



# **The City of Vancouver**

## **STREET RESTORATION MANUAL**

(This Street Restoration Manual is to be used in conjunction with the MMCD General Conditions, Specifications, and Standard Detail Drawings 2000 Version)

**Engineering Services**  
**Departmental Services Division**  
**Kent Construction Supplies & Services Branch**  
**Materials Lab**

Rev. August 2008

# **STREET RESTORATION MANUAL**

## **Including Excavation and Backfilling of Trenches and Cuts**

The purpose of this manual is to provide standards, specifications, and procedures to ensure that construction works on City streets are carried out in accordance with the best available standards and procedures in order to minimize maintenance requirements and reduce life cycle costs.

All applicable permits must be obtained prior to any work and all work must be inspected by City inspector.

## FOREWORD

### MISSION:

**City of Vancouver Mission Statement: To create a great City of communities that cares about its people, its environment and the opportunities to live, work and prosper.**

The goals of this Street Restoration Manual are:

- To optimize the life cycle cost of the Street network, while attempting to meet the needs of the utility groups as much as possible.
- To establish “Best Practice” Standards and Procedures for quality street restorations which result in well functioning, and aesthetically pleasing roads, sidewalks and boulevards once utilities installations and/or repairs are completed.
- To assist in minimizing construction time, and ensure that construction activities on all City of Vancouver streets are coordinated and consistent.

### PROBLEM:

- The City of Vancouver has an increasingly complex underground environment that includes the following services:
  - 2,020 km of City sewers and over 100 km of Metro Vancouver sewer, for a total of over 2,120 km of sewer mains
  - 1,500 km of City water mains, and over 170 km of Metro Vancouver water mains, for a total of over 1,670 km of water mains
  - 1,987 km of non-telecommunications underground services (such as hydro and steam heat ducts, and gas) and 580 km of telecommunications underground utility plant
  - In addition: the connecting of these utilities to private property
- It is inevitable that roadway cuts will occur in order to maintain, and expand this extensive infrastructure. It is estimated that trenched pavement areas (i.e. roads dug up to install pipe) cause a 32% reduction in pavement life (source - Impact of Utility Trenching and Appurtenances on Pavement Performance in Ottawa-Carleton -- an Ottawa-Carleton study of urban regional roads). We need to reduce the impact of roadway cuts by improving current practices.
- Municipalities have a duty to residents to ensure that public land is used responsibly. The space beneath city streets is getting more crowded every year with pipes and cables. Costs to install or repair services are increasing due to this crowding. Large sewer and water pipes must be buried underneath a tangle of other pipes and ducts. This is slow, difficult work, and requires the utmost care to ensure adequate compaction of backfill in trenches. Careful excavation, backfilling, and restoration of

cuts and trenches in City streets are necessary to minimize future street structure deficiencies, and to eliminate the need to undertake street repairs prematurely.

## **SUMMARY:**

Since settlements are often related to inadequate control in excavation, backfilling and cut restoration, it is important that every effort be made to perform this construction work professionally and in conformance to our mission of caring for our people. This Street Restoration Manual has been prepared to outline material specifications and best construction practices for restoring city streets so that they remain safe, structurally sound, smooth and aesthetic. It is intended that all Contractors, Public Utilities and City work forces carefully follow these specifications.

From time to time, better practices will be developed, and amendments will subsequently be made to this document.

## USE OF THIS MANUAL WITH THE MASTER MUNICIPAL SPECIFICATIONS

All references to Specifications, Master Specifications, Master Municipal Specifications, Technical Specifications, etc., shall be taken to mean the most recent version of the Master Municipal Construction Documents (MMCD): General Conditions, Specifications, and Standard Detail Drawings, as amended by the City Of Vancouver Supplemental Specifications and the City Of Vancouver Supplemental Detail Drawings herein. The City of Vancouver Specifications and Drawings within this manual supersede those within the MMCD where noted. In all other areas the MMCD Specifications /Drawings are applicable. As such, users of this Manual will also need to refer to the MMCD Specifications.

Note: City of Vancouver Superpave Asphalt and Mix Design Specification is also included herein.

This manual has been coded and indexed to parallel the sections and titles of the Master Municipal Construction Documents (MMCD). It also includes additional index numbers (sections) not currently used in the MMCD documents. These additional sections reflect specific restoration works required for work on the City of Vancouver's street infrastructure system.

Copies of the MMCD may be obtained for a fee by contacting Support Services Unlimited at 604-681-0295, fax 604-681-4545. Further information can be obtained from the [MMCD website](#).

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The Section Numbers shown below encompass all of the existing Specifications covered by MMCD - 2000, Volume 2, and form part of this manual. Where only the title and Section Number is shown within this Table of Contents then the MMCD Specification applies in its entirety. No further reference to these unaltered sections is made hereafter. Where a section, or sub-section is over-ridden by City of Vancouver Supplemental Specifications, those sections are shown below with an asterisk (\*) and the title is in bold Italics. Within the manual following, the specific “ADD”, “DELETE” and “REPLACE” over-ride provisions are indicated in full in the appropriate section.

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## PART 1 - INTRODUCTION

### 1.1 PURPOSE

The purpose of this manual is to provide standards, specifications, and procedures to ensure that construction works on City streets are carried out in accordance with the best available standards and procedures in order to minimize maintenance requirements and reduce life cycle costs.

### 1.2 SCOPE

This manual outlines standards, specifications, and procedures for construction and restoration works of street, sidewalk, utility service cuts and trenches, building site foundations adjacent to City properties.

### 1.3 DEFINITIONS

Building excavation: an excavation made during the construction of building adjacent to the City streets.

City Engineer: means the General Manager of Engineering Services of the City of Vancouver or his authorized representative.

Contractor: for the purpose of this manual 'Contractor' means any authorized person, company, corporation, or combination thereof, or agent who is actually performing the work on City streets and includes City forces.

Cut: an excavation made on City property for any purpose.

Permittee: an authorized person, Contractor, company or agent who has been granted permission to do work on the City streets by the City Engineer.

Site Engineer: in this specification, "Site Engineer" means the registered Professional Engineer, who:

Provides assurance that the plans and supporting documents for certain geotechnical components of a Project substantially conform to the standards required in the Streets Restoration Manual by issuing the following 'Letters of Assurance' as required by Vancouver Building Bylaws:

- Schedule B-1 "Assurance of Professional Design and Commitment for Field Review"
- Schedule B-2 "Summary of Design and Field Review Requirements" and
- Schedule C-B "Assurance of Professional Field Review and Compliance"

Street: means public rights-of-way belonging to the City of Vancouver and includes lanes.

## 1.4 CONTACTS AT THE CITY OF VANCOUVER

Throughout this manual reference is made to several Branches within Engineering Services, as well as other Departments at the City of Vancouver. Following is a listing of those contacts:

### **City of Vancouver**

453 West 12th Avenue  
Vancouver, BC V5Y 1V8

### **City Clerks Office**

Phone: 604-873-7276

### **Engineering Services:**

Environmental Protection Branch

Phone: 604-871-6540

Kent Construction Supplies & Services Branch  
(Materials Engineer)

Phone: 604-301-0354  
604-321-1508

Projects, Development Services Branch

Phone: 604-873-7322

Sanitation Operations Branch

Phone: 604-326-4600

Sewers and Drainage Design Branch

Phone: 604-873-7357

Sewer Operations Branch

Phone: 604-326-4680

Streets Administration Branch

Phone: 604-873-7448

Streets Design Branch

Phone: 604-873-7323

Streets Operations Branch

Phone: 604-871-6200

Traffic Management Branch

Phone: 604-873-7020

Utilities Management Branch

Phone: 604-873-7371

Water Design Branch

Phone: 604-871-6109

Waterworks Operations Branch

Phone: 604-326-4800

Enquiry Centre (Building Permits)

Phone: 604-873-7611

## **PART 2 - ADMINISTRATION**

### **2.0 AUTHORITY**

The City Engineer, by authority of Council, controls all work performed on City streets. Materials and methods for restoration specifications are provided by this manual to facilitate the restoration in a safe, proven and consistent manner that meets City standards at all times.

Resolution of any dispute in technical nature between this manual, and any other referenced sources such as MMCD that is not covered by other City regulations, shall be at the sole discretion of the City Engineer.

### **2.1 CITY OWNED PROPERTIES**

No City owned properties such as bench marks, monuments, iron pins, lead plugs, stakes or other tie points and special effects on sidewalk at street intersections shall be disturbed or disposed of without permission from the City Engineer. The contractor shall bear the expense of re-establishing any of these items which the City Engineer deems necessary. Damage done to existing street improvements, properties and/or utility structures shall be repaired at the expense of the contractor for work under its custody.

### **2.2 CONDITION OF CONSTRUCTION**

All work within City properties shall be carried out and completed within the stated terms and conditions of any applicable permit, specification and by-law.

Street areas disturbed shall be maintained with competent temporary repair to the satisfaction of the City Engineer until such areas are permanently repaired. In the event the contractor fails or neglects to carry out such tasks for whatever reasons, the City may do the necessary repairs at the expense of the contractor.

The contractor shall be responsible and liable for all work done by them, or on their behalf. All permanent restoration work shall be maintained by the contractor for a period of two years including damage caused by backfill deficiency. City will assume responsibility for permanent surface restoration undertaken by its own crews. All work must be inspected by City inspectors to ensure compliance.

Inform and consult the City before starting any construction activities in City owned areas with non-traditional construction materials such as, but not limited to, bricks; pavers; cobble stones and wood planks that are in special value to the City. Special construction procedures and restoration method may be required. Failure to do so may warrant immediate work stoppage with cost to restore damages bound by the contractor. The City shall be the sole deciding authority on the authenticity of the materials involved.

It is the contractor's responsibility to seek clarification and instruction from the City regarding construction activities that are not covered by the applicable permits, by-laws and City and MMCD Specifications. In the event of any variation arises between this manual and City by-laws; the by-laws shall prevail.

## PART 3 - TECHNICAL

### DIVISION 1: GENERAL REQUIREMENTS

#### Section 01535 Temporary Facilities

**DELETE:** 1.0 GENERAL and replace with 1.0 OUTLINE

#### 1.0 OUTLINE

- 1.0.1 These specifications cover materials, equipment and procedures to be used when backfilling excavations of various types on City streets.

Backfill shall be considered as commencing 0.3 m above the utility. The bedding around the utility, and to 0.3 m above the utility, shall be specified by the Design Branch concerned or the Utility Authority, and shall be satisfactory to the City Engineer.

Details of backfilling are listed under Section 02223 of MMCD Vol. II, and as supplemented herein.

The City's standard specifications for mineral aggregates are as given in Division 2 - "Sitework", and will assist in selecting the suitable materials for backfill and restoration work.

**ADD:** 1.17 Building Excavations Adjacent to or Encroaching on the Street

#### 1.17 Building Excavations Adjacent to or Encroaching on the Street

The Contractor shall, in addition to obtaining permission from the Building Inspector under applicable building by-law, ensure that the method of supporting the street and appurtenances thereon is in accordance with applicable by-laws and to the satisfaction of the City Engineer.

## Section 01561 Environmental Protection

### **ADD: 1.0.3 under 1.0 GENERAL**

- 1.0.3 Clean up shall progress as rapidly as the work itself and upon completion of the job, the contractor shall remove all debris and waste material caused by construction operations and leave the job site in a clean and neat condition.

All wastes and wastewater resulting from construction and its related activities on City property must be strictly treated in accordance with all related City regulations and By-laws such as Sewer and Watercourse By-law and Federal Fisheries Act. Failure to do so could result in immediate stoppage of work and penalty. Further information and guideline pamphlet can be obtained from City Environment Protection Office, Streets Operations, Sanitation Operations, Water Operations and Sewer Operations Branches. See contact numbers on page 2 of this manual.

Where vehicular, bicycle or pedestrian volumes are heavy and where weather conditions result in unsightliness, discomfort, or hazards, the contractor shall always take special precautions, to ensure that the site is kept both clean and safe.

Fire Hydrants shall be left clear for hose connections at all times.

### **REPLACE: 1.2.2 under 1.2 Disposal of Wastes with the following:**

- 1.2.2 Do not dispose of waste, liquids or volatile materials, such as mineral spirits, oil or paint thinner into watercourses, storm or sanitary sewers.

### **DELETE: 1.3.3 under 1.3 Drainage and replace with the following:**

- 1.3.3 Do not discharge water with a pH less than 6.0 or greater than 9.0
- 1.3.4 Control disposal of runoff water containing suspended materials or other harmful substances in accordance with Federal, Provincial and Municipal requirements.
- 1.3.5 A truck wheel wash system may be required to keep mud, dirt and debris from being tracked onto roads and into the storm sewers system.
- 1.3.6 Storm drain inlet protection may be required adjacent to the work being done.

- 1.3.7 An Erosion Sediment Control Plan subjected to the approval of the City of Vancouver Manager of Environmental Protection may be required prior to the work being done.

**DELETE: 1.5.1 and 1.5.5 under 1.5 Work Adjacent to Watercourses and replace with the following:**

- 1.5.1 Work around watercourses shall be done in accordance with the most recent version of the “Land Development Guidelines for the Protection of Aquatic Habitat” published by the Federal Department of Fisheries and Oceans and Provincial Ministry of Environment Lands and Parks.
- 1.5.5 No temporary stream crossings will be allowed without the approval of the federal, provincial or municipal authorities.
- 1.5.9 Prevent sand blasting and other extraneous materials from entering watercourses.

## Section 01570 Traffic Regulation

### **ADD: 1.0.5 under 1.0 GENERAL**

- 1.0.5 The Contractor shall, at his own expense and without further or other order, provide, erect and maintain all requisite barriers, fences, or other proper protection in accordance with the latest version of "B.C. M.O.T. Traffic and Control Manual for Work on Roadways".

The Contractor shall also abide by any instructions issued by the City Engineer regarding traffic control.

