -10] or 45 |
| Percent difference in non-recoverable creep compliance between 0.1 kPa and 3.2 kPa, Jnrdiff (%) | | 0.1 | N/A<br>Testing carried out only for information purpose | |

For residential street pavements regular PG58-28 asphalt cement will be used with no polymer modification and MSCR testing required. PG 58S-28 will be used on collector road pavements and some polymer modification will be required; this asphalt cement shall meet the MSCR $J_{nr3.2}$ and percent recovery requirements.

Guidelines for the selection of PGAC graded using Multiple Stress Creep Recovery (MSCR) test is given in Table 800-3 below.

**Table 800-3**
**Guidelines for Selection of PGAC Graded Using MSCR Test**

| Road Type | Recommended PGAC Grade Using MSCR Test | Optional Grade Increase (Note 1) |
|---|---|---|
| Urban Freeway | 58V-28 | N/A |
| Rural Freeway<br>Urban Arterial | 58H-28 | 58V-28 |
| Rural Arterial<br>Urban Collector | Consider specifying 58H-28 if truck traffic is greater than 20% of AADT | 58V-28 |
| Rural Collector<br>Urban/Suburban Collector | 58S-28 | 58H-28 or 58V-28 |
| Toll Plaza<br>Port Facility<br>Dedicated Transit ways<br>Truck Marshalling Yards<br>(standing traffic) | 58E-28 | N/A |

Notes:

A. It is recommended that MSCR graded PGAC is used in both surface and top binder courses, i.e. top 80 mm to 100 mm of hot mix.

1. Consideration should be given to an increase in the high temperature traffic level for roadways which experience a high percentage of Trucks or bus traffic at slow operating speeds, frequent stops and starts, and historical concerns with instability rutting.

## .02.03 Construction

The supply and placement of hot mix and warm mix asphalt shall be in accordance with the following:

a) OPSS 310 Construction Specification for Hot Mix Asphalt, as amended;

b) OPSS 310 - Appendix C for the placement of warm mix asphalt.

**.02.03.01 Pre-pave Meeting**

At least one (1) week prior to any scheduled milling or paving operation to occur, a mandatory Pre-pave meeting shall be held. The Contractor shall ensure that all required documentation relating to the milling and paving operations has been submitted for review and approved prior to the meeting. The items shall include, but are not limited to, the following:

a) Approved mix designs and Job Mix Formulas;

b) Proposed milling and paving dates and paving equipment to be used;

c) Asphalt placement and compaction rolling patterns;

d) Roadway, lane closures and vehicle access restrictions;

e) Tack coat scheduling and application patterns.

**.02.03.02 Asphalt Plant Inspection**

The Contractor shall permit access to the City's inspector in order to monitor the asphalt mix production, particularly the amount of Reclaimed Asphalt Pavement (RAP) added. The stockpiles of aggregates and RAP shall be clearly labelled / identified.

The asphalt plant's health and safety procedures that may be required shall be provided by the Contractor in advance.

Upon request from the Project Manager, the Contractor shall supply copies of plant records during asphalt production that will allow a demonstration of the proportion of RAP added to the mix.

**.02.03.03 Tack Coat**

Prior to the application of any of surface or binder coarse asphalt, tack coat shall be applied. Hot-mix and warm-mix asphalt can be placed only after the tack coat is cured (changes the colour from brown to black and becomes sticky).

**.02.03.04 Placement of Binder and Surface Course Asphalt**

Any type of asphalt having a thickness of 80mm or more shall be placed in a minimum of 2 lifts unless otherwise directed by the Project Manager.

The finished elevation of the surface course asphalt shall be placed so as to be flush with the lower edge of curb at the depressed portion of all wheelchair ramps. The surface course asphalt shall slope down and away from the curb to form a gutter line in front of the wheelchair ramp.

**.02.03.05 Binder Course Asphalt – Temporary Ramping**

When the surface course asphalt is to be delayed or placed the following year, temporary asphalt ramps shall be placed at all wheelchair ramps and driveway approaches. The top of the temporary asphalt ramps shall be placed so as to be flush with the lower edge of curb at the depressed portion of all wheelchair ramps

and driveway approaches. The temporary asphalt ramps shall be removed at the time of placement of the surface course asphalt at no additional cost.

**.02.03.06 Use of Paving Equipment – Paving in Echelon**

OPSS 310.07.07 is amended with the addition of the following paragraph:

Paving in Echelon is mandatory for the placement of binder and surface course asphalt. The pavers shall be operated at the same time and maintain a distance of not more than 50m from each other so that a hot joint is obtained between the lanes of mixtures being placed. The Contractor shall supply sufficient personnel to adequately control both spreading operations simultaneously.

Where the entire width of the proposed pavement platform cannot be paved in echelon with 2 pavers, one longitudinal construction joint is permitted. Each half of the road shall be paved in echelon resulting in only one longitudinal joint in the binder and surface courses located at the centreline of the road. The joint shall be located to ensure that it does not align with the wheel path of traffic.

**.02.03.07 Asphalt Material Transfer Vehicle**

OPSS 310.07.07 is amended with the addition of the following paragraph:

A Shuttle Buggy® Asphalt Material Transfer Vehicle (AMTV) is required for all paving operations, including paving using only one paver. The use of an AMTV will be paid for by the tonne.

**.02.03.08 Re-Heating and Compaction of Longitudinal Joints**

OPSS 310.07.07 is amended with the addition of the following paragraph:

For surface course, the Contractor shall use an approved method of re-heating, re-working and compacting all centreline longitudinal cold joints. Pricing shall be based on an infra-red heating system capable of maintaining a minimum temperature of 93° C to produce a welded joint, without scorching or burning the mix.

All re-heating methods shall be approved prior to the start of any asphalt placement.

The density of the mix at any longitudinal joint shall be within 1.5 percent of the mainline mat density. Compaction of longitudinal joint shall be measured within 0.3 m from the joint.

**.02.03.09 Review of Longitudinal Joint Quality**

Prior to the expiry of the 24 month maintenance period, all joints in surface course asphalt shall be reviewed. The review will consider weld quality, proper compaction and separation. All joints showing signs of separation or poor welding shall be re-heated and compacted to achieve a welded joint. All repairs to longitudinal joints shall be at the cost of the Contractor.

**.02.03.10 Aggregate Gradation and Asphalt Cement Content Acceptance**

OPSS 310.08.04 is deleted and replaced by the following:

If the HMA is borderline for aggregate gradation or asphalt cement content specified in Table 800-4, the Contractor shall take immediate corrective action through process control at the HMA plant. A total of three consecutive borderline test results for any attribute representing up to 1,000 tonnes of HMA production shall result in the work being deemed rejectable.