### **ADD: the following under 1.2 Protection of Public Traffic**

- 1.2.7 Pedestrians:
- Pedestrian behaviour (a person on foot or in a wheelchair) is to be monitored and addressed appropriately whenever their movements are impacted
  - A pedestrian provision must be in place whenever a sidewalk is closed for work purposes, or a reasonable alternate solution to the satisfaction of the City Engineer
  - When observations reveal a condition that requires additional measures be taken to ensure the public's safety, the contractor must make all efforts to correct the situation in a timely manner
  - No two parallel sidewalks are to be under construction concurrently
  - Where work directly impacts sidewalk accessibility, ramps with a tactile surface are to be provided at either end of the work area allowing pedestrians to safely negotiate the grade change between the roadway surface and drop ramps, curbs and boulevards

#### Cyclists:

- Specific care and attention shall be provided for construction on Bike Routes or within Bike Lanes. Refer to the pamphlet 'Construction on Vancouver's Bicycle Routes', available through the Traffic Management Branch, for further information
- A traffic plan with clear directions of how cyclists are to be managed should be provided to Engineering staff
- Field review must be conducted regularly to ensure there are no conflicts between other road users or workers
- Different measures are to be used for the varying type of work impact - Emergency, Long Term and Short Term
- Accommodations are to be made whenever possible to allow cyclists through the work zone safely

Trucking:

- All truck operators must operate the vehicle in a safe and courteous manner and in full compliance with Provincial and Federal Motor Vehicle and Trucking Regulations
- All truck operators must comply with City of Vancouver By-laws regulating truck use, including truck route, engine brake noise, weight and load securement (tarping) provisions. There will be a zero tolerance on overloading trucks and untarped loads
- All vehicles must be inspected prior to leaving a site to ensure no debris is on the vehicle and that no debris or rocks are between tires



## DIVISION 2: SITEWORK

### Section 02000 References

**ADD:** under 1.2.7 ASTM (C)

- |          |   |
|----------|---|
| 1.2.7.25 | ASTM C 33, <i>Standard Specification for Concrete Aggregates</i>  |
| 1.2.7.26 | ASTM C140, <i>Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units</i> |
| 1.2.7.27 | ASTM C144, <i>Standard Specification for Aggregate for Masonry Mortar</i>                                 |
| 1.2.7.28 | ASTM C936, <i>Standard Specification for Solid Concrete Interlocking Paving Units</i>                     |
| 1.2.7.29 | ASTM C979, <i>Pigments for Integrally Coloured Concrete</i>   |

**ADD:** under 1.2.8 ASTM (D)

- |          |  |
|----------|--|
| 1.2.8.37 | ASTM D2216, <i>Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock</i> |
| 1.2.8.38 | ASTM D4491, <i>Permittivity</i>  |
| 1.2.8.39 | ASTM D4751, <i>Apparent Opening Size</i>   |
| 1.2.8.40 | ASTM D4632, <i>Grab tensile Strength</i>   |
| 1.2.8.41 | ASTM D4833, <i>Puncture Resistance</i>   |
| 1.2.8.42 | ASTM D4533, <i>Trapezoidal Tear</i>  |
| 1.2.8.43 | ASTM D3786, <i>Mullen Burst</i>  |
| 1.2.8.44 | ASTM D4353, <i>Sampling of Geotextiles for Testing</i>   |
| 1.2.8.45 | ASTM D4355, <i>Ultraviolet Stability</i>   |
| 1.2.8.46 | ASTM D4873, <i>Guide for Identification, Storage, and handling of Geosynthetics</i>                      |

**ADD: under 1.2.13 CAN/CSA = CAN3**

1.2.13.16      *CAN/CSA-A179, Mortar and Grout for Unit masonry*

**ADD: 1.2.17 AASHTO under 1.2 Referenced Specifications**

1.2.17.1      *AASHTO M288, Geotextile Specifications for Highway Applications*

**ADD: 1.2.18 Municipal & Provincial By-Laws under 1.2 Referenced Specifications**

1.2.18      Municipal & Provincial By-laws:

1.2.18.1\*      B.C. M.O.T. Traffic Control Manual for Work on Roadways

1.2.18.2\*\*      Latest version of applicable City of Vancouver By-laws

\*Available for a fee from the [BC Provincial Government](#).

\*\*Information on Vancouver by-laws is available on [City of Vancouver](#) website. Reading copy of these by-laws may also be available at the main branch of the Vancouver Public Library.

## Section 02104 Shrub and Tree Preservation

**ADD:** **3.6 Work Adjacent Trees under 3.0 EXECUTION**

### 3.6 Work Adjacent Trees

- 3.6.1 No tree branches or roots may be cut without prior approval by the City Engineer.
- 3.6.2 Branches and roots are to be cut with a sharp axe or saw with a Park Board inspector present. Cutting roots with an excavating equipment such as backhoe or gradall bucket is not acceptable.
- 3.6.3 Where required by the City Engineer, construction adjacent to trees will be done by hand, not by machine.

## Section 02223

### Excavating, Trenching & Backfilling

**ADD: 1.0.2 1.0.3 under 1.0 GENERAL**

1.0.2 All backfilling shall be controlled. There shall be three methods, the choice of which is left to the permittee unless otherwise considered impractical by the City Engineer.

1.0.2.1 **Granular or Sand Backfill** method compacted to specifications. Use import granular fill materials as per Section 02226 unless otherwise specified or approved by the City Engineer. All testing and inspection reports shall be made available to the City Engineer upon request.

1.0.2.2 **Controlled Density Fill** (Section 02236) method constructed to specifications. Timbering and shoring shall be removed as backfilling progresses unless specifically authorized by the City Engineer to do otherwise.

Before backfilling proceeds, the excavation shall be free from water, debris or sloughed soil unless considered impractical by the City Engineer.

Shallow tunnelling shall not be allowed except where impractical to do otherwise, in the opinion of the City Engineer. Tunnels shall be backfilled to the satisfaction of the City Engineer. Trench-less method for necessary crossings are preferred.

The contractor shall submit a Professional Engineer certified mix design and quality control testing reports to the City Engineer for record. Quality control testing must be performed by an independent CSA certified inspection agency. City may also choose to carry out verification testing and inspection to confirm the performance of the work.

1.0.2.3 **Approved Granular Native Materials** shall be compacted to the levels indicated below in Clauses 3.5.4 and 3.5.5. Native Silts and/or Clay Materials shall not be used, as clarified in Section 02226 Clause 2.2, “Granular Native Material Backfill”.

Native Granular Materials (primarily sand) are permissible for backfilling up to 1.2 m below the finished grade provided that they meet the requirements set for in Clause 2.2 of Section 02226 - “Aggregates and Granular Materials”. All approved granular native shall be compacted to a minimum 95% modified proctor density. In addition to the compaction requirement, the

granular native material must be proven to be stable enough to provide a good foundation for the lifts of granular base on top. The acceptance of certain native granular materials will be at the sole discretion of the City Engineer. The City Engineer may also impose additional acceptance requirements as deemed necessary for the use of approved granular native material. See Section 02226 for further details.

- 1.0.3 Street cut repairs in peat area must be restored strictly in accordance with standard drawing MF 137-AH in page 109 of this manual.

**DELETE:** 1.1.5 Waterworks Section 02666 under 1.1 Related Work and replace with 1.1.5 City of Vancouver Waterworks Standards

- 1.1.5 City of Vancouver Waterworks Standards

Refer to City of Vancouver Waterworks Standards, available by contacting City of Vancouver Water Design Branch at 604-871-6109.

**DELETE:** 1.1.6 Storm Sewers Section 02721 under 1.1 Related Work

**DELETE:** 1.1.8 Manholes and Catch Basins Section 02725 under 1.1 Related Work

**DELETE:** 1.1.9 Sanitary Sewers Section 02731 under 1.1 Related Work

**DELETE:** 1.1.10 Sewage Forcemains Section 02732 under 1.1 Related Work

**ADD:** 1.1.6 City of Vancouver Sewers & Drainage Standards under 1.1 Related Work

- 1.1.6 City of Vancouver Sewers & Drainage Standards  
Refer to City of Vancouver Sewers Design Manual, available by contacting the City of Vancouver Sewers and Drainage Design Branch at 604-873-7357.

**DELETE:** 3.3.6 'Hand excavation: .... or facilities.' under 3.3 Excavation and replace with the following:

- 3.3.6 Hand and Hydro Vacuum Excavation: Excavate by hand if necessary to preserve or minimize damage to existing trees, shrubs, buildings, and all similar existing features or facilities. Where, in the opinion of the City Engineer, mechanical excavation presents a high risk of damage to existing underground utilities, the City Engineer can require either Hand or Hydro

Vacuum Excavation to be done in order to expose those underground utilities.

**DELETE:** 3.5.1 'General: place .... To installed pipe.' under 3.5 Backfill and Compaction and replace with the following:

- 3.5.1 General: Care must be exercised in selecting compacting equipment. In City streets there are many utilities with service connections that are susceptible to damage. The use of drop hammer type compactors, and large vibrating rollers shall not be allowed, except under special conditions approved by the City Engineer. The Contractor shall assume all responsibility for costs/damages caused to any existing utility.

**DELETE:** 3.5.4 'Compaction: place .... Damage to pipe' under 3.5 Backfill and Compaction and replace with the following:

- 3.5.4 Backfill Classifications  
(Refer also to Figure 1 of the "Standard Detail Drawings" in page 92 of this Manual)

3.5.4.1 **Class A Backfill**

Backfilling of excavations in the following locations shall be according to Class A specifications.

- Paved roadways
- Sidewalks
- Curbs & Gutters
- Unpaved roadways (including ditches)
- Lanes
- Entrance Crossings
- Or unless specifically identified by the City Engineer.

Backfills near roadways, sidewalks, curbs, utilities, walls or structures within a distance equal to the excavation depth - Figure 1 (page 92).

\* For Building Backfills refer to Section 02596, "Restorations of Excavations Surrounding Building Sites".

3.5.4.2 **Class B Backfill**

Backfilling of excavations in the following locations shall be according to Class B Specifications.

Boulevards further from roadways, sidewalks, curbs, utilities, walls or structures, than the distance equal to the excavation depth.

And, only other locations which, in the opinion of the City Engineer, will not be a hazard should settlement occur.

Note: All existing utilities in the boulevard, exposed by the excavation, are to be supported to Class A specifications.

### 3.5.5 Backfill Density Specifications

#### 3.5.5.1 Class A Specification

The maximum dry density of prepared backfills shall be determined in accordance with the latest revision of ASTM D1557 (Modified Proctor Method). In-situ soil densities for backfill materials shall meet the following minimum requirements:

<u>Depth Below the Surface</u>	<u>% of Modified Proctor Density</u>
0 m - 1.2 m	95 (Engineering Backfill Materials Only)
> 1.2 m	85 (Engineering Backfill Materials)
> 1.2 m	95 (Approved Granular Native Materials)

**Notes:**

- Requirements for compaction of engineering backfill below 1.2 m in the case of building backfills within a distance equal to the excavation's depth from the property line of the street (Figure 1, page 92) is 90% of modified proctor density.
- Pavement restored with interlocking concrete blocks instead of asphalt pavement will require a higher compaction standard for the top 800 mm of granular base and subbase. See Section 02515, "Unit Paving" for Details.

#### 3.5.5.2 Class B Specification

Excavations of this type shall be backfilled as follows:

Within 1.2 meters of the surface - minimum of 85% modified Proctor Density. For depths below 1.2 meters of the surface - random backfill placed by any convenient method, providing that no "consolidation voids" are present throughout that material.

- 3.5.6 Backfill materials shall be placed in uniform lifts not exceeding 300 mm in loose thickness and compact to specified densities unless otherwise specified or allowed by the City Engineer.

**DELETE:** 3.6 Surface Restoration under 3.0 EXECUTION and replace with the following:

### **3.6 Surface Restoration**

#### **3.6.1 Pavement Restorations:**

Refer to the following City of Vancouver Supplemental Sections (separate from MMCD):

- Section 02590 Surface Restorations for Trench/Utility Cuts - General Requirements
- Section 02591 Restoration of Cuts in Pavements: Light Duty Asphalt Surfaced Roads
- Section 02952 Restoration of Cuts in Pavements: Heavy Duty Asphaltic Concrete Surfaces
- Section 02953 Restoration of Cuts in Pavements: Portland Cement Concrete Surfaces
- Section 02954 Restoration of Cuts: Portland Cement Concrete Sidewalks Driveway Crossings
- Section 02595 Restoration of Drill Holes in Pavements/Sidewalks
- Section 02956 Restoration of Excavations Surrounding Building Sites

#### **3.6.2 Boulevards and Landscape Restorations:**

Refer to the following sections:

- Section 02921 Topsoil and Finish Grading
- Section 02933 Seeding
- Section 02934 Hydraulic Seeding
- Section 02938 Sodding
- Section 02950 Planting of Trees, Shrubs and Ground Covers.

Note: Section 02950 of MMCD is superseded in entirety by the City of Vancouver's "Street Tree and Landscape Guidelines" available by contacting the City Streets Administration Branch at 604-873-7448.



## Section 02224 Roadway Excavation, Embankment and Compaction

**DELETE:** 2.2 Specified Materials under 2.0 PRODUCTS and replace with the following:

### 2.2 Specified Materials

2.2.1 Materials for embankment fill (subgrade fill) to be:

- 2.2.1.1 Approved native or imported granular material (refer to SRM Section 02226)
- 2.2.1.2 Pit Run (City of Vancouver aggregate item #12; refer to SRM Section 02226 Clause 2.3)
- 2.2.1.3 Sand Fill (City of Vancouver aggregate item # 17; refer to SRM Section 02226 Clause 2.5)
- 2.2.1.4 75 mm Crushed Tailings (City of Vancouver aggregate item #13; refer to SRM Section 02226 Clause 2.9)

The final acceptance to use the above materials or other proposed materials shall be at the sole discretion of the City Engineer.

**DELETE:** 3.4.4 under 3.4 PLACING and replace with the following:

- 3.4.4 Place backfill material in uniform lifts not exceeding 300 mm in loose thickness and compact to specified densities.

## Section 02226 Aggregates and Granular Materials

**DELETE:** 2.2 Native Material under 2.0 PRODUCTS and replace with the following:

### 2.2 Granular Native Material

Granular Native Material may be used only with the express written permission of the City Engineer, and provided it can be compacted to the requirement stated in Clauses 3.5.4 and 3.5.5 of Section 02223, “Backfill Classifications”, and provided that such materials also meet the following requirements:

- % passing the 600 um (#30) sieve: Not to exceed 55%
- % passing the 75 um (#200) sieve: Not to exceed 20%
- Liquid Limit (LL): Not to exceed 25
- Plasticity Index (PI): Not to exceed 10
- To be used only up to 1.2 m below finished grade
- Relatively free of organic and foreign matter (max. 0.5% by mass)
- Reasonably well-graded with coefficient of uniformity ( $C_u$ ) not lower than 10 and to the satisfaction of the City Engineer
- To be placed in uniform lifts of maximum 200 mm in loose thickness
- Not to be used in inclement weather
- In-situ moisture content to be within the range (preferably +/- 2% of the optimum or less) determined by ‘Modified Proctor’ test that will provide for minimum specified compaction.

Prior to any granular native material being approved for use, the grain size and in-situ moisture content of the proposed material must be verified by washed sieve and moisture content test as per ASTM C117, C136 and D2216.

A “Modified Proctor Test”, as per ASTM D1557, shall subsequently be conducted to determine the moisture density relationship of the proposed soil. The in-situ moisture content shall then be compared against the “Optimum Moisture Content” determined from the Proctor Test to give an indication as to the viability of using the material. If the in-situ moisture content is found to be within the range of moisture levels that will yield the desired minimum compaction levels it may be considered for approval. The moisture content and grain sizes shall be closely monitored thereafter to ensure that material properties are consistent and minimum compaction levels can be achieved. Every effort shall be made to maintain the favourable moisture of a suitable granular native material.

Only native granular materials with properties within above limits, as verified by Sieve Analysis, Proctor Tests and in-situ Moisture Tests can be used as backfill materials. Any deviation in materials as trench work progresses, or any changes in soils strata throughout the depth of the trench must meet the same criteria as outlined above; testing confirming continuous compliance and the frequency of that testing shall be to the satisfaction of the City Engineer.

Compaction shall subsequently be done in equal lifts not exceeding 200 mm in loose thickness, as necessary throughout the entire depth of the backfill in order to ensure even and adequate compaction to the specified levels of compaction.

Thicker lifts may be considered if it can be demonstrated that specified densities is achievable for a given combination of material, equipment, and conditions. Before the City Engineer gives his approval, the permittee may be called upon to demonstrate that their compaction method and machinery are feasible and adequate to meet the specified requirements.

In addition to the specified compaction requirement, the compacted backfill using approved granular native material must also be able to provide good stability and acceptable load bearing capacity with minimum settlement to the satisfaction of the City Engineer. The City Engineer may require the contractor to provide an independent third party certification and or additional testing to verify the specified properties of the granular native backfill.

Native silty and/or clayey materials are, at best, difficult to compact to specification and impossible to compact under wet conditions. The re-use of soils containing silts and clays, outside of the parameters set above, is typically not allowed because of the difficulty in achieving consistent compaction levels. With their very narrow “optimal moisture range” and the near impossibility of correcting the moisture content in the field, these materials are seldom suitable as backfill for cuts. Where, in the opinion of the City Engineer, native material is unsuitable it shall be removed from the job and approved granular material shall be substituted and no claim for extra payment shall be made.

**DELETE: 2.3 Pit Run Gravel under 2.0 PRODUCTS and replace with the following:**

### **2.3 Pit Run (City of Vancouver Item #12)**

This granular material may be considered to be used for deep fills only if the regular used items #17 and #9 are not available from the suppliers. It should be well graded and free-draining with clay lumps, organic matter and other extraneous material totalling not more than 0.5% by mass, and screened to remove all stones in excess of 75 mm. The material should compact readily to the density specified for its use. The City may specify additional requirements as part of the conditions of accepting the material for backfill purpose. The final acceptance of the material will be solely at the discretion of the City Engineer. The grading limits shall be:

SIEVE SIZE		% PASSING (by wt.)
75.0 mm	(3 in)	100
12.5 mm	(½ in)	56 - 100
4.75 mm	(No. 4)	32 - 83
2.36 mm	(No. 8)	17 - 70
75 um	(No. 200)	2 - 10

**DELETE: 2.5 River Sand under 2.0 PRODUCTS and replace with the following:**

## 2.5 Sand Fill (City of Vancouver Item #17)

This granular material is also used for deep fills, to a maximum upper limit of 0.6 m (2') below the base of pavement. This material shall be sand with uniform quality. Clean sand containing less than 0.5% organic materials is generally acceptable. This material is used for deep fills where a granular fill material is required. The grading limits shall be:

SIEVE SIZE		% PASSING (by wt.)
12.5 mm	(½ in)	100
9.5 mm	(3/8 in)	91 - 100
4.75 mm	(No. 4)	83 - 100
2.36 mm	(No. 8)	73 - 94
1.18 mm	(No. 16)	57 - 80
600 µm	(No. 30)	33 - 60
300 µm	(No. 50)	10 - 37
150 µm	(No. 100)	4 - 17
75 µm	(No. 200)	0 - 5

**DELETE: 2.6 Drain Rocks under 2.0 PRODUCTS and replace with the following:**

## 2.6 19 mm Clear Drain Rock (City of Vancouver Item #7)

- 2.6.1 Drain rock shall be of uniform quality, thoroughly washed free of sand, silt and clay, and should not contain more than 15% in crushed particles. It shall consist of durable particles capable of withstanding the effects of handling and spreading without degradation or production of deleterious fines. The grading limits shall be as follows:

SIEVE SIZE		% PASSING (by wt.)
37.5 mm	(1-1/2 in)	100
25 mm	(1 in)	0 - 100
19 mm	(3/4 in)	0 - 100
12.5 mm	(1/2 in)	0 - 30
4.75 mm	(No. 4)	0 - 3

- 2.6.2 An alternate partially crushed rock with proven physical properties against degradation meeting the above gradation limits may be allowed to be used as drain rock with City Engineer's approval. Final acceptance of the material will be at the discretion of the City Engineer.
- 2.6.3 Drain rock to be used only where specified in Standard Detail Drawings or Contract Drawings. Use of drain rock other than as specified requires

approval of City Engineer after examination of soils against which drain rock will be placed.

**DELETE: 2.7 Granular Pipe Bedding and Surround Materials under 2.0 PRODUCTS and replace with the following:**

## **2.7 20 mm to 2.5 mm Clear Crushed Coarse Aggregate (Pipe Bedding) (City of Vancouver Item #15)**

This material shall be of uniform quality, crushed to size as necessary and shall consist of sound, tough, durable, highly angular, 100% mechanically crushed fragments, with two or more fractured faces having a rough surface texture. It shall be free from an excess of flat or elongated particles, wood, shells, coatings of clay or any other deleterious material. Aggregates with objectionable polishing characteristics are not acceptable. The grading limits shall be:

SIEVE SIZE		% PASSING (by wt.)
19 mm	(3/4 in)	100
12.5 mm	(½ in)	28 - 46
9.5 mm	(3/8 in)	8 - 21
4.75 mm	(No. 4)	3 - 11
2.36 mm	(No. 8)	0 - 6
1.18 mm	(No. 16)	0 - 2

**DELETE: 2.9 Crushed Granular Sub-Base under 2.0 PRODUCTS and replace with the following:**

## **2.9 75 mm Crushed Tailings (City of Vancouver Item #13)**

This material shall be a well-graded 75 mm minus 100% crushed quarried material of uniform quality suitable for use in fills and road base lifts. It shall consist of durable particles capable of withstanding the effects of handling, spreading and compacting without degrading, resulting in the production of deleterious fines. The recommended grading limits are:

SIEVE SIZE		% PASSING (by wt.)
75 mm	(3 in)	100
19 mm	(3/4 in)	40 - 50
4.75 mm	(No. 4)	20 - 35
0.075 mm	(No. 200)	2 - 8

**DELETE: 2.10 Granular Base under 2.0 PRODUCTS and replace with the following:**

### **2.10 19 mm Minus Combined Crushed Aggregate (Mulch) Fill (City of Vancouver Item #9)**

This material shall be of uniform quality, crushed to size as necessary and consisting of sound, tough, durable, mechanically crushed fragments. A minimum 60% of particles by mass of the portion retained on a 9.5 mm sieve shall have at least one freshly fractured face. The grading limits shall be:

SIEVE SIZE		% PASSING (by wt.)
19 mm	(3/4 in)	100
12.5 mm	(½ in)	61 - 95
9.5 mm	(3/8 in)	45 - 85
4.75 mm	(No. 4)	35 - 60
2.36 mm	(No. 8)	26 - 47
1.18 mm	(No. 16)	20 - 39
600 µm	(No. 30)	13 - 29
300 µm	(No. 50)	8 - 21
150 µm	(No. 100)	5 - 15
75 µm	(No. 200)	2 - 8

This is a high quality granular fill and may be used up to the bottom of the asphalt or concrete surface.

**DELETE: 2.11.1 under 2.11 RECYCLED AGGREGATE MATERIAL and replace with the following:**

- 2.11.1 Aggregates containing recycled material may be utilized if approved by the City Engineer. In addition to meeting all other conditions of this manual, recycled material should exhibit the same quality as in quarried products. Recycled material should consist only of crushed concrete aggregates, crushed asphalt slabs and virgin mineral aggregates of control quantity; other construction and demolition materials such as bricks and plaster are not acceptable. The use of any recycled products must be approved by the City Engineer.

**ADD: 2.12 9.5 mm Minus Rounded Granular Aggregate (Pea-Gravel)**

### **2.12 9.5 mm Minus Rounded Granular Aggregate (Pea-Gravel)**

The material may be used only in backfill operations adjacent to foundation walls, as per standard detail drawing figure H1 on page 93 of this manual.

The material shall be of uniform quality, thoroughly washed free of sand, silt and clay and shall contain no more than 5% non-rounded (having one or more fractured faces) particles by mass on material retained on the 4.75 mm sieve size or larger. The particles shall be durable, capable of withstanding the effects of handling, placement and compaction without the production of deleterious fines. The grading limits shall be:

SIEVE SIZE		% PASSING (by wt.)
9.5 mm	(3/8 in)	100
6.3 mm	(1/4 in)	60 to 85
4.75 mm	(No. 4)	40 to 75
2.36 mm	(No. 8)	0 to 13
1.18 mm	(No. 16)	0 to 1

Any proposed alternative materials for the specified pea gravel must be approved by the City Engineer prior to its use. The City Engineer may also require additional qualification requirements for the replacement product.

## Section 02236 Control Density Fill

**ADD: 1.5.2 under 1.5 Inspection and Testing**

- 1.5.2 Submit Professional Engineer certified mix design and quality control test certificate to the City Engineer for record upon request. Quality control testing must be performed by an independent CSA certified inspection agency at least once per pour placed on any one day. The City may also choose to carry out quality assurance inspection to verify the performance of the work. Any non-conforming CDF shall be repaired or replaced to the satisfaction of the City Engineer by the contractor at their own expense.

**ADD: 2.1.7 under 2.1 Materials**

- 2.1.7 Control density fill supplied to the City shall satisfy the requirements of CSA A23.1-04 Table 5 Alternative 1 and the current specified requirements within the current City contract for supplying and delivering of ready mix concrete.



## Section 02242 Dust and Debris Control (Dust Control in MMCD)

**ADD: 1.0.3 under 1.0 GENERAL**

- 1.0.3 Haul routes along and across any public traveled way shall be kept free and clean of all rubbish and debris, including spillage, resulting from construction operations. Water or dust palliative, or both, shall be supplied as necessary to prevent dust nuisance, to the satisfaction of the City Engineer.

Any vehicle exiting a site that is handling loose material or travelling over loose material shall be inspected to ensure no debris is on the vehicle or between the tires.

If sites are not adequately controlled for dust, or kept clean to the satisfaction of the City Engineer, the City may do the work at the Contractor's expense. Flushing of debris into City catch-basins is not permitted without the express written consent of the City Engineer.

**DELETE: 3.1.1 under 3.1 APPLICATION and replace with the following:**

- 3.1.1 The intention of this specification is to apply water when necessary to control dust at all times. It is the Contractor's option to use the other methods described in this section.

## Section 02498 Geosynthetics

**DELETE:** 1.0.3 under 1.0 GENERAL and replace with the following:

- 1.0.3 This section currently provides minimum specifications for geotextiles only. The use of geogrids, geocomposites and geomembranes is permitted providing the Contractor has submitted advance notice of the use of the proposed material to the City, and that the proposed material has been reviewed and approved by the City Engineer. Any damage to existing geogrids, geocomposites, and geomembranes must be repaired or replaced to the satisfaction of the City Engineer.

**ADD:** 1.5.4, 1.5.5 and 1.5.6 under 1.5 Delivery and Storage

- 1.5.4 At no time shall the geotextile be exposed to ultraviolet light for a period exceeding fourteen days.
- 1.5.5 Geotextile rolls shall be stored in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.
- 1.5.6 The geotextile shall be labelled as per ASTM D4873, *Guide for Identification, Storage, and Handling of Geosynthetics*.

**ADD:** 2.1.6 under 2.1 Geosynthetic

- 2.1.6 The geotextile shall have no tears or defects which adversely alter its physical properties.

**ADD:** 3.1.5, 3.1.6 and 3.1.7 under 3.1 Installation

- 3.1.5 The geotextile shall be placed loosely (not taut) with no wrinkles or fold. Care will be taken to place the geotextile in intimate contact with the soil so that no void spaces occur between the geotextile and the underlying soil.
- 3.1.6 When geotextile is overlapped, the upstream geotextile shall overlap over the downstream.
- 3.1.7 Care shall be taken during construction to avoid contamination of the geotextile with soil or other material. Contaminated geotextile shall be removed and replaced at the contractor's expense.

## Section 02512

### Hot-Mix Asphalt Concrete Paving

(including City of Vancouver Superpave Asphalt Mix Design)

**DELETE:** 2.0 PRODUCTS and replace with the following:

## 2.0 PRODUCTS & SPECIFICATIONS FOR SUPERPAVE ASPHALT MIX DESIGN

**DELETE:** 2.1 MATERIALS and replace with the following:

### 2.1 Superpave Asphalt Mixture - Materials Requirements

- 2.1.1 **Asphalt Cement:** Asphalt cement shall be a minimum PG 64-22 for industrial/arterial pavements and PG 58-22 for higher zoned residential pavements and light duty residential pavements unless otherwise specified by the City Engineer. All PG binders used shall meet the requirements as specified in AASHTO M 320-05 "*Standard Specification for Performance-Graded Asphalt Binder*". Routine quality control test results and Temperature-Viscosity curve for the Project Binder shall be provided to the City Engineer.
- 2.1.2 **Mineral Aggregates:** Aggregates shall meet the latest established Superpave standards for aggregate characteristics. The requirement for each of these properties is based on traffic level and position within the pavement structure. Specifications shall be based on the traffic level of 3 to 30 million ESALs and mat thickness of 100 mm or less unless otherwise specified by the City Engineer.
- 2.1.3 **Consensus Aggregate Requirements:**
  - 2.1.3.1 Coarse Aggregate Angularity: ASTM D5821, "*Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate*". The minimum value shall be 95/90 that is 95% of the coarse aggregate shall have one or more freshly fractured face and at least 90% shall have two or more freshly fractured faces for pavement thickness  $\leq 100$  mm.
  - 2.1.3.2 Fine Aggregate Angularity: AASHTO T304, "*Uncompacted Void Content of Fine Aggregate*". The minimum value shall be 45% for  $\leq 100$  mm and 40% for  $> 100$  mm.
  - 2.1.3.3 Flat and Elongated Particles: ASTM D4791, "*Flat or Elongated Particles in Coarse Aggregate*". Test is performed on coarse aggregate larger than 4.75 mm. The maximum value allowed shall be 10% based on a 5:1 maximum length-to-minimum thickness ratio.