**TABLE 800-4**
**Tolerances for the Job-Mix Formula Aggregate Gradation and Asphalt Cement Content**

| Mix | Attribute | Tolerances on the Job-Mix Formula % (Note 1) | | |
|---|---|---|---|---|
| | | **Acceptable** | **Borderline** | **Rejectable** |
| Surface Course | DLS, 4.75mm sieve size | < 5.0 | 5.0 to 7.5 | >7.5 |
| | 600 µm sieve size | < 3.5 | 3.5 to 5.0 | >5.0 |
| | 75 µm sieve size | < 2.0 | 2.0 to 3.0 | >3.0 |
| Binder and Levelling Courses | DLS, 4.75mm sieve size | < 7.0 | 7.0 to 10.0 | >10.0 |
| | 600 µm sieve size | < 4.5 | 4.5 to 6.0 | >6.0 |
| | 75 µm sieve size | < 2.0 | 2.0 to 3.0 | >3.0 |
| All Mixes | Asphalt Cement Content | < 0.20 | 0.2 to 0.30 | >0.30 |
| Note 1: Tolerances on the job-mix formula apply as both plus and minus from the job-mix formula percent. | | | | |

Rejected HMA due to aggregate gradation, such as non-compliance on the DLS 4.75mm, 600 µm, or 75 µm sieve sizes, or non-compliance due to the asphalt cement content specified in Table 800-4, shall be removed and replaced with acceptable HMA.

The asphalt cement content and aggregate gradation shall be determined for each day's mix production for a given plant location on the basis of the sampling frequency criteria in Table 800-5.

Table 6 found in OPSS 310 is hereby deleted and replaced by Table 800-5 below.

**TABLE 800-5**
**Criteria for Asphalt Cement Content Sampling and Testing**

| MIX TYPE | ASPHALT PLANT DAILY PRODUCTION FOR PROJECT | MINIMUM TEST SAMPLES |
|---|---|---|
| Surface Course | < 200 tonnes | 3 |
| | > 200 tonnes | 5 |
| Binder Course | < 500 tonnes | 3 |
| | > 500 tonnes | 5 |

**.02.03.11 Air Voids Acceptance for HMA Production**

The production of air voids for all HMA mixes shall be evaluated according to Table 800-6.

Table 9 found in OPSS 310 is hereby deleted and replaced by Table 800-6 below.

**TABLE 800-6**
**Air Void Criteria for Hot Mix Asphalt Production (LS-265)**

| Mix | Air Voids (%) | | |
|---|---|---|---|
| | Acceptable | Borderline | Rejectable |
| All Mixes | 3.0 to 5.0 | 2.0 to 2.9 and 5.1 to 6.0 | < 2.0 and > 6.0 |

If the HMA is borderline for air voids as specified in Table 800-6, the Contractor shall be notified in writing and shall take immediate corrective action through process control at the HMA plant.

If the HMA is deemed rejectable, the Contractor and Project Manager shall review and identify the limits of rejectable HMA that has been placed and shall be removed and replaced with acceptable HMA pavement.

### .02.03.12 Asphalt Layer Segregation

All hot mix asphalt shall be inspected for segregation in accordance with the following:

### .02.03.12.01 Types of Segregation

Segregation consists of areas with comparatively coarser texture than that of the surrounding pavement. All segregation is deemed to be deficient materials and/or workmanship, regardless of the type, location, cause or severity. The Contractor shall provide traffic control, as required, to conduct all segregation assessments.

Two main types of segregation are recognized:

Mid-lane Segregation:consists of any continuous or semi-continuous longitudinal mark or “streak”, typically no greater than 300mm in width. Such segregation is often found in the middle of the lane, in the vicinity of a paver’s gearbox, but may be located anywhere across the width of the lane.

Other Segregation: consists of discrete areas or patches of regular, irregular or chevron shape.

### .02.03.12.02 Severity of Segregation

The severity of segregation is categorized as follows:

Slight Segregation: The pavement matrix is in place between the coarse aggregate particles; however there are slightly more coarse aggregate particles in comparison with the surrounding acceptable mix.

Medium Segregation: The pavement has significantly more coarse aggregate particles than the surrounding acceptable mat and usually exhibits some lack of surface matrix.

Severe Segregation: The pavement appears very coarse, with coarse aggregate particle against coarse aggregate particle and the pavement has little or no matrix.

### .02.03.12.03 Paving Segregation

If the Contractor fails to prevent slight segregation in paving, the Project Manager will issue a written warning and request the Contractor to address the problem. The Contractor may be allowed to continue paving at the discretion of the Project Manager. If medium segregation is observed, the paving operation will be stopped. The Contractor shall prove to the satisfaction of the Project Manager that the paving can be continued without any medium segregation.

**.02.03.12.04 Correction of Segregation**

If the Contractor's actions fail to prevent continued slight to medium segregation from any source, the Project Manager may instruct the Contractor to cease paving until the problem has been corrected and the City shall not be held responsible for any additional costs that the Contractor may incur as a result.

From the time that the Contractor receives notification of mid-lane segregation, the Contractor will be allowed a maximum of 100 tonnes of mix to be placed on the Contract, in order to demonstrate the effectiveness of any repairs and/or adjustments that have been made to a defective paver.

The Contractor shall demonstrate the repairs and/or adjustments to the paver, which is acceptable to the Project Manager. If the Contractor is unable to eliminate segregation to the satisfaction of the Project Manager, by making repairs or adjustments to the paver within the allowable 100 tonnes of hot mix, then the Contractor shall discontinue the use of that machine and/or material.

**.02.03.12.05 Mid-Lane Segregation**

Medium to severe mid-lane segregation shall be repaired by removal and replacement at no cost to the City. Slight mid-lane segregation will be accepted into the work with no payment reduction.

**.02.03.12.06 Other Segregation**

The disposition of Other Segregation shall be as follows:

Slight Segregation: Slightly segregated mix will be accepted into the work with no payment reduction.

Medium Segregation: Medium segregation in all HMA lifts shall be repaired at the direction of the Project Manager at no cost to the City.

Severe Segregation: All severely segregated mix shall be repaired by removal and replacement at no cost to the City.

Levelling or padding courses with a total thickness which is less than that is normally placed in a lift of hot mix (i.e., usually 40mm), that is not machine-laid and any areas of "handwork" shall not be assessed on the basis of segregation but on the basis of other workmanship-related problems. However, if they deteriorate prior to being overlaid by another pavement course, the Project Manager will assess the causes of the deterioration before determining responsibility for the cost of repairs.