- 2.1.3.4 Clay Content: ASTM D2419 or AASHTO T176, “*Sand Equivalent Value of Soils and Fine Aggregate*”. The minimum sand equivalent value for fine aggregate shall be 45%.

#### 2.1.4 Source Aggregate Requirements:

- 2.1.4.1 Toughness: ASTM C131 or C535, “*Resistance to Degradation of Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine*”. The loss shall not be more than 35%.
- 2.1.4.2 Soundness: ASTM C88, “*Soundness of Aggregates by use of Magnesium Sulfate*.” The loss shall not be more than 15% for coarse aggregate and 18% for fine aggregate.
- 2.1.4.3 Deleterious Materials: ASTM C142, “*Clay Lumps and Friable Particles in Aggregates*”. The loss shall not be more than 1%.

#### 2.1.5 Design Aggregate Gradation Requirements:

The design aggregate structure shall meet the Superpave gradation requirements. A design structure must pass between gradation control points while avoiding gradation restricted zones as indicated below in Clauses 2.1.5.1, 2.1.5.2 and 2.1.5.3. It is recommended that the design gradation pass below the restricted zone. Exception can be made on individual cases with documented success history and test results. The supplier must provide proof documentation on such mix design to the City Engineer upon request.

##### 2.1.5.1 12.5 mm Nominal Maximum Aggregate Size Mix

City of Vancouver, Heavy Duty Surface Mix

Sieve mm	Control Points		Restricted Zone Boundary	
	Minimum	Maximum	Minimum	Maximum
19	100			
12.5	90	100		
9.5		90		
4.75				
2.36	28	58	39.1	39.1
1.18			25.6	31.6
0.600			19.1	23.1
0.300			15.5	15.5
0.075	2	10		

##### 2.1.5.2 19 mm Nominal Maximum Aggregate Size Mix

City of Vancouver, Heavy Duty Surface/Base Mix. The City Engineer will consider the use of this mix for base or surface

course only on an individual project basis. The City Engineer's decision will be final.

Sieve mm	Control Points		Restricted Zone Boundary	
	Minimum	Maximum	Minimum	Maximum
25	100			
19	90	100		
12.5		90		
9.5				
4.75				
2.36	23	49	34.6	34.6
1.18			22.3	28.3
0.600			16.7	20.7
0.300			13.7	13.7
0.075	2	8		

#### 2.1.5.3 25 mm Nominal Maximum Aggregate Size Mix

City of Vancouver, Heavy Duty Base Mix

Sieve mm	Control Points		Restricted Zone Boundary	
	Minimum	Maximum	Minimum	Maximum
37.5	100			
25	90	100		
19		90		
12.5				
9.5				
4.75			39.5	39.5
2.36	19	45	26.8	30.8
1.18			18.1	24.1
0.600			13.6	17.6
0.300			11.4	11.4
0.075	1	7		

\*Note: Superpave uses these aggregate size definitions:

**Maximum Size:** One sieve size larger than the nominal maximum size.

**Nominal Maximum Size:** One sieve size larger than the first sieve to retain more than 10 percent of combined aggregate.

**Control Points:** Function as master range between which gradation must pass.

Restricted Zone: Resides along the maximum density gradation. It forms a band through which the combined gradation is recommended not to pass.

**DELETE 2.2 MIX DESIGN and replace with the following:**

## 2.2 Superpave Asphalt Mix Design

- 2.2.1 Submit job mix formula to the City Engineer for review and approval. Mix designs older than two years will not be acceptable to the City.
- 2.2.2 Mix Designs should be based on the following **AASHTO Standards, Asphalt Institute Manual and C-SHRP Technical Brief:**
- M 323-04: “Standard Specifications for Superpave Volumetric Mix Design”
  - R 30-02: “Standard Practice for Mixture Conditioning of Hot-Mix Asphalt (HMA)”
  - R 35-04: “Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA)”
  - T 312-04: “Standard Method of Test for Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor”
  - Asphalt Institute Manual: “Superpave Mix Design Superpave series No. 2 (SP-2)”
  - “Superpave 2000 - Improved Standards for a New Millenium” C-SHRP Technical Brief #17 issued by Canadian Strategic Highways Research Program (C-SHRP)
- 2.2.3 Laboratory compaction shall be by means of a Superpave Gyratory Compactor (SGC) and the asphalt content selected based on volumetric design requirements according to the above-mentioned standards.

Mixture Properties	Criteria
Air Voids, %	4.0
VMA, % for 25 mm Nominal Max Size	12.0 Min.
VMA, % for 19 mm Nominal Max Size	13.0 Min.
VMA, % for 12.5 mm Nominal Max Size	14.0 Min.
VFA, %	65 - 75
Dust Proportion	0.6 - 1.2*
%Gmm @ N-initial	Max. 89
%Gmm @ N-design	96
%Gmm @ N-maximun	Max. 98
% TSR (Moisture Sensitivity)	Min. 80
Gmm = maximum theoretical specific gravity	

\* Ratio may increase to 0.8 - 1.6 if the aggregate gradation passes beneath the restricted zone boundaries.

- 2.2.4 Compactive effort of the design mixture  
Asphalt mix shall be designed at the following specified design number of gyrations unless otherwise specified by the City Engineer:

N-initial	8
N-design	100
N-maximum	160

- 2.2.5 The air voids of the design mix shall be 4.0 %.

- 2.2.6 Use of Reclaimed Asphalt Pavement (RAP) in Superpave mix

Superpave asphalt mix may contain up to a maximum 15% RAP by weight of total mix without a special mix design. The City Engineer may approve a higher proportion of RAP if the contractor can demonstrate with proof documentation their ability to produce a mix meeting the requirements of the specification.

Tier	% RAP by wt of Total Mix	Determine RAP AC Content	Measure RAP Gradation	Measure RAP AC Stiffness	Measure Agg Blend Properties	PG Grade Change
1	≤ 15%	(a)	yes	no	yes	none
2	16% to 25%	yes	yes	no (b)	yes	one grade lower (c)
3	> 25%	yes	yes	yes	yes	use blending chart
(a) At the discretion of the agency (b) Unless blending chart is used (c) Or use blending chart						

- 2.2.7 The job mix formulas, with the mixing variance limits in Clause 3.1.4.1 applied, shall not result in a gradation that is outside the recommended Superpave design limits as stated in Clauses 2.1.5.1, 2.1.5.2, 2.1.5.3 and the applicable design standards as stated in Clause 2.2. The final gradation of the supplied mix as represented by the test samples must also retain the initial designed nominal maximum aggregate size of the mix.

**DELETE 3.1.4.1 and 3.1.4.2 under 3.1.4 Mixing Tolerances and replace with the following:**

- 3.1.4.1 Mixing tolerances:  
Permissible variation in aggregate gradation from the job mix (percent of total mass) shall be as follows:

Gradation	Tolerance
Passing 4.75 mm and larger sieves	+/- 5%
Passing 2.36 mm to 0.6 mm	+/- 4%
Passing 0.6 mm to 0.3 mm	+/- 3%
Passing 0.3 mm to 0.15 mm	+/- 2%
Passing 0.15 mm to 0.075 mm	+/- 1.5%

3.1.4.2 Permissible variation of asphalt cement from job mix, 0.25%

**ADD: 3.2.3.3 under 3.2.3 VIBRATORY ROLLERS:**

3.2.3.3 Vibratory rollers may only be used with precaution to ensure there will be no damages done to nearby structures and utilities, or cause unreasonable discomfort to nearby residents.

While compaction standards as set forth in Sections 02223 and 02512 must always be met, extreme care must be taken around cast iron watermain as additional costs may be incurred by the contractor if the repair of leaking/damaged watermain becomes necessary.

**ADD: 3.5.8 Established Practices under 3.5 PLACING:**

3.5.8 Established Practices:

In addition to the requirements of this specification, the Contractor shall adhere to the practices described in the Paving Manual Series No. 8 published by the Asphalt Institute.

**DELETE: 3.6.1 under 3.6 COMPACTION and replace with the following:**

- 3.6.1 Roll asphalt continuously to meet the following requirements:
- 38 mm nominal maximum aggregate size mix: 95 to 96% of MTD
  - 25 mm nominal maximum aggregate size mix: 95 to 96% of MTD
  - 19 mm nominal maximum aggregate size mix: 93 to 96% MTD
  - 12.5 mm nominal maximum aggregate size mix: 92 to 96% MTD
  - 9.5 mm nominal maximum aggregate size mix: 92 to 96% MTD

Maximum Theoretical Density (MTD) of each mix shall be determined in accordance with AASHTO T 209-05 or ASTM D2041-03. Final compaction level of the finished pavement shall be determined by core samples. The contractor will be required to provide core density verification data upon request by the City Engineer.

A minimum three cores shall be obtained from random locations as selected by the City Engineer. No more than one individual test result shall be more than 1.0% below or 2.0% above the specified range as indicated above and the average test results of the cores must be within the specified range. The



contractor may be allowed to extract one additional core near the original failed area with the consent of the City Engineer. New average will be calculated with the new core result replacing the original failed data. Failing to comply constitutes immediate rejection.

**ADD: 3.6.6 Confined Areas under 3.6 COMPACTION**

- 3.6.6 Confined Areas: The Contractor shall use smaller approved power compactors or tampers in areas around manholes, poles, or other structures which are inaccessible to a roller, to the satisfaction of the City Engineer.

## SECTION 02515 UNIT PAVING

### ADD: 1.0.2 under 1.0 GENERAL

- 1.0.2 The City maintains an inventory of “approved” concrete paver styles. Contact Streets Operations at 604-871-6200 for further information prior to any restoration work involving paver stones. Any variation from the original must be approved by the City Engineer.

### ADD: 1.1.7 under 1.1 RELATED WORK

1.1.7 Geosynthetics

Section 02498

### ADD: 1.3.2 under 1.3 SAMPLES

- 1.3.2 Concrete unit pavers shall comply with the latest revision of ASTM C936, “*Solid Concrete Interlocking Paving Units*” and Interlocking Concrete Pavement Institute (ICPI) Tech Specs with the following requirements:
- Compressive strength and water absorption to ASTM C140
  - Resistance to freezing and thawing to ASTM C67
  - Abrasion resistance to ASTM C418
  - Concrete pavers shall be free of chips, spalls, cracks and all other manufacturing defects, to the satisfaction of the City Engineer. Rejection of more than 10% for these reasons in any one lot shall be ground for rejection of the entire lot.
  - The supplier shall be prepared to provide independent reports of the producing lot for the above specified tests upon request of the City Engineer.

### ADD: 1.8 Quality Assurance under 1.0 GENERAL

## 1.8 Quality Assurance

- 1.8.1 The contractor may be required to install a 2 m X 2 m mock up.
- 1.8.2 Upon acceptance by the City Engineer, this trial mock up will be retained as the standard for the project. Surcharge of the bedding sand layer, joint sizes, line, laying pattern(s), colour(s) and texture of the mock up panel shall be consistent throughout the job.
- 1.8.3 Subject to acceptance by the City Engineer, the mock up may form part of the permanent. Mock up that is not part of the final product shall be removed and properly dispose of at contractor expense.

**DELETE: 2.1.4 Granular Laying Course under 2.1 MATERIALS and replace with the following:**

- 2.1.4 Bedding sand (also referred to as granular laying sand or concrete sand) shall consist of clean, hard, durable crushed stone particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials. Bedding sand shall meet the general requirements for fine aggregate as specified in CSA A23.1-04 Table 12. Grading of the sand shall be within the following limits (CSA A23.1-04 Table 10 FA1):

SIEVE SIZE	% PASSING (by wt.)
10 mm	100
5 mm	95 - 100
2.5 mm	80 - 100
1.25 mm	50 - 90
630 µm	25 - 65
315 µm	10 - 35
160 µm	2 - 10
80 µm	0 - 1

**ADD: 2.1.7 Joint Sand, 2.1.8 Geotextile, 2.1.9 Cement-Treated Base, 2.1.10 Unbounded Granular Subbase under 2.1 MATERIALS**

- 2.1.7 Joint sand shall conform to CSA A179-04 within the following grading limits:

SIEVE SIZE	% PASSING (by wt.)
5 mm	100
2.5 mm	90 - 100
1.25 mm	85 - 100
630 µm	65 - 95
315 µm	15 - 80
160 µm	0 - 35
80 µm	0 - 1

- 2.1.8 Geotextile used to prevent the migration of bedding sand shall meet the requirements as described in AASHTO M288 Class 2.

- 2.1.9 Cement-treated base material shall have a 7-day unconfined compressive strength of at least 4.5 MPa.

- 2.1.10 Unbound granular subbase material shall have a Plasticity Index less than 10 and a Liquid Limit less than 25.

**ADD: 3.1.3, 3.1.4 under 3.1 SUBGRADE PREPARATION**

- 3.1.3 Subgrade soils having a California Bearing Ratio (CBR) of 3% or less should be evaluated for either replacement with a material with higher bearing strength, installation of an aggregate subbase capping layer, improvement by stabilization, or use of geotextiles.
- 3.1.4 The excavated site shall be free of organic materials and large rocks.

**DELETE 3.2.2 and 3.2.4 under 3.2 GRANULAR SUBBASE AND BASE and add the following:**

- 3.2.2 Compact the top 600 mm of base and subbase directly beneath the bedding sand to a minimum of 98% Modified Proctor density as per ASTM D1557 unless otherwise specified by the City Engineer. The remaining 400 mm base and subbase will require the normal 95% Modified Proctor density. Special attention shall be given to achieving compaction standards adjacent to curbs, catch basins, and utility structures.
- 3.2.4 Ensure that top of granular base is within the specified tolerances as listed in MMCD Section 02233 Clause 3.4.
- 3.2.5 Variation in final surface base elevations shall not exceed 10 mm when tested with a 3 m straightedge. The finished and compacted surface of the aggregate base should not allow continuous migration of bedding sand into the base layer.
- 3.2.6 Road base design elevation is to be equal to the road design elevation, minus the thickness of the pavers and minus the thickness of the compacted sand bedding layer (minimum 25 mm to 35 mm maximum), plus the amount 3 mm to 6 mm which is the amount that is desired for the initial height of paver surface above the road design elevation.
- 3.2.7 The surface of the base course and its perimeter around the edge restraints shall be inspected for areas that might allow bedding sand to migrate after installation. Such locations may be found around utility structures, or at catch basins. These areas shall be covered with a geotextile fabric as required by the City Engineer to prevent loss of the bedding sand. Geotextile shall also be installed between the bedding sand and curbs, sidewalks, and foundation walls at the discretion of the City Engineer to prevent sand migration.
- 3.2.8 Geotextile fabric shall be used along edge restraints and concrete utility collars to prevent the loss of bedding sand. A minimum 300 mm wide geotextile strip shall be applied along the base and turned up along the sides of the restraints and concrete utility collars. Do not place filter cloth on top of the bedding sand.

- 3.2.9 Every joint of the geotextile fabric used must have a minimum 300 mm downslope overlap.

**ADD: 3.3.2, 3.3.3, 3.3.4 & 3.3.5 under 3.3 EDGE RESTRAINTS**

- 3.3.2 Edge restraints must be in place prior to laying unit pavers.
- 3.3.3 Install temporary bracing with plastic or metal edge restraints around the perimeter of the utility cut opening to secure existing pavers. The restraints are to be pinned to the base using metal spikes.
- 3.3.4 If there is a change in slope, a straight edge shall be formed at the top, with the pavers and the pattern resumed down the slope.
- 3.3.5 Edge restraints shall not be installed on top of bedding sand.

**DELETE: 3.4.1 under 3.4 GRANULAR LAYING COURSE and replace with the following:**

- 3.4.1 Screed bedding sand in a uniform layer to give a compacted thickness of 25 mm.
- 3.4.2 Bedding sand shall be maintained at a uniform density. Screeded sand left overnight or subject to rain shall be rechecked for level and raked and re-screeded where necessary.
- 3.4.3 Bedding sand shall not be used to correct out of tolerance granular base.

**DELETE: 3.5.4.1 to 3.5.4.6 under 3.5 UNIT PAVING and replace with the following:**

- 3.5.4.1 Set pavers in laying design as shown on Contract Drawings or as specified by City Engineer. Align pavers to maintain correct lines and patterns.
- 3.5.4.2 Herringbone 45° pattern is required in areas subject to vehicular traffic. This pattern offers the greatest structural capacity and resistance to lateral movements.
- 3.5.4.3 A crowned profile is required in areas subject to vehicular traffic.
- 3.5.4.4 Existing pavers shall be removed to a minimum 0.8 m from the edges of utility cuts. Restoration of pavers must be on undisturbed granular materials and bedding. Retain existing pavers so they can be reinstated upon completion of utility repair.

Stack the pavers neatly near the opening, out of the way of excavation equipment.

- 3.5.4.5 Set pavers with 3 mm +/- joints. No more than 5% of the joints shall exceed 6 mm wide to achieve straight bond lines.
- 3.5.4.6 Joint (bond) lines shall not deviate more than +/- 15 mm over 15 m from string lines.
- 3.5.4.7 Fill gaps at the edges of the paved area with cut pavers or edge units. Pavers shall be cut using double bladed splitter or masonry saw to achieve a smooth cut. No pieces shall be smaller than 10 mm; smaller gaps shall be filled with sand. Adjust bond pattern at pavement edges such that cutting of edge pavers is minimized. All cut pavers exposed to vehicle tires shall be no smaller than one-third of a whole paver.
- 3.5.4.8 Keep skid steer and forklift equipment off newly laid pavers that have not received initial protection and joint sand.
- 3.5.4.9 Use a low-amplitude plate compactor capable of at least 22 kN at a frequency of 75 to 100 Hz to vibrate the pavers into the sand. Tamp down and level pavers with a minimum of four passes and until joints are filled with sand, unit pavers are true to grade, within design tolerances and free of movement. Remove any cracked or damaged pavers and replace with new units.
- 3.5.4.10 Simultaneously spread, sweep and compact dry joints sand into joints continuously until full. Tamp down and level pavers with suitable vibratory force for a minimum of four passes and until joints are filled with sand, unit pavers are true to grade, within design tolerances and free of movement. Do not compact within 2 m unrestrained edges of paving units.
- 3.5.4.11 Ensure paver elevation is approximately 3 to 6 mm above road design grade after compaction.
- 3.5.4.12 The surface elevation of pavers shall be 3 to 6 mm above adjacent drainage inlets, concrete collars or channels.
- 3.5.4.13 The elevation of adjacent pavers may not differ by more than 3 mm.
- 3.5.4.14 All pavements within 2 m of unfinished edges shall have the joints fully filled with sand and be compacted at the end of each day. The laying face of any incomplete areas must be covered with plastic sheets overnight to prevent exposed bedding sand from becoming saturated from rainfall.

- 3.5.4.15 For utility installation in streets and walks constructed with concrete pavers, special provisions may be required. Contact Streets Design Branch for further details.
- 3.5.4.16 All permanent repairs which have been constructed by the contractor shall be maintained by the contractor for a period of two years unless otherwise noted in applicable by-laws. The contractor is also responsible, within this two years period, for the extra costs the City incurs for the repair of damage to the pavement caused by backfill deficiency.

## **SECTION 02521 PORTLAND CEMENT CONCRETE PAVEMENT**

**DELETE:** 3.2.2 under 3.2 GRADE PREPARATION and replace with the following:

- 3.2.2 Compact to minimum 95% modified proctor density for the top 1.2 m of the granular fill from finished grade in accordance with ASTM D1557 (all following references to density imply compliance with ASTM D1557).



## SECTION 02523 CONCRETE WALKS, CURBS AND GUTTERS

### **ADD: 1.1.6 under 1.1 RELATED WORK**

1.1.6 Geosynthetics

Section 02498

### **ADD: 3.3.9 under 3.3 FORMWORK**

3.3.9 At lanes, crossings, etc., formworks shall be left in place until the concrete has attained sufficient strength to bear traffic loads without edge damage.

### **ADD: 3.7.2, 3.7.3 and 3.7.4 under 3.7 DRIVEWAY CROSSINGS AND WHEEL CHAIR RAMPS**

3.7.2 Wheel Chair Ramps (See Curb Ramp Design Standards in page 103 of this manual):

3.7.2.1 Ramps should land wheelchair and other users safely in the crosswalk and in the desired direction of travel.

3.7.2.2 Wherever possible, 2 ramps shall be installed per corner. Large single curb ramps may be installed on:

- Steep streets where one of the two doubles ramps would have an unacceptable cross fall or
- Where double curb ramps cannot be accommodated due to a site condition and obstructions such as poles, catch basins, and property line that would result in less than 1 meter full curb between the two ramps

3.7.2.3 Double Curb Ramp Design (refer to Standard Detail Drawing MF 137-L-5 on page 104 of this manual):

- The ramp and the directional score lines shall lead into the crosswalk, lining up with the ramp across the street and be parallel with the crossing or marked crosswalk. The directional score lines are intended to aid the visually impaired pedestrian across the street
- Where a greener treatment is desired grass can be installed between the two ramps where there is a reasonable expectation that the adjacent property owner will mow the additional grass area

3.7.2.4 Large Single Curb Ramp Design (refer to Standard Detail Drawing MF 137-L-3 on page 105 of this manual):

- The ramp and the directional scores lines shall lead over the curb and into the crosswalk, lining up with the ramp across the street and be parallel with the crossing or marked crosswalk. The directional score lines are intended to aid the visually impaired pedestrian across the street

- 3.7.3 The minimum thickness of all concrete driveway crossings shall be 150 mm (minimum thickness for commercial crossings is 200 mm). See Standard Detail Drawings MF 137-AF and MF 137-AG on page 107 & 108.
- 3.7.4 The minimum thickness of all curb ramps shall taper from 100 mm at the back of ramp (matching the sidewalk thickness) to 200 mm at the back of curb. See Curb Ramp Design Standards on page 103 to 106 for more detail.

**REPLACE: 3.5.6 under 3.5 Concrete Placement with the following:**

- 3.5.6 Place concrete within 120 minutes of batching time.

**ADD: 3.12.9, 3.12.10, 3.12.11, 3.12.12 and 3.12.13 under 3.12 FINISHING**

- 3.12.9 Finished curb and gutter shall have a smooth and uniform surface, true to line, grade, and section and shall be free from voids, sags, bumps, or other irregularities to the satisfaction of the City Engineer.
- 3.12.10 Walks 1.5 m, 1.8 m and 2.0 m in width shall be marked off in panels 1.5 m, 1.8 m or 2.0 m long respectively unless otherwise directed by the City Engineer. Control joints, to control and minimize cracking, shall be installed to the satisfaction of the City Engineer. The scoring pattern of the sidewalk is governed by the distance between the constants such as tree pits and water boxes. Keep the scoring pattern as square as possible for the sidewalk stones (panels). See Standard Drawings MF 137-F-2, MF 137-F-3, and MF 137-F-4 on pages 100 to 102.
- 3.12.11 Cutting and marking tools shall have a cutting edge not less than 25 mm in depth and the edge of the panel shall be rounded to a 6 mm radius. Trowel edge to be as close to flush as possible with broom finish.
- 3.12.12 Carefully fit, cut, and mark the sidewalk around all waterworks boxes, lamp standards, poles, and hydrants to prevent cracking of the slabs, to the satisfaction of the City Engineer.
- 3.12.13 Scoring pattern for exposed aggregate front filler walk: Whenever there is sidewalk constant presented, the scoring pattern must follow through from the main sidewalk scoring pattern. If there are an odd number of stones greater than three between the constants, two cuts are required at equal distance from the constants. A cut is generally spaced between two adjacent

sidewalk stones as long as it provides balanced scoring pattern between constants. No cuts are required for three stones or less.

**ADD: 3.13.3 under 3.13 SPECIAL EFFECTS**

- 3.13.3 At street intersections the cast year shall be stamped in the surface of the sidewalk as directed by the City Engineer. The necessary template figures will be available from the City.

Old historical sidewalk stamp markings 1950 or older have special value to the City and are required to be saved and keep in place. The City must be contacted and consulted prior to the demolition and removal of the markings.

**ADD: to end of first sentence of 3.14.1 the following:**

- 3.14.1 "...for a minimum 24 hours after final set.

**DELETE: 3.16.1 under 3.16 PERFORATED DRAIN and replace with the following:**

- 3.16.1 Install perforated drain pipe adjacent to sidewalk or curb and gutter wherever the adjacent finished grade rises more than 1 m within 10 m of the sidewalk or curb and gutter. Perforated drain shall also be installed where shown on Contract Drawings or as directed by the City Engineer.
- 3.16.2 Drain pipe or fittings to be continuously extruded polyvinyl chloride (PVC) or acrylonitrile butadiene-styrene (ABS) plastics, meeting the requirements of the latest revision of CSA B182.1. It shall be available in 3 metre lengths with nominal diameter of 100 mm and perforations as detailed in Section 4.1.4 of CSA B182.1 for leach field pipe. The pipe will include bell and spigot design suitable for solvent welding, where required.
- 3.16.3 Connect to catch basins and stamp letter "D" in walk where drain crosses under.
- 3.16.4 Perforated Corrugated Metal Pipe (PCMP) shall conform to the latest revision of the requirements for Corrugated Metal Culvert Pipe AASHTO Designation M36. PCMP shall consist of 18 gauge (minimum 1.214 mm) metal with 6.35 mm minimum diameter rivets or the seam may be formed by welding. Helical corrugated pipe will be acceptable if it has corrugation 6.35 mm deep by 38 mm wide. Perforations shall consist of two groups of two lines each. The holes shall be not less than 6.35 mm nor more than 11.1 mm in diameter and shall be located in the inside ridges of all corrugations. The lines of holes shall be approximately 25 mm apart and the outer rows of holes shall be not more than 67.5 degrees from the centre line of the non-perforated segment.

- 3.16.5 Drain pipe placed across lane entrances shall be either corrugated metal pipe or non-perforated P.V.C. pipe conforming to the latest C.S.A. standard and having a S.D.R. of 28 or lower, 700 KPa at 5% deflection, and a minimum of 400 mm of cover.
- 3.16.6 Geotextile (filter fabric) shall be installed between drain gravel and overlying soil. The filter fabric geotextile shall meet the requirements described in AASHTO M288 for Class 2.
- 3.16.7 Refer to Section 02721 - Storm Sewers and Standard Detail Drawings MF 137-B-1 in page 98 of this manual.

**ADD: 3.17.3 and 3.17.4 under 3.17 ACCEPTANCE**

- 3.17.3 Any portion marked or damaged by vandalism, rain, frost, equipment, traffic, or other, to be replaced at Contractor's cost.
- 3.17.4 The Contractor shall be responsible for any damage to existing Concrete Walks, Curbs, and Gutters at their worksite or any damages at adjacent sites, and shall make all necessary repairs to any damage caused from their construction activities to the satisfaction of the City Engineer.