**.02.03.12.07 Repairs**

All repairs shall be subjected to the approval by the Project Manager.

Repairs shall consist of removal and replacement with new hot mix or a hot mix overlay, where permitted.

Repairs for segregated hot mix shall be full lane or shoulder width. However, localized repairs may be permissible for mid-lane segregation in binder courses provided hot joints are used or the mat is still hot.

A paver shall be used for all repairs except those where localized repairs are allowed.

Where localized repairs are allowed for mid-lane segregation in binder courses, these repairs shall be:

- Less than or equal to 300mm in width;
- To the full depth of the subject lift; and
- Entirely tack-coated.

Hot mix used in all repairs shall meet the requirements specified for the tender item in the Contract. All repairs shall be done in a workmanlike manner complying with all requirements for placing hot mix stated in the Contract. All repaired areas must be entirely tack-coated and all transverse joints in surface course repairs must butt up to a vertical face.

For surface and binder courses, all repairs for remedial work due to visually defective mix, including pavement removal and replacement, overlays where permitted, additional shouldering, traffic control and any other work which has to be redone such as line painting shall be made entirely at the Contractor's expense.

| DRAWING No. | DATE | DESCRIPTION |
|---|---|---|
| **RD-100.01** | November 2005 | Road Restoration Over Utility Cuts –Sheet 1of 2 |
| **RD-100.02** | November 2005 | Road Restoration Over Utility Cuts - Sheet 2 of 2 |
| **RD-101** | November 2005 | 100 mm Dia. Perforated Drain Pipe Detail |
| **RD-102.01** | June 2017 | Wheelchair Ramp Locations Without Inegrated Accessibility Treatment |
| **RD-102.02** | June 2017 | Control Joints at Side Inlet Catch Basin Frame and Cover and Utility Pole Isolation Boxout |
| **RD-103** | January 2011 | Combined Concrete Walk and Curb and Independent Concrete Walk |
| **RD-104** | January 2011 | Asphalt Sidewalk |
| **RD-105** | November 2005 | Interlocking Paving Stone Sidewalk |
| **RD-106** | June 2017 | Standard Approach |
| **RD-107** | June 2017 | California Style Approach |
| **RD-108** | June 2017 | Asphalt Driveway Approach |
| **RD-109** | June 2017 | Concrete Apron Approach |
| **RD-110.01** | June 2017 | Offset Curb & Gutter Detail at Single Catchbasin |
| **RD-110.02** | June 2017 | Offset Curb & Gutter Detail at Double Catchbasin |
| **RD-111** | June 2017 | Shoulder Paving for Manholes and Chambers in Shoulders |
| **RD-112** | November 2005 | Concrete Alleyway |
| **RD-113.01** | November 2005 | Typical Road Cross Section - Local Urban Residential (20.0 m Right–of-Way) |
| **RD-113.02** | November 2005 | Typical Road Cross Section - Local Urban Residential (18.0 m Right–of-Way) |
| **RD-113.03** | November 2005 | Typical Road Cross Section Local Urban Residential - Without Sidewalk For Cul De Sacs (18.0 m Right–of-Way) |
| **RD-113.04** | November 2005 | Standard Road Section For Private Townhouses |
| **RD-113.05** | June 2017 | Rural Cross Section |
| **RD-114** | June 2017 | Unsignalized Industrial & Commercial Entrance - Urban Section |
| **RD-115** | June 2017 | Hammerhead Turning Movement Diagram |
| **RD-116.01** | November 2005 | Permanent Cul-De-Sac For Local Residential Streets – Symmetrical (18.0 m Right–of-Way) |

Note: 24” x 36” and 18” x 24” size drawings are not bound in this document

| DRAWING No. | DATE | DESCRIPTION |
|---|---|---|
| **RD-116.02** | November 2005 | Permanent Cul-De-Sac For Local Residential Streets – Offset Left (18.0 m Right–of-Way) |
| **RD-116.03** | November 2005 | Cul-De-Sac For Industrial & Commercial Streets |
| **RD-116.04** | June 2017 | Temporary Turning Circle (20.0 m R.O.W.) |
| **RD-117** | June 2017 | Rural Residential Entrances |
| **RD-118** | June 2017 | Rural Industrial & Commercial Entrances |
| **RD-119.01** | November 2005 | Measurement for Payment Diagram – Road Reconstruction Only |
| **RD-119.02** | November 2005 | Measurement for Payment Diagram – Road Reconstruction and Combined Walk and Curb Reconstruction |
| **RD-119.03** | January 2011 | Measurement for Payment Diagram – Widening / Realignment /Narrowing |
| **RD-119.04** | November 2005 | Measurement for Payment Diagram – Road and Independent Curb and Gutter Reconstruction |
| **RD-120** | June 2017 | Typical Transit Shelter Pad for 1.2 m by 3.0 m Shelter |
| **RD-121** | November 2005 | Rear Yard Swale Detail |
| **RD-122** | November 2005 | Typical Toe of Excarpment Swale & Berm Detail |
| **RD-123.01** | June 2017 | Privacy Fence |
| **RD-123.02** | June 2017 | Privacy Fence Details |
| **RD-124.01** | October 2017 | Integrated Accessibility – Sidewalk/Urban Braille Guidelines (Size 24” x 36”) |
| **RD-124.02** | October 2017 | Integrated Accessibility – Sidewalk/Urban Braille Guidelines (Size 24” x 36”) |
| **RD-124.03** | October 2017 | Integrated Accessibility – Sidewalk/Urban Braille Guidelines (Size 24” x 36”) |
| **RD-125.01** | November 2005 | Heritage Poles and Details (Size 24” x 36”) |
| **RD-125.02** | June 2017 | Heritage Poles and Details (Size 24” x 36”) |
| **RD-126** | November 2005 | Irrigation – Typical Details (Size 24” x 36”) |
| **RD-127** | June 2017 | Typical Construction of Flagstone Wall on Slope |
| **DT:0111-01** | September 2015 | Typical Installation of Underground Traffic Control Devices (Size 24” x 36”) |
| **DT:0111-02** | September 2015 | Typical Installation of Grounding and Bonding for Traffic Control Devices (Size 24” x 36”) |