**\*ADD: Sections 02590 through 02596 as follows:**

## **Section 02590**

### **Surface Restorations for Trench & Utility Cuts - General Requirements**

- 1.0 An asphaltic repair shall be made which is suitable for use by traffic, on any roadway or lane (including sidewalks, boulevard crossings, etc.) subject to vehicular or pedestrian traffic until permanent repairs have been made, and at the discretion of the City Engineer. It shall be constructed as per Section 02512, "Hot Mix Asphalt Concrete Paving", and shall be maintained in a safe condition at the expense of the Contractor or the Branch concerned. Gravel surfaced repair flush with the surrounding pavement may be acceptable in specific applications with the express written consent of the City Engineer.
- 1.1 The contractor is responsible for any and all peripheral damage to the road which has been caused by the trench and utility cut activity. This includes all damage to the surrounding paving structure which has caused that structure to crack or deteriorate or become unstable versus its condition prior to the trench and utility cut activity. In such cases, unless the contractor can clearly demonstrate such damage was present before the cutting of the road, the contractor is responsible for, and must ensure that the entire damaged area of pavement, plus the standard minimum 200 mm cutback, is repaired to the full applicable road standard. For example, a Higher Zoned route requires that all damaged pavement be repaired to that Higher Zoned standard, and an Arterial Road shall be repaired to the Arterial standard for the entire damaged area.
- 1.2 Non-excavated saw cut pavement shall be restored in accordance with Sections 02591, 02592, 02593, 02594, 02595 and 02596 of this manual. For any other proposed treatment of non-excavated saw cut pavement, consult City Engineering Services for further instructions.
- 1.3 The repairs (both temporary and permanent) shall be made flush and true to grade with the existing surface after compaction. Careful attention must be given to finished ride quality in conformance with our Mission Statement.  
  
\* Note: For both 1.1 and 1.2 above, with the approval of the City Engineer, the Contractor may avoid the need for temporary repairs, and proceed directly to permanent repairs.
- 1.4 The practice of mounding up a repair in order to rely on passing traffic to complete consolidation and compaction of the backfill will be cause for immediate rejection by the City Engineer, and for immediate satisfactory repairs to be performed by City forces. The expense of such corrective work shall be borne by the Contractor who constructed the mounded repair. Finished compacted pavements must be flush with adjacent road.

- 1.5 For those backfilled excavations not subject to vehicular or pedestrian traffic the surface shall be returned to a condition equal to, or better than the condition existing before the excavation was made.
- 1.6 Drawings relative to the restoration of trench and utility cuts are as indicated on drawings MF137-AE, 1 to 5 (pages 87 through 91). For specific details of the various restoration types, refer to the following sections:
- Section 02515 relates to the restoration of pavement surfaces with concrete pavers.
  - Section 02591 relates to the restoration of light duty asphalt surfaced roads (under 100 mm in asphalt thickness).
  - Section 02592 relates to the restoration of cuts in heavy duty asphalt pavement surfaces (arterial, industrial, bus and higher zoned routes over 100 mm in total asphalt thickness).
  - Section 02593 relates to the restoration of Portland cement concrete road surfaces.
  - Section 02594 relates to the restoration of Portland cement concrete sidewalks & driveway crossings.
  - Section 02595 relates to the restoration of drill holes in road pavements and sidewalks.
  - Section 02596 relates to the restoration of excavations surrounding building sites.
- 1.7 Utility cut shall be permanently restored as follows unless otherwise noted in applicable by-laws:
- 1.7.1 For cuts in pavement that is two to five years old from date of issuance of the work permit.
- Rebuild the entire aggregate pavement structure within the cut in accordance with City standards if required
  - Grind and overlay or repave the full lane width of the lane with City approved material
  - Thickness and properties of repairing asphalt pavement must match the adjacent pavement structure
  - Partially damaged lane(s) must be removed to its full lane width and restored
  - Longitudinal joint for successive lifts of asphalt must be overlapping by at least 150 mm except at the curb edge
- 1.7.2 For cuts in pavement that is less than two years old from date of issuance of the work permit.
- Rebuild the entire aggregate pavement structure within the cut in accordance with City standards if required
  - Grind and overlay or repave the full width of the pavement from curb to curb
  - Thickness and properties of repairing asphalt pavement must match the adjacent pavement structure
  - Longitudinal joint for successive lifts of asphalt must be overlapping by at least 150 mm except at the curb edge

- 1.7.3 For cuts in concrete pavement, sidewalks and driveway crossing, the same replacement age limits as described in Clauses 1.7.1 and 1.7.2 above are valid. The permanent restoration shall be completed in accordance with Sections 02593, 02594, 02595 and 02596 of this manual unless otherwise noted in relevant by-laws.
- 1.7.4 For cuts in asphalt and concrete pavement, sidewalks and driveway crossing that are older than five years from date of issuance of work permit, the permanent restoration shall be carried out in accordance with Section 02591, 02592, 02593, 02594, 02595 and 02596 unless otherwise directed by the City Engineer.
- 1.7.5 For cuts in concrete unit pavement surfaces, the permanent restoration shall be carried out in accordance with Section 02515 unless otherwise directed by the City Engineer.

Longitudinal cuts shall be repaired at the surface such that the final longitudinal asphalt joint is not in line with the traffic wheel path. For example: Final longitudinal joints shall be at lane lines, or in the center of the lane. This requirement applies only to the top surface lift of asphalt, and not the underlying trench walls.

Provide inspection and test records to the City Engineer upon request.

## **Section 02591**

### **Restoration of Cuts in Pavement - Light Duty Asphalt Surfaced Roads** (Refer also to drawing MF 137-AE-2, page 88)

#### **1.0 DESCRIPTION**

- 1.1 This specification covers the surface restoration of road surfaces on low volume residential streets and lanes where the road surface consists of approximately 100 mm or less of asphaltic material.
- 1.2 The specification is divided into Schedule "I" and Schedule "II" for the convenience of the Contractor.

Schedule "I" covers the repairs of the following road surfaces:

- Gravel roads, lanes and driveways, including shoulders of strip pavement.
- Spray-capped surfaces (surfaces sprayed with asphalt and covered with fine aggregate).
- Macadam or penetration type pavements.

Schedule "II" covers the repairs of:

- Asphalt pavements approximately 100 mm or less thick, including asphalt driveways.
- 1.3 The repair materials for both Schedule "I" and "II" shall be City approved Superpave hot mix except for gravel surfaces which shall be repaired with approved crushed granular materials. All asphaltic materials shall be in accordance with the latest Asphalt Paving Specification (see Section 02512 herein) for the City of Vancouver Engineering Services.
- 1.4 The road surface on any street to be repaired may involve both Schedules "I" and "II". The Contractor shall at all times use the appropriate schedule dictated by the type of pavement being repaired.

#### **2.0 INSPECTION**

- 2.1 Twenty four hours notice is required, complete with a list of all locations where repairs are to be constructed, prior to the commencement of work. The City Engineer will subsequently inspect all work done.
- 2.2 The City Engineer may request inspection and test records for the restoration work.



## 3.0 RESTORATION

### 3.1 Schedule I - Gravel Spraycap & Macadam Pavements

#### 3.1.1 Gravel surfaces on roads, lanes and driveways, including shoulders of strip pavements

The surface shall be restored by backfilling with approved granular material to a depth corresponding to the depth of the existing granular material on both sides of the excavation and the backfilled material shall be compacted to minimum 95% modified proctor density. The grade and camber of all repairs shall conform to the grade and camber of the existing surface.

#### 3.1.2 Spray-capped surfaces and macadam pavements preparation

Particular attention shall be given to the excavation before constructing the repair.

The procedure shall be:

- (1) Saw cut and remove all areas which have been broken up or disturbed by the trenching operation.
- (2) Trim vertically and square up the edges to permit good even compaction along the edges of the repair.

Asphalt grindings may be considered as backfill materials, but their use will be only at the express written consent of the City Engineer.

**Note:** For 3.1.1 & 3.1.2 above, the sub-grade shall consist of a minimum of 150 mm of 19 mm crushed aggregate (as per Clause 2.10 of Section 02226) immediately below the paving course. Below this 150 mm of crushed aggregate shall be an additional minimum of 450 mm of either 19 mm crushed aggregate or 75 mm crushed tailings (as per Clause 2.9 of Section 02226). Below these levels fill materials shall be in accordance with approved aggregates as set forth in Section 02226, "Aggregates and Granular Materials". All aggregates shall be compacted as per Section 02223, "Excavating, Trenching & Backfilling".

#### 3.1.3 Placing the Asphalt Mix:

Ensure the temperature of the hot mixed asphalt mix is within the working temperature range (normally between 135°C to 150°C) as recommended by the producer. Do not place mix that is below the minimum working temperature. The asphalt repair material shall be uniformly spread and thoroughly compacted to a minimum of 50 mm lift thickness. The grade and camber of the repairs shall be smooth and true, and conform to the grade and camber of the existing surface. All excess shall be removed by sweeping. Provide the best possible seamless joints by raking of finer materials to fill in all the gaps directly adjacent to the joints.

#### 3.1.4 Ambient Temperature:

No patching other than temporary patching shall be done when the air temperature is below 4°C or the grade is frozen unless otherwise authorized by the City Engineer.

### **3.2 Schedule II - Hot-Mix Asphalt Patching on Asphalt Pavements**

3.2.1 Approximately 100 mm or less thick including asphalt driveways. Pavement thickness shall match existing, provided the minimum thickness is at least 50mm.

3.2.2 The grade shall consist of a minimum 150 mm thick of 19 mm crushed aggregate (as per Clause 2.10 of Section 02226) immediately below the paving course. Below this 150 mm thick of crushed aggregate shall be an additional minimum 450 mm thick of either 19 mm crushed aggregate or 75 mm crushed tailings (as per Clause 2.9 of Section 02226). Below these levels fill materials shall be in accordance with approved aggregates as set forth in Section 02226, "Aggregates and Granular Materials". All aggregates shall be compacted as per Section 02223, "Excavating, Trenching & Backfilling".

3.2.3 Preparation of Edges  
Particular attention shall be given to edges of the existing asphalt surface before constructing the repair. Particular attention must also be paid to ensure that longitudinal joints are not in line with traffic wheel paths. Refer to drawings MF 137-AE-2 and Figure 2 on page 88 and 94).

The procedure shall be:

(1) Saw cut and remove all areas which have been broken up or disturbed by the trenching operation.

(2) Trim vertically and square up the edges to permit good even compaction along the edges of the repair.

(3) Clean, dry and paint the edges along the top of the trench wall as well as the adjoining surface area for about 125 mm +/- with asphalt emulsion, or 85-100 penetration grade asphalt binder. Provide the best possible seamless joints by raking of finer materials to fill in all the gaps directly adjacent to the joints, leaving a flush finish between old and new asphalt. Refer to Figure 2 'Cut Repairs - Edge Treatment' in page 94 of this manual for compliance requirements.

3.2.4 Mixing Plant Approval:  
The Contractor shall obtain the City Engineer's approval of the central mixing plant prior to the beginning of repair works. The mixes shall meet the requirements of the latest City Asphaltic Paving Specification (refer to Section 02512 herein) Clause 2.1.5.1, 12.5 mm Nominal Maximum Size Superpave Mix.

3.2.5 Placing the Mixture:

Ensure the temperature of the hot mixed asphalt mix is within the working temperature range (normally between 135°C to 150°C) as recommended by the producer. Do not place mix that is below the minimum working temperature. It shall be laid only on compacted granular base which is free of standing water and only when weather conditions are suitable. Upon arrival it shall be immediately put in place in a uniform lift without any segregation. The asphalt mixture shall be thoroughly compacted with appropriate compaction equipment to a thickness matching the surrounding pavement, and in no case less than 50 mm.

**3.2.6 Compaction:**

While still within the working temperature range the mixture shall be thoroughly and uniformly compacted by a power driven roller or hot tampers. The surface of the mixture after compaction shall be smooth and true to the crown and grade of the existing pavement surface. The compaction of the pavement shall meet the requirement of Clause 3.6.1 of Section 02512.

**3.2.7 Ambient Temperature:**

Repairs shall be made only when the air temperature is above 4°C (40°F).

**3.2.8 Maintenance:**

All permanent repairs which have been constructed by the Contractor shall be maintained by the Contractor for a period of two years unless otherwise noted in applicable City by-laws. The contractor is also responsible, within this two years period, for the extra costs the City incurs for the repair of damage to the pavement caused by backfill deficiency.

## **Section 02592**

### **Restoration of Cuts in Pavements - Heavy Duty Asphalt Surfaces** (Refer also to drawings MF 137-AE-3 and MF 137-AE-4, pages 89 & 90)

#### **1.0 GENERAL**

- 1.1 This Specification covers the final repairs of cuts in permanent, heavier duty pavements (arterial, industrial, bus routes, higher zoned routes, etc.) over 100 mm thick and having an asphaltic concrete wearing surface. It includes pavements having asphaltic concrete and/or concrete bases.

Higher Zoned Routes are defined as those properties with any abutting properties zoned RM or above as defined by the City of Vancouver Zoning and Development Bylaw (#3575), unless the route is in an Industrial area, or is also a arterial or transit route. Restoration of Higher Zoned Route pavement structure shall be in accordance with drawing MF 137-AE-3, unless the road was constructed to the higher standard below, then standard drawing MF 137-AE-4 shall apply.

For industrial, Arterial and Transit Routes, pavement structures refer to Drawing MF 137-AE-4.

- 1.2 Particular attention must be paid to ensure that longitudinal joints are not in line with traffic wheel paths. Refer to drawings MF 137-AE -3, MF-137-AE-4 and Figure 2 (Page 94).
- 1.3 In some situations an alternative engineered pavement structure may be considered, upon approval of the City Engineer.

#### **2.0 GRADE PREPARATION**

- 2.1 The grade shall consist of a minimum 150 mm of 19 mm Crushed Aggregate (as per Clause 2.10 of Section 02226) immediately below the paving course. Below this 150 mm of Crushed Aggregate shall be an additional minimum of 450 mm of either 19 mm Crushed Aggregate or 75 mm Crushed Tailings (as per Clause 2.9 of Section 02226). Below these levels fill materials shall be in accordance with approved aggregates as set forth in Section 02226, "Aggregates and Granular Materials". All aggregates shall be compacted as per Section 02223, "Excavating, Trenching & Backfilling".

#### **3.0 ACCESS DURING CONSTRUCTION**

- 3.1 Where temporary access is required during the curing period, the Contractor shall cover such crossings or portions of the restored pavement as directed by the City Engineer with steel plates and maintain the same in proper condition to allow traffic to pass.

- 3.2 During certain periods some streets may require repairs under special conditions, for example streets serving special events, streets used for traffic diversion, etc. to the satisfaction of the City Engineer.
- 3.3 Construction shall be scheduled not to interfere with the rush hours of the predominant direction of traffic. Certain streets such as Broadway are heavily loaded in both directions and construction should be completed between rush hours on these.

Note: For situations as described in Clauses 3.2 & 3.3 above, the final decision on the duration and extent of closure permissible will be at the discretion of the City of Vancouver Traffic Management Branch.

- 3.4 Traffic shall not be permitted on the repairs during curing periods, which shall be considered to begin upon completion of rolling, and to end when the repair is exposed to traffic.

## **4.0 MATERIALS**

### **4.1 General**

- 4.1.1 Materials utilized in these works shall conform to specifications set out herein and to noted sections of the latest edition of the ASTM and CSA specifications. Supplemental City of Vancouver Standard Specifications for Mineral Aggregate is included in this manual in Section 02226.
- 4.1.2 Materials not specifically covered herein shall be of a quality acceptable to the City Engineer.
- 4.1.3 Equivalent materials of a quality acceptable to the City Engineer may be substituted for materials specified by trade name. Where samples are required, a 10 working days period shall be allowed for examination of samples.

### **4.2 Portland Cement**

- 4.2.1 Portland Cement shall conform to specifications under the latest revision of CSA-A5 within CSA-A3000, "Cementitious Materials Compendium".

### **4.3 Concrete**

- 4.3.1 All concrete supplied shall meet the requirements of CSA A23.1-04 and City of Vancouver specified mix requirements unless otherwise allowed by the City Engineer. Concrete shall be normal weight and the Contractor and its supplier shall assume responsibility for the quality and performance of the concrete as per CSA A23.1-04 Table 5 Alternative 1. Submit mix design to the City Engineer for review and record.

- 4.3.2 Repair Patching Road Base Mix for Cuts:**  
City of Vancouver roller compacted concrete mix 1500A is to be used for base course in cuts patching for arterial, industrial and transit routes (see standard drawing MF 137-AE-4). Alternate concrete mix must be approved by the City Engineer. Mix 1500A shall be designed to meet CSA A23.1-04 Clause 8.10 and the following City requirements:

City Mix number	:	1500A (No-Slump Concrete)
Cement Type	:	CSA Type GU (HE if required)
Max. Aggregate Size	:	20 mm
Optimum Moisture Content	:	To be determined as per CSA A23.2-12C
Compacted Density	:	To within +/- 2% of the design concrete density
Strength Accelerator	:	As needed
Hot Water	:	When required
Exposure Class	:	F1 (CSA A23.1-04 Table 2)
Compressive Strength, MPa	:	15 @ 5 hours & 30 @ 28 days
Aggregates	:	As per CSA A23.1-04 Clauses 4.2.3.3, 4.2.3.4, 4.2.3.5, 4.2.3.6 & 4.2.3.7
Mix Proportions	:	As per CSA A23.1-04 Clause 4.3 and City specified requirements as above

- 4.3.3** This mix shall be compacted with vibratory mechanical compactor to within +/- 2% of the design mix density (to be provided by the supplier to the City upon request).
- 4.3.4** Asphalt paving on top of the concrete can only be taken place when the strength of the concrete reaches 15 MPa or higher. Provide verification test certificate to the City Engineer upon request.
- 4.3.5** Concrete curing shall begin immediately following the final compaction until the asphalt paving or for a period necessary to attain a minimum 70% of the 28-day specified strength. Special curing method and material must be approved by the City Engineer.

## **4.4 Asphaltic Concrete**

- 4.4.1** Asphaltic Concrete used as surfacing material in cut restoration shall be Superpave mix and supplied by an approved mixing plant. The Contractor shall obtain the City Engineer's approval of the proposed mixing plant prior to the beginning of work. The mixes shall meet the requirements of the latest Asphalt Paving Specifications (refer to Section 02512 herein), Clause 2.1.5.1, 12.5 mm Nominal Maximum Size Surface Mix, and Clause 2.1.5.3, 25

mm Nominal Maximum Size Base Mix as required or unless otherwise allowed by the City Engineer.

## 5.0 CONSTRUCTION METHODS

### 5.1 Preparation:

- 5.1.1 The temporary repair surface and the fill material shall be removed to a depth to yield a pavement thickness as indicated on Drawings MF 137-AE-3 & AE-4, and then recompact prior to the final repair.

### 5.2 “Shoulders” for Cut Repairs in Asphaltic Surfaces:

- 5.2.1 The outline of the final repair shall be rectangular in shape and shall provide for a minimum shoulder of 200 mm in each direction from the excavation. Thus, the width and length of the final repair shall be at least 400 mm oversize from that of the temporary repair, which matched the original cut dimension.
- 5.2.2 If a side of the cut is 500 mm or less from a pavement edge, joint or crack after providing a 200 mm shoulder, the portion of pavement between the cut and edge, joint or crack shall be removed.

### 5.3 Cutting

- 5.3.1 Vertical, straight cuts shall be made along the outline using equipment such as diamond saws, or road milling machines, as approved by the City Engineer.

### 5.4 Cleaning and Tamping

- 5.4.1 The edges of the cut shall be chipped, brushed and thoroughly cleaned to remove all loose material. Chipping will not be necessary for the roughened surfaces provided by asphalt milling machines.
- 5.4.2 The top 75 mm of the edge must be dry. If heating is required take special care to not overheat the existing asphaltic pavement (i.e. no discoloration of the asphalt from heating). Any discoloured asphalt must be removed.
- 5.4.3 The backfill and shoulder shall then be thoroughly tamped.

### 5.5 Concrete Base

- 5.5.1 When mix 1500A concrete base is used, as specified in the section on materials above, it shall be placed in the cut to the levels indicated on

drawing MF 137-AE-4. A mechanical vibratory roller shall be used to compact the base thoroughly to the satisfaction of the City engineer. Hand tamping is not adequate and is not permitted as a substitute.

- 5.5.2 In extreme weather conditions (i.e. heavy rain) alternative materials for the concrete base lift may be allowed but only with prior written approval by the City Engineer.

## 5.6 Asphaltic Concrete Surface

- 5.6.1 Immediately after completion of works specified above, the edges along the top of the trench wall as well as the adjoining surface area for about 100 mm +/- of the cut shall be painted with 85-100 penetration grade asphalt binder or asphalt emulsion and, asphaltic concrete shall be placed on top of the Portland cement concrete base. Ensure the temperature of the hot mix asphalt mix is within the working temperature range (normally between 135°C to 150°C) as recommended by the producer. Do not place mix that is below the minimum working temperature. Rake the hot mix immediately into place to a level that will provide a flush surface after compaction.

- 5.6.2 While still within the working temperature range, the asphaltic concrete surface shall be thoroughly and uniformly compacted with a 9-11 tonne static roller, or a roller with equivalent compactive force.

- 5.6.3 The surface of the asphaltic concrete after compaction shall be smooth and true to the crown and grade of the adjacent pavement surface. Provide the best possible seamless joints by raking of finer materials to fill in all the gaps directly adjacent to the joints, leaving a flush finish between old and new asphalt. Refer to Figure 2 'Cut Repairs - Edge Treatment' in page 94 of this manual for compliance requirements.

Good workmanship and ride quality is critical and will be monitored closely. A non-flush grade between existing and cut repair surfaces is cause for rejection.

- 5.6.4 Asphaltic concrete shall be laid only when air temperature is above 4°C unless otherwise agreed to by the City Engineer.

## 6.0 INSPECTION

- 6.1 Unless otherwise covered by prior agreement, the inspection of this work is governed by the conditions of the applicable by-laws along with the general specifications of this manual. In the event of any conflicts arise between this manual and the conditions of the applicable by-laws, the by-laws shall prevail.
- 6.2 The City's Engineering Services Department shall be notified 24 hours in advance for any inspection.



- 6.3 Any departure from the conditions of the applicable bylaws and these specifications shall be considered just cause for rejection of the work by the inspector. Should a repair be rejected in this manner, the City may rebuild the said repair at the expense of the Contractor or authority that constructed the repair.
- 6.4 City inspectors shall be given free access to all construction works and the plants that are producing materials for use in said construction.

## **7.0 MAINTENANCE**

- 7.1 The Contractor or authorities shall maintain the pavements which they have permanently restored in complete repair for two years from the date of completion unless otherwise noted in applicable City by-laws. The contractor is also responsible, within this two years period, for the extra costs the City incurs for the repair of damage to the pavement caused by backfill deficiency.

## **8.0 ALTERNATIVE METHOD**

- 8.1 Alternative methods may be allowed **only with prior written approval** by the City Engineer.

## **Section 02593**

### **Restoration of Cuts in Pavements - Portland Cement Concrete Surfaces** (Refer also to drawing MF 137-AE-5, page 91)

#### **1.0 GENERAL**

- 1.1 The specification covers the final repairing of cuts in all concrete pavements.

#### **2.0 GRANULAR FILL PREPARATION**

- 2.1 The granular roadway fill shall consist of a minimum 150 mm thick of 19 mm Crushed Aggregate as granular base (as per Clause 2.10 of Section 02226) immediately below the paving course. Below this 150 mm of crushed aggregate shall be an additional 450 mm thick of either 19 mm Crushed Aggregate or 75 mm Crushed Tailings as granular sub-base (as per Clause 2.9 of Section 02226). Fill materials used below these levels shall be in accordance with approved aggregates as set forth in Section 02226, "Aggregates and Granular Materials". Any alternate fill materials must be approved by the City Engineer. All aggregates shall be compacted as per Section 02223, "Excavating, Trenching & Backfilling".

#### **3.0 MATERIALS**

##### **3.1 General**

- 3.1.1 Materials utilized in these works shall conform to specifications set out herein and to noted sections of the latest edition of specifications of ASTM and CSA. City of Vancouver Standard Supplemental Specifications for Mineral Aggregate is included in this manual under Section 02226.
- 3.1.2 Materials not specifically covered herein shall be of a quality acceptable to the City Engineer.
- 3.1.3 Equivalent material of a quality acceptable to the City Engineer may be substituted for materials specified by trade name. Where samples are required, a 10 working day period shall be allowed for examination of samples.

##### **3.2 Portland Cement**

- 3.2.1 Portland Cement shall conform to specifications under the latest revision of CSA A-5, within CSA A-3000, "Cementitious Materials Compendium".

##### **3.3 Concrete**

All concrete supplied shall meet the requirements of C.S.A. Standard CSA-A23.1-04 and City specified mix requirements unless otherwise allowed by the City Engineer. Concrete shall be normal weight and the contractor and its supplier shall assume responsibility for mix quality and performance as per CSA A23.1-04 Table 5 Alternative 1. Submit mix design to the City Engineer for review and record. Provide test certificate to the City Engineer upon request. Alternate mixes to the mix 1503 must be approved by the City Engineer.

<b>City Mix No.</b>	:	<b>1503</b>
Cement Type	:	CSA Type GU (HE if required)
Max. Aggregate Size, mm	:	20
Slump, mm	:	80 +/- 30
Air Content, %	:	5 - 8
Strength Accelerator	:	As needed
Hot Water	:	When required
Exposure Class	:	C2 (CSA A23.1-04 Table 2)
Compressive Strength, MPa	:	15 @ 3 days & 32 @ 28 days

### 3.4 Curing Compounds

- 3.4.1 A membrane curing compound containing a fugitive dye and complying with the latest revision of ASTM Specification C-309 may be used. It shall be applied within the temperature range recommended by the manufacturer, and using the rates and methods recommended by the manufacturer.

## 4.0 CONSTRUCTION METHODS

### 4.1 Preparation:

- 4.1.1 The temporary repair surface and the fill material shall be removed to a depth of 250 mm, or to the bottom of the existing concrete pavement (whichever is greater).

### 4.2 “Shoulders” for cut repairs in Concrete Roadways:

- 4.2.1 The outline of the final repair shall be rectangular in shape and shall provide for a minimum shoulder of 200 mm in each direction from the excavation. Thus, the width and length of the final repair shall be at least 400 mm oversize from that of the temporary repair, which matched the original cut dimension.
- 4.2.2 If a side of the cut is 500 mm or less from a pavement edge, joint or crack after providing a 200 mm shoulder, the portion of pavement between the cut and the edge, joint or crack shall be removed. In any event, there must be a minimum of ½ of the original slab’s total surface area remaining, or else the entire slab must be removed and replaced. Any deviation from this requirement shall only be at the express written consent of the City

Engineer or his authorized representatives from the Streets Operations Branch.

#### 4.3 Cutting

- 4.3.1 Cutting shall be performed by saw-cut only. Edges of completed cuts shall be straight and vertical. The roughened edge normally left by street milling machines is sufficient.

#### 4.4 Cleaning, Surface Preparation of Adjacent Saw-cut Concrete Surface and Base Tamping

- 4.4.1 Smooth saw-cut surface below the surface must be cleaned and free from any deleterious materials for bonding. The exposed surface shall be roughened prior to the placing of the restoration concrete. The City Engineer may request the use of a bonding agent and/or any other methods to achieve the desired results.
- 4.4.2 The edges and the exposed surface of the cut shall be brushed and thoroughly cleaned to remove all loose and unsound concrete.
- 4.4.3 The backfill and shoulder shall be thoroughly tamped and the edges of the cut moistened.

#### 4.5 Concrete

- 4.5.1 Internal vibrators shall be used wherever practicable to consolidate the concrete. Any other consolidation method must be approved by the City Engineer prior to the pour and hand tamping is not an acceptable method. Curing shall commence as soon as possible after final placement and finishing and continue for a period necessary to attain 70% of the 28 days specified strength.

#### 4.6 Formwork

- 4.6.1 If side forms are required, they shall be of steel, lumber, or an approved alternative in good condition, and of a depth equal to or greater than the thickness of the existing pavement. The forms shall be placed accurately to line and grade of the existing pavement and held rigidly in place, and driven down flush with or below the top surface of the form. No forms shall be removed until after the concrete is sufficiently cured as defined in Clause 4.5.1 above, or as directed by the City Engineer.

#### 4.7 Joints

- 4.7.1 Joint construction shall be as outlined in Section 02521, Clause 3.14 of MMCD.

#### 4.8 Weather

4.8.1 Concrete shall not be placed when ambient temperature is below 4°C unless special provisions are put in place to protect the concrete from cold weather damage. The contractor shall submit their methodology of cold weather concreting to the City Engineer for review prior to the concrete placement. In no case shall concrete be deposited upon a frozen grade, nor shall frozen materials be used in the concrete.

4.8.2 The concrete shall be protected against rain and frost until it has cured sufficiently to the satisfaction of the City Engineer.

#### 4.9 Curing

4.9.1 Curing shall commence as soon as possible with two coats of a curing compound as specified in the materials section of this specification after final finishing and continue for a period necessary to attain 70% of the 28 days specified strength. Traffic shall not be permitted on the repairs during this time unless otherwise directed by the City Engineer.