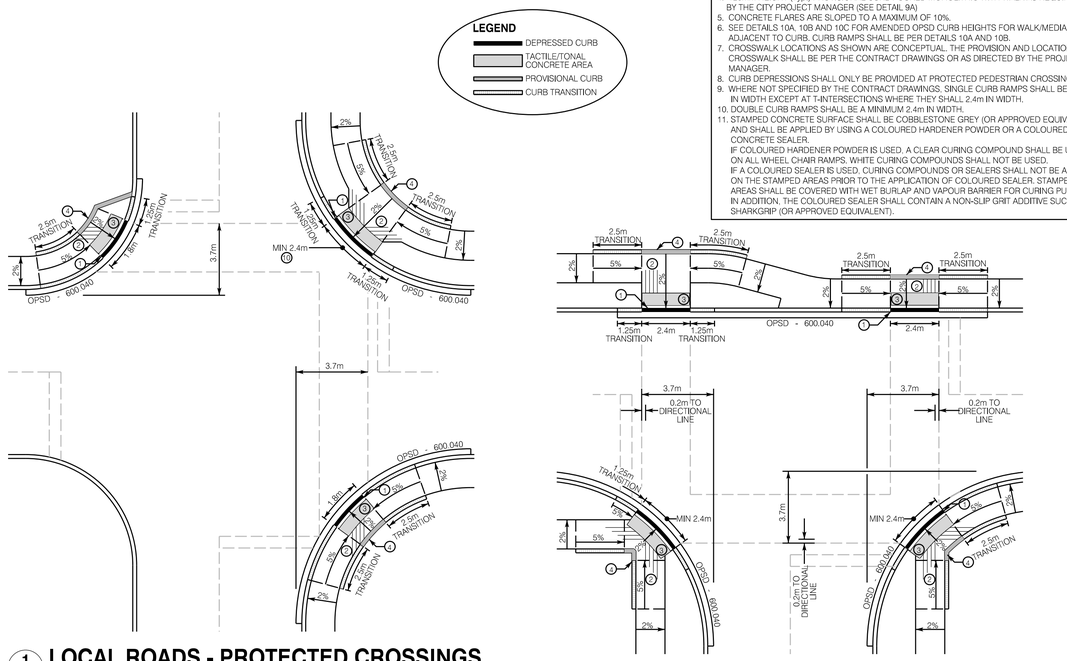
Note: 24” x 36” and 18” x 24” size drawings are not bound in this document

| DRAWING No. | DATE | DESCRIPTION |
|---|---|---|
| **DT:0119-01** | January 2017 | Standard Design for Speed Humps (Size 18” x 24”) |

Note: 24” x 36” and 18” x 24” size drawings are not bound in this document

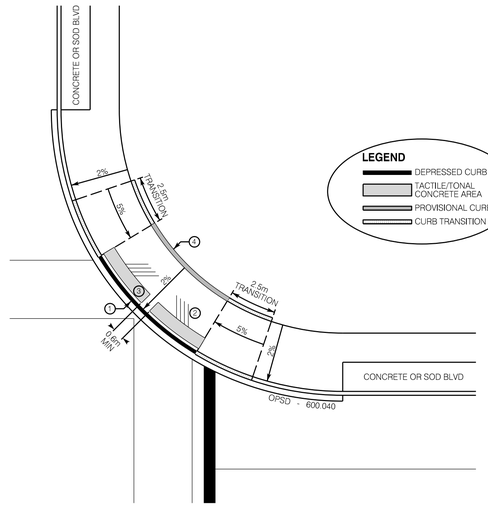
CITY OF HAMILTON - INTEGRATED ACCESSIBILITY - SIDEWALK/URBAN BRAILLE GUIDELINES

RD-124.01




**NOTES:**
1. ALL CURBING AT CURB RAMPS SHALL BE PER RD-124.03 DETAIL 10B) iii).
2. DIRECTIONAL LINES TO BE PER DETAIL 18A AND SHALL BE ALIGNED WITH DIRECTIONAL LINES IN OPPOSING CORNERS OR IN THE MEDIAN ISLAND.
3. TACTILE/TONAL CONCRETE STAMP SHALL BE OFFSET 150mm FROM BACK OF CURB. IS 610mm DEEP AND BE PER DETAIL 18B.
4. 125mm HEIGHT (Typ.) PROVISIONAL CURB POURED MONOLITHIC WITH WALK AS REQUIRED BY THE CITY PROJECT MANAGER (SEE DETAIL 9A)
5. CONCRETE FLARES ARE SLOPED TO A MAXIMUM OF 10%.
6. SEE DETAILS 10A, 10B AND 10C FOR AMENDED OPSD CURB HEIGHTS FOR WALK/MEDIAN/BLVD ADJACENT TO CURB. CURB RAMPS SHALL BE PER DETAILS 10A AND 10B.
7. CROSSWALK LOCATIONS AS SHOWN ARE CONCEPTUAL. THE PROVISION AND LOCATION OF CROSSWALK SHALL BE PER THE CONTRACT DRAWINGS OR AS DIRECTED BY THE PROJECT MANAGER.
8. CURB DEPRESSIONS SHALL ONLY BE PROVIDED AT PROTECTED PEDESTRIAN CROSSINGS.
9. WHERE NOT SPECIFIED BY THE CONTRACT DRAWINGS, SINGLE CURB RAMPS SHALL BE 1.8m IN WIDTH EXCEPT AT T-INTERSECTIONS WHERE THEY SHALL 2.4m IN WIDTH.
10. DOUBLE CURB RAMPS SHALL BE A MINIMUM 2.4m IN WIDTH.
11. STAMPED CONCRETE SURFACE SHALL BE COBBLESTONE GREY (OR APPROVED EQUIVALENT) AND SHALL BE APPLIED BY USING A COLOURED HARDENER POWDER OR A COLOURED CONCRETE SEALER.
IF COLOURED HARDENER POWDER IS USED, A CLEAR CURING COMPOUND SHALL BE USED ON ALL WHEEL CHAIR RAMPS. WHITE CURING COMPOUNDS SHALL NOT BE USED.
IF A COLOURED SEALER IS USED, CURING COMPOUNDS OR SEALERS SHALL NOT BE APPLIED ON THE STAMPED AREAS PRIOR TO THE APPLICATION OF COLOURED SEALER. STAMPED AREAS SHALL BE COVERED WITH WET BURLAP AND VAPOUR BARRIER FOR CURING PURPOSES. IN ADDITION, THE COLOURED SEALER SHALL CONTAIN A NON-SLIP GRIT ADDITIVE SUCH AS H&C SHARKGRIP (OR APPROVED EQUIVALENT).

## 1 LOCAL ROADS - PROTECTED CROSSINGS

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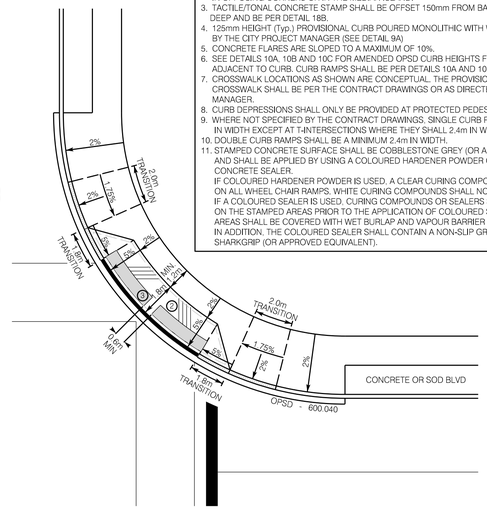
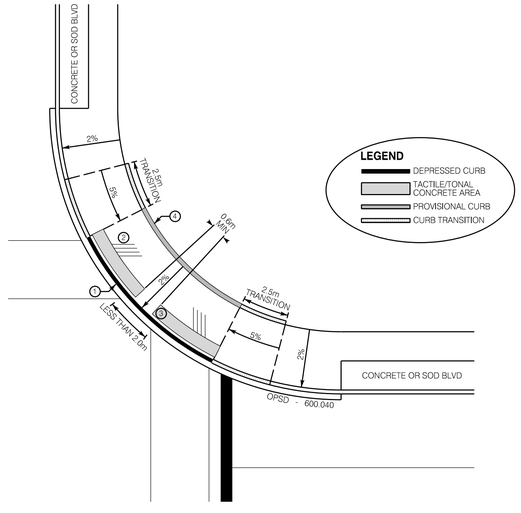
**PREFERRED TREATMENT**

**2A WALK ADJACENT TO CURB (VARIABLE WIDTH)**




**2B WALK ADJACENT TO CURB (3.0m WIDTH OR LARGER)**
**BACK OF WALK ELEVATION MAINTAINED**
**SEPARATE CURB RAMP POUR**

## 2 INTERSECTING CROSSWALKS




**NOTES:**
1. ALL CURBING AT CURB RAMPS SHALL BE PER RD-124.03 DETAIL 10B) iii).
2. DIRECTIONAL LINES TO BE PER DETAIL 18A AND SHALL BE ALIGNED WITH DIRECTIONAL LINES IN OPPOSING CORNERS OR IN THE MEDIAN ISLAND.
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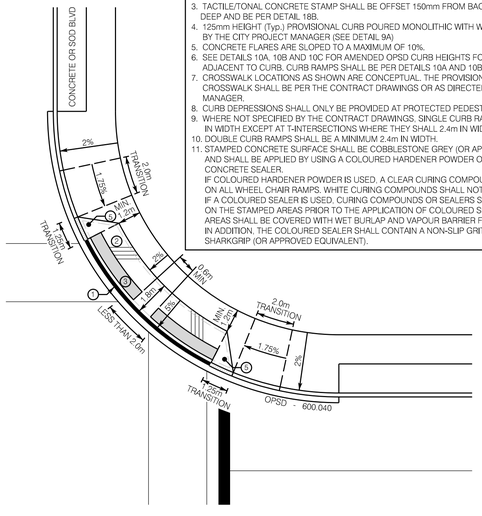
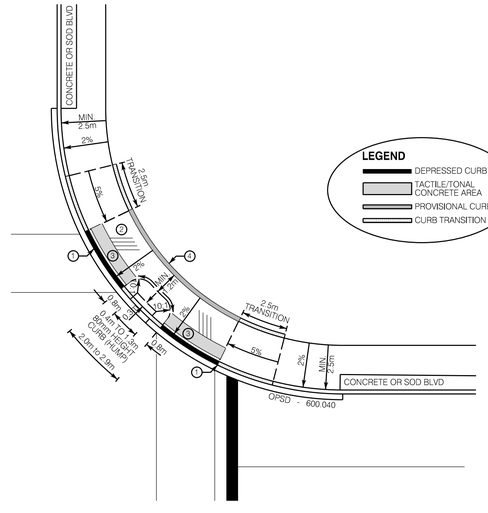



**PREFERRED TREATMENT**

**3A WALK ADJACENT TO CURB (VARIABLE WIDTH)**

**3B WALK ADJACENT TO CURB (3.0m WIDTH OR GREATER)**
**BACK OF WALK ELEVATION MAINTAINED**
**SEPARATE CURB RAMP POUR**

## 3 SEPARATED CROSSWALKS
## DISTANCE LESS THAN 2.0m




**NOTES:**
1. ALL CURBING AT CURB RAMPS SHALL BE PER RD-124.03 DETAIL 10B) iii).
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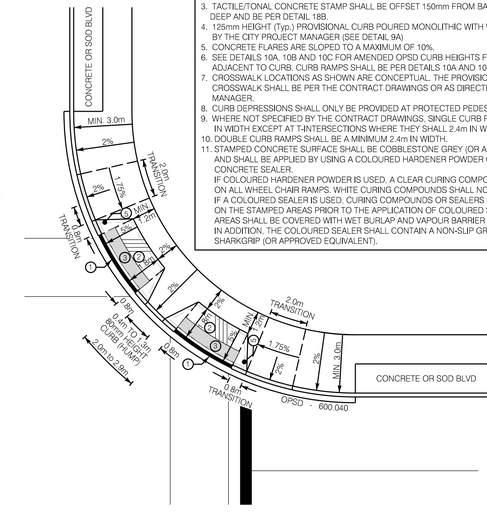



**PREFERRED TREATMENT**

**4A WALK ADJACENT TO CURB (2.5m WIDTH OR GREATER)**

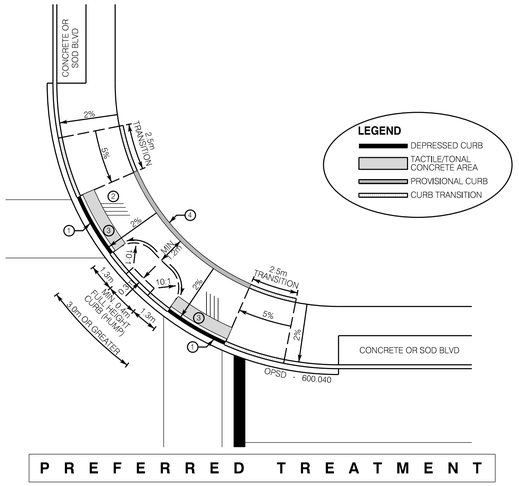
**4B WALK ADJACENT TO CURB (3.0m WIDTH OR GREATER)**
**BACK OF WALK ELEVATION MAINTAINED**
**SEPARATE CURB RAMP POUR**

## 4 SEPARATED CROSSWALKS
## DISTANCE 2.0m to 2.9m

City of Hamilton
Public Works Department

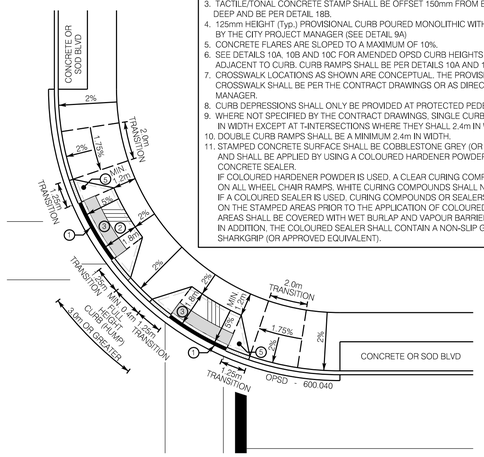
CITY OF HAMILTON - INTEGRATED ACCESSIBILITY - SIDEWALK/URBAN BRAILLE GUIDELINES

| DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED (N.T.S.) | DATE OCTOBER 2017 | REV No 1 | FORMERLY | HAMILTON STD. No. RD-124.01 |
|---|---|---|---|---|




P R E F E R R E D T R E A T M E N T

**5A** WALK ADJACENT TO CURB (VARIABLE WIDTH)




**5B** WALK ADJACENT TO CURB (3.0m WIDTH OR GREATER)
BACK OF WALK ELEVATION MAINTAINED
SEPARATE CURB RAMP POUR

**NOTES:**
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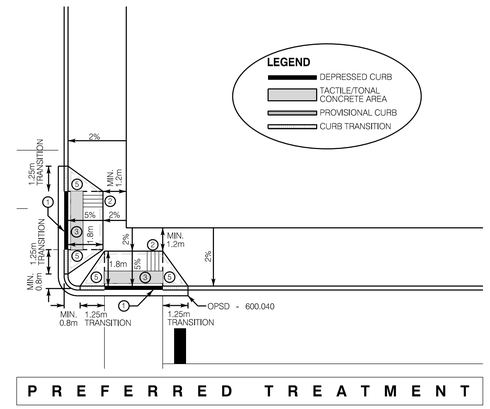
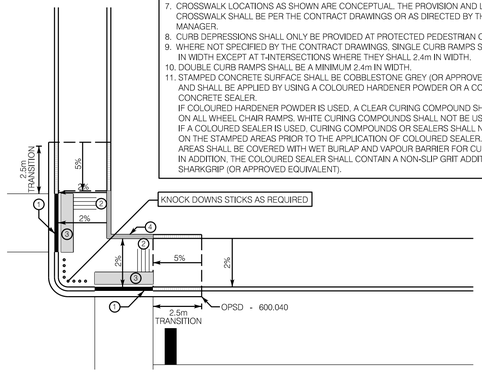
## 5 SEPARATED CROSSWALKS DISTANCE GREATER OR EQUAL TO 3.0m




P R E F E R R E D T R E A T M E N T

**6A** WALK ADJACENT TO CURB (3.0m WIDTH OR GREATER)




**6B** WALK ADJACENT TO CURB (VARIABLE WIDTH)

**NOTES:**
1. ALL CURBING AT CURB RAMPS SHALL BE PER RD-124.03 DETAIL 10B) iii).
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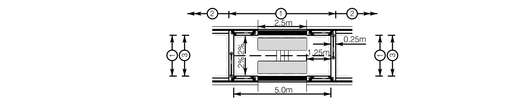
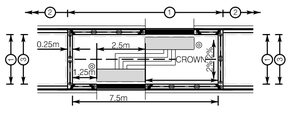
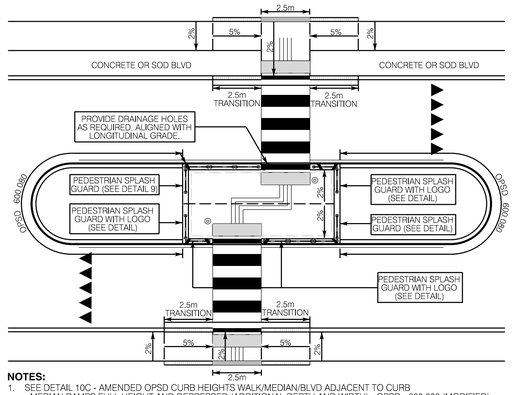
## 6 1m RADIUS AT BANNED TURNS




**7A** PEDESTRIAN CORRAL - MEDIAN LANE WIDTHS - 3.0m TO 3.4m



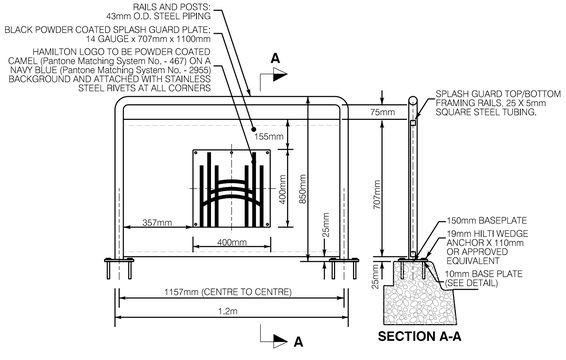

**7B** PEDESTRIAN CORRAL - MEDIAN LANE WIDTHS - 3.45m OR GREATER



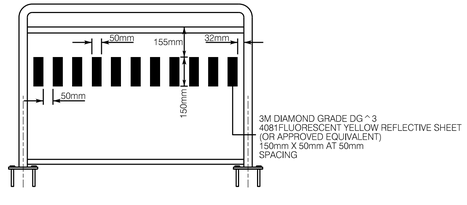

**NOTES:**
1. SEE DETAIL 10C - AMENDED OPSD CURB HEIGHTS WALK/MEDIAN/BLVD ADJACENT TO CURB - MEDIAN RAMPS FULL HEIGHT AND DEPRESSED (ADDITIONAL DEPTH AND WIDTH) - OPSD - 600.080 (MODIFIED)
2. CURB SHALL BE OPSD - 600.080 (UNMODIFIED).
3. SEE DETAIL 10C - AMENDED OPSD CURB HEIGHTS WALK/MEDIAN/BLVD ADJACENT TO CURB*** WITHOUT GUTTER.

**7C** GENERAL

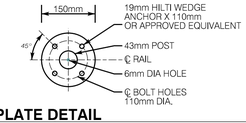
## 7 MEDIAN ISLANDS - PROTECTED CROSSING




**8A** PLAN AND SECTION (OUTER FACE)

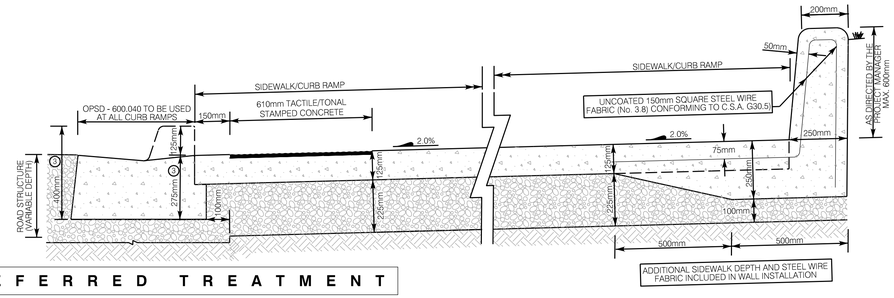



**8B** PLAN AND SECTION (INNER FACE)



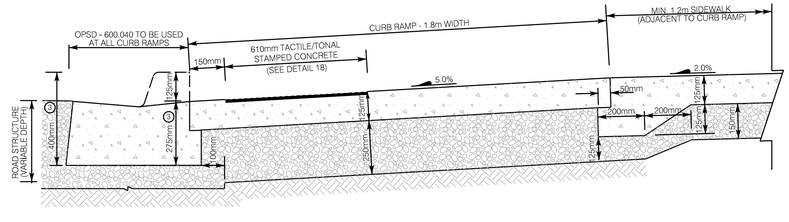

**8C** BASE PLATE DETAIL

## 8 SPLASH GUARD

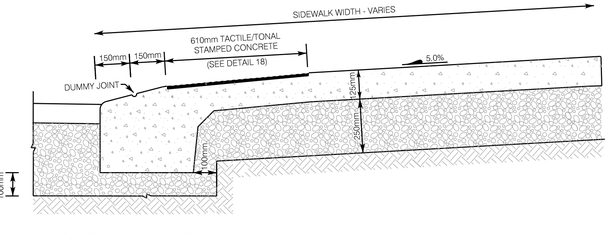



P R E F E R R E D T R E A T M E N T

**9A** COMBINED SIDEWALK AND CURB RAMP




**9B** INDEPENDENT SIDEWALK AND CURB RAMP




**9C** COMBINED SIDEWALK AND CURB

## 9 CURB RAMPS

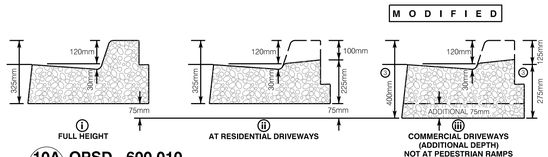
City of Hamilton
Public Works Department

CITY OF HAMILTON - INTEGRATED ACCESSIBILITY - SIDEWALK/URBAN BRAILLE GUIDELINES

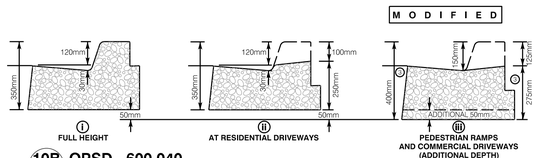
| DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED (N.T.S.) | DATE OCTOBER 2017 | REV. No 1 | FORMERLY | HAMILTON STD. No. RD-124.02 |
|---|---|---|---|---|

CITY OF HAMILTON - INTEGRATED ACCESSIBILITY - SIDEWALK/URBAN BRAILLE GUIDELINES

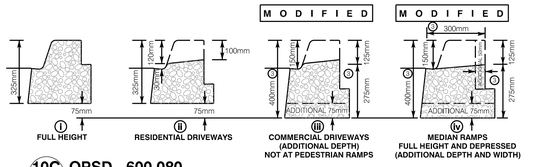
RD-124.03




10A OPSD - 600.010

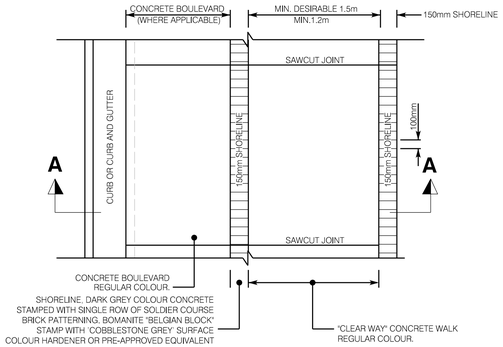



10B OPSD - 600.040



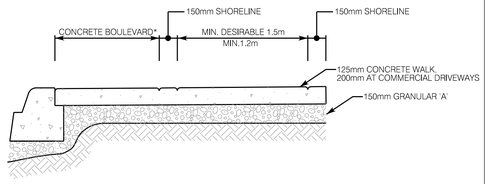

10C OPSD - 600.080

## 10 AMENDED OPSD CURB HEIGHTS WALK/MEDIAN/BLVD ADJACENT TO CURB



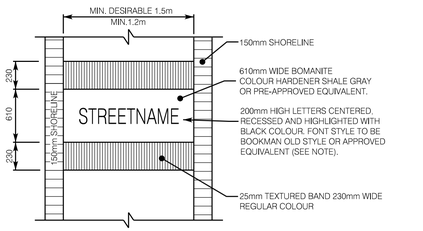

**NOTES:**
1. TEST POURS INDICATING FINISH, COLOUR, STAMP PATTERNS AND TECHNIQUE MUST BE APPROVED PRIOR TO INSTALLATION.
2. FINISH AND COLOUR OF URBAN BRAILLE SIDEWALK AND BOULEVARD SHALL MATCH KING STREET EAST.
3. FINISH, SURFACE COLOUR HARDENER AND STAMP PATTERN ACCORDING TO BOMANITE METHODS AND SPECIFICATIONS OR PRE-APPROVED EQUIVALENT.
4. HIGH PENETRATING ACRYLIC SEALER TO BE APPLIED AFTER APPROVAL OF FINISHED SURFACE.

11A PLAN



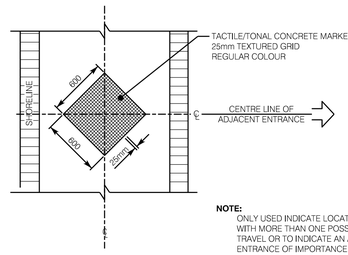

11B SECTION A-A

## 11 URBAN BRAILLE SIDEWALK/BOULEVARD SECTIONS AND DETAILS



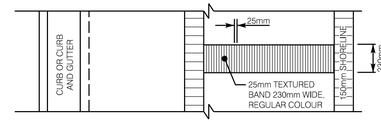

**NOTE:**
STREET NAME OF INTERSECTING STREET SHALL BE ORIENTED TO FACE PEDESTRIANS APPROACHING THE INTERSECTION.

## 12 STREET NAME TABLET

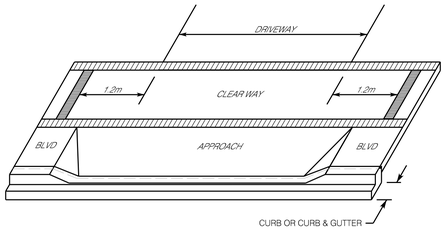



**NOTE:**
ONLY USED INDICATE LOCATIONS IN "CLEAR WAY" WITH MORE THAN ONE POSSIBLE ROUTE OF TRAVEL OR TO INDICATE AN ADJACENT ENTRANCE OF IMPORTANCE (EX. BANK, LIBRARY, COMMUNITY CENTRE, BANK, MAJOR MALL ENTRANCE)

## 13 ENTRANCE DIAMOND AND DECISION NODE MARKER

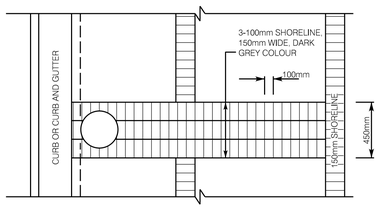



14A GENERAL

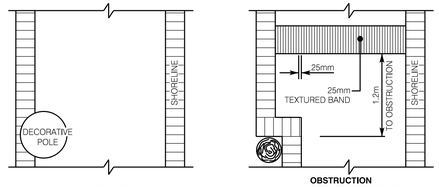



14B DRIVEWAY TREATMENT

## 14 25mm TEXTURED BAND - DRIVEWAYS



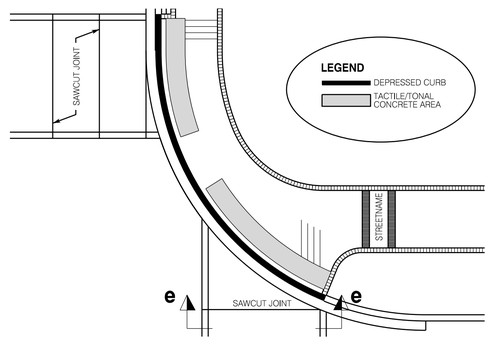

## 15 SHORELINES - TRANSIT STOP (450mm WIDE)



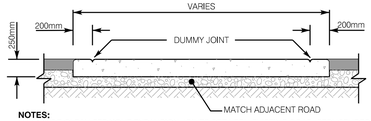

DECORATIVE POLE
OBSTRUCTION MARKER NOT REQUIRED

OBSTRUCTION
(i.e. NON-DECORATIVE POLES, HYDRANTS, UTILITY CABINETS)

## 16 25mm TEXTURED BAND - OBSTRUCTIONS



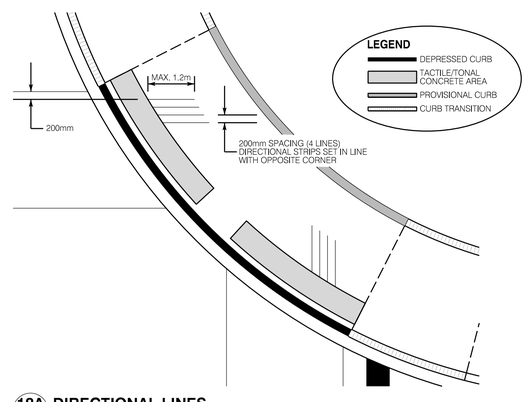

17A PLAN



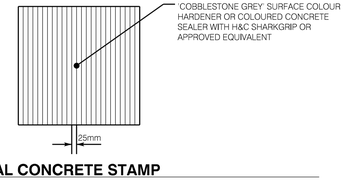

**NOTES:**
1. PROVIDE CLEAN STRAIGHT EXPANSION JOINTS BETWEEN EXISTING ROAD, STRUCTURES, AND CROSSWALKS AND CAULK WITH APPROVED ELASTIC JOINT SEALANT.
2. EXPANSION JOINTS AT EVERY 3.0m MAX.
3. SAWCUT CONTROL JOINTS AT EVERY 1.5m MAX.
4. POUR CROSSWALK TO CENTRE OF ROADWAY AND MAINTAIN TRAFFIC AS DIRECTED. KEY CENTRE CONSTRUCTION JOINT AND INSERT 450X20mm DOWELS AT 1.0m O.C..

17B SECTION E-E

## 17 CONCRETE CROSSWALK

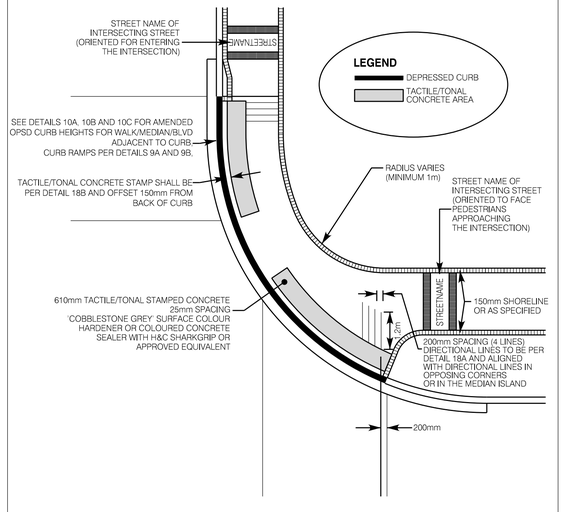



18A DIRECTIONAL LINES




18B TACTILE/TONAL CONCRETE STAMP

## 18 DIRECTIONAL LINES AND TACTILE/TONAL CONCRETE STAMP




## 19 RAMP DETAIL AND DIRECTIONAL LINES

City of Hamilton
Public Works Department

CITY OF HAMILTON - INTEGRATED ACCESSIBILITY - SIDEWALK/URBAN BRAILLE GUIDELINES

| DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED (N.T.S.) | DATE OCTOBER 2017 | REV No 1 | FORMERLY | HAMILTON STD. No. RD-124.03 |
|---|---|---|---|---|