### 5.0 INSPECTION

5.1 Unless otherwise specified, a permit and a deposit shall be required for this work and the City Engineer's designated representative shall be present during the restoration of the pavement. The cost of this inspection shall be charged against the deposit.

5.2 The City Engineer shall be notified 24 hours in advance of the start of the work.

5.3 Any departure from these specifications shall be considered just cause for rejection of the work by the inspector. Should a repair be rejected in this manner, the City will rebuild the said repair at the expense of the Contractor or authority that constructed the repair.

5.4 Inspectors shall be given free access to all construction works and the plants that are producing materials for use in said construction.

### 6.0 MAINTENANCE

6.1 The Contractors or authorities shall maintain the pavements which they have permanently restored for two years from the date of completion unless otherwise noted in applicable City by-laws. The contractor is also responsible, within this two years period, for the extra costs the City incurs for the repair of damage to the pavement caused by backfill deficiency.

## **Section 02594**

### **Restoration of Cuts in Portland Cement Concrete Sidewalks, Ramps & Driveway Crossings**

**(Refer also to standard drawings on pages 100 to 108)**

#### **1.0 GENERAL**

- 1.1 This specification covers the restoration of Portland cement concrete sidewalks, ramps and crossings that have been cut, broken, damaged, or undermined during operations on City of Vancouver streets.

#### **2.0 REQUIREMENTS**

- 2.1 Restoration shall be done as soon as practicable, in the opinion of the City Engineer, but within four weeks after completion of the project.

#### **3.0 GRADE PREPARATION**

- 3.1 The granular aggregate grade shall consist of a minimum of 100 mm of 19 mm Crushed Aggregate (as per Clause 2.10 of Section 02226) for sidewalks and ramps and 150 mm for crossings immediately below the concrete. Fill materials below these levels shall be approved aggregates in accordance with Section 02226, "Aggregates and Granular Materials". Refer to standard drawings 101, 102, 103, 108 and 109 for further details. All aggregates shall be compacted as per Section 02223, "Excavating, Trenching & Backfilling".

#### **4.0 SIDEWALK AND CROSSING CONSTRUCTION**

##### **4.1 Restoration**

- 4.1.1 All concrete supplied shall meet the requirements of CSA Standard CSA-A23.1-04 and City specified mix requirements. Concrete shall be normal weight and the contractor and its supplier shall assume responsibility for the quality and performance of the concrete as per CSA A23.1-04 Alternative 1. Alternate mixes may be used only with the written approval of the City Engineer. Submit mix design to the City Engineer for review and record.

Concrete for the restoration of sidewalks and crossings shall be finished to match the surrounding walk unless otherwise directed by the City Engineer, and shall conform to the following requirements:

<b>City Mix No.</b>	:	<b>2828B (Sidewalks)</b>
Cement Type	:	CSA Type GU (HE if required)
Max. Aggregate Size, mm	:	20 or 14
Slump, mm	:	80 +/- 30
Total Air Content %	:	5 - 8
Strength Accelerator	:	As needed
Hot Water	:	When required
Exposure Class	:	C2 (CSA A23.1-04 Table 2)
Compressive Strength, MPa	:	Min. 15 @ 7 days & 32 @ 28 day

<b>City Mix No.</b>	:	<b>1503 (Crossings)</b>
Cement Type	:	CSA Type GU (HE if required)
Max. Aggregate Size, mm	:	20 or 14
Slump, mm	:	80 +/- 30
Air Content, %	:	5 - 8
Strength Accelerator	:	As needed
Hot Water	:	When required
Exposure Class	:	C2 (CSA A23.1-04 Table 2)
Compressive Strength, MPa	:	Min. 15 @ 3 days & 32 @ 28 days

- 4.1.2 Details for typical sidewalk, ramps and crossing (standard markings) are indicated on drawings MF 137-F-2, MF 137-F-3, MF 137-F-4, Curb ramp design Standards, MF 137-L-5, MF 137-L-3, MF 137-L-6, MF 137-AF and MF 137-AG, pages 100 to 108, in the Standard Details Drawings index of this manual.
- 4.1.3 Construction Joints: Construction shall be as outlined in Clause 3.14, Section 02521 of MMCD and shall be uniform. Where tree pits are encountered, construction joints shall extend from the corners of tree pits in order to minimize and control cracking.
- 4.1.4 Tree Pit Installation: When installing tree pits in front filler walk, the tree pits must be installed at the front edge of main walk. The seat for the tree pit surround panels at main sidewalk edge must be part of the sidewalk construction.
- 4.1.5 The building strip must be poured separately of main walk. Expansion joint to be used between main walk and building strip.
- 4.2 Removal of Sidewalk and Crossing
- 4.2.1 Whenever a part of a panel, square or section of sidewalk or crossing is broken, damaged or undermined, the entire panel, square or section shall be removed and replaced neatly to the nearest score, groove or joint. No partial repairs are allowed.
- 4.2.2 Whenever removing sidewalk from against a building, the sidewalk must be totally removed as outlined in Clause 4.2.1 above or concrete sawed cut if workable to provide a clean, straight edge.

## **5.0 INSPECTION**

- 5.1 Unless otherwise covered by prior agreement, a permit and a deposit or fee shall generally be required for this work and the City Engineer's designated representative shall be present during the restoration of the pavement. The cost of this inspection shall be charged against the deposit or contractor.
- 5.2 The City's Engineering Services shall be notified 24 hours in advance of the start of the work.
- 5.3 Any departure from these specifications shall be considered just cause for rejection of the work by the inspector. Should a repair be rejected in this manner, the City will rebuild the said repair at the expense of the Contractor or authority that constructed the repair.
- 5.4 Inspectors shall be given free access to all construction works and the plants that are producing materials for use in said construction.

## **6.0 MAINTENANCE**

- 6.1 The Contractor shall maintain the sidewalk which they have permanently restored for a two year period from date of completion unless otherwise noted in applicable City by-laws. The contractor is also responsible, within this two year period, for the extra costs the City incurs for the repair of damage to the pavement caused by backfill deficiency.



## **Section 02595**

### **Restoration of Drill Holes in Pavements and Sidewalks**

#### **1.0 GENERAL**

- 1.1 This specification covers repairs to drill holes in pavements of all types and in concrete sidewalks.
- 1.2 The specification for cutting through pavements and excavating trenches and holes on City of Vancouver streets is an integral part of this specification.
- 1.3 If there are extensive drill holes to be drilled within a small area, in the opinion of the City Engineer, a written detailed restoration plan from the contractor may be required prior to the commencing of the drilling. Such extensive damage to the pavement could be treated as a trench or utility cut and the restoration shall be in accordance with the applicable City by-laws.
- 1.4 The Contractor shall maintain the area which they have permanently restored for a two years period from date of completion unless otherwise noted in applicable City by-laws. The contractor is also responsible, within this two years period, for the extra costs the City incurs for the repair of damage to the pavement caused by backfill deficiency.

#### **2.0 PREPARATION**

##### **2.1 Preparation of Hole**

- 2.1.1 All foreign and loose material shall be removed from the hole and from the surface of the surrounding pavement. The hole and its surrounding surface shall be free of standing water but in saturated surface dry condition for restoration method 'A'. For method 'B' restoration, the hole shall be relatively dry prior to the repair to ensure good bonding to the existing pavement for the pre-mix asphalt patching material.
- 2.1.2 Drill holes that are 150 mm or smaller in diameter can be repaired without further alternation of their dimensions with the exception of holes in sidewalk. Repair of all drill holes in sidewalk shall be in accordance with Section 02594 Clause 4.2. Drill holes that are larger than 150 mm in diameter shall be restored according to the following procedures:
  - The outline of the final repair shall be either square or rectangular in shape. The repair dimensions are measured by extending a minimum 200 mm shoulder to all sides of the drill holes or drill areas
  - For asphalt pavement, repair in accordance with Section 02592 Clause 5.6
  - For concrete pavement, repair in accordance with Section 02593 Clause 4.0

## 2.2 Material and Compaction of Granular Base and Sub-base for Small Drill Holes

- 2.2.1 Clean, washed sand fill similar to City's aggregate item #17 (Section 02226 Clause 2.5) shall be placed into the hole and thoroughly tamped in maximum 300 mm layers with suitable tamping tool up to the underside of the asphalt or concrete surfaces.

## 3.0 EXECUTION

### 3.1 METHOD A - Concrete Plug for Drill Holes 150 mm or Smaller in Diameter in Concrete Surfaces Only (Excluding Sidewalk)

- 3.1.1 The hole shall be prepared in accordance with Clauses 2.0 above prior to the restoration.
- 3.1.2 All material used and the method of measuring and mixing shall be to the satisfaction of the City Engineer.
- 3.1.3 A commercially available fast setting 'traffic patch' type concrete patching material shall be used for the concrete restoration work. Prepare the product according to the manufacture's recommendations. An after mixing slump value greater than 100 mm is generally not recommended for quick set. Consolidate and finish the patching material with conventional concrete practices. The elevation, surface texture and thickness of the concrete patch shall match the adjacent concrete pavement.
- 3.1.4 Restored holes shall be allowed to cure with conventional curing methods and protected from traffic as long as possible. Avoid concrete repair when ambient temperature is below 4°C. Warm mixing water is recommended for cold weather repair. Always protect repair concrete from freezing weather.
- 3.1.5 All repairs are subject to the inspection and satisfaction of the City Engineer. All unsatisfactory repairs shall be corrected by the contractor as directed by the City Engineer or the City will carry out the correction at the contractor's expense.

### 3.2 METHOD B - Sand Cement Mortar Plug and Asphalt Pre-Mix for Asphalt Surfaces

- 3.2.1 All materials and the method of measuring and mixing shall be to the satisfaction of the City Engineer.
- 3.2.2 Mix one part of cement and 2 parts of clean coarse sand with sufficient amount of water until a workable but stiff consistency is obtained. The mixture shall be tamped into the hole up to within 100 mm of the surface. A commercially available fast setting concrete fine mix will also work well in this application. Allow the concrete mix to cure as much as possible. Pre-mix

asphalt shall then be consolidated into the top 100 mm with mechanical tamping device and finished to conform to the surface of the adjacent pavement. Pre-mix asphalt may not be accepted as a permanent patching material for larger size repair. Consult City Engineer for further information.

- 3.2.3 The Contractor shall ensure that, upon completion of drilling work, as well as on final repair, the site (including adjoining sites) is thoroughly cleaned and that no excess material is left on the site.
- 3.2.4 All repairs are subject to the inspection and satisfaction of the City Engineer in accordance with this manual and the applicable City by-laws. Any deficiencies identified by the City shall be corrected by the contractor at his own cost.

## **Section 02596**

### **Restoration of Excavations Surrounding Building Sites**

**(Refer also to Figure 1, page 92, and to Figure H1, page 93)**

#### **1.0 GENERAL**

- 1.1 This section covers the backfilling of excavations made in connection with construction of foundations, walls or other geotechnical elements as part of any construction project on private property.
- 1.2 This section of the Manual has been prepared in response to the recommendations of the Association of Professional Engineers and Geoscientists Backfill Assurance Task Force report, dated Oct 16, 1996.
- 1.3 The Contractor shall maintain the area which they have permanently restored for a two years period from date of completion unless otherwise noted in applicable City by-laws. The contractor is also responsible, within this two years period, for the extra costs the City incurs for the repair of damage to the pavement caused by backfill deficiency.

#### **2.0 DEFINITIONS**

- 2.1 In this section, the “Site Engineer” means the registered Professional Engineer, who:

Provides assurance that the plans and supporting documents for certain geotechnical components of a Project substantially conform to the standards required in the Streets Restoration Manual by issuing the following ‘Letters of Assurance’ as required by Vancouver Building Bylaws:

- Schedule B-1 “Assurance of Professional Design and Commitment for Field Review”
- Schedule B-2 “Summary of Design and Field Review Requirements” and
- Schedule C-B “Assurance of Professional Field Review and Compliance”

#### **3.0 BACKFILLING**

##### **3.1 Backfilling Methodology**

- 3.1.1 In usual practice, excavation widths are 0.6 m (2 feet) maximum, with vertical walls. Sloped edges to excavations are generally not acceptable, because of the impact on other uses of the street. Excavations with sloped edges and those which project into street corridors used by trees, underground utilities or surface structures (sidewalks, curbs, etc.) may require special backfilling procedures. All such exceptional cases shall be subject to the direction and approval of the City Engineer.

- 3.1.2 Backfilling requirements, depend upon the depth of the excavation and its proximity to City property, are described in Clause 3.2 below.

### 3.2 Backfill Designs - Excavations Close to City Property

- 3.2.1 When the excavation encroaches onto City property, or the depth of the excavation below finished grades is greater than or equal to the shortest horizontal distance from the edge of the excavation to the adjacent City property line, all backfilling shall conform to one of the following approved options (Figure H1):

3.2.2.1 **Option 1 - Pea-gravel Material (Section 02226) plus Controlled Density Fill (Section 02236)**

When pea-gravel is to be used as backfill material, the Consultant or City Forces shall ensure that the pea gravel will remain confined to its original area of placement, should subsequent work be undertaken on any adjacent sites. The proposed method of providing such confinement shall be submitted to the Projects, Development Services Branch (604-873-7322) of the City Engineering Services Department for review prior to the commencement of backfill operations.

Pea-gravel Material shall be placed from the bottom of the excavation to a grade below the finished surface grade, determined as follows:

- 300 mm below the finished surface grade, plus an additional depth below this grade determined by 1.5 times the width of the excavation, to a maximum of 1.2 m.
- Controlled Density Fill (Section 02236) shall be placed above the pea-gravel material to no nearer than 300 mm (12") of finished surface grade. The top 300 mm (12") of the backfill may be backfilled with granular base material, or may contain landscaping materials subject to the review and approval of the Site Engineer.

Pea-gravel shall be consolidated in place with an immersion concrete vibrator or other approved methods to a density equivalent to a minimum 90% modified proctor and to the satisfaction of the City Engineer. "End dumping" of pea-gravel is not an acceptable method of compaction.

3.2.1.2 **Option 2 - Controlled Density Fill (See also Section 02236)**

Controlled Density Fill shall be placed for the full depth of the excavation, to within 300 mm of the finished surface grade. The top 300 mm of the backfill may be backfilled with granular base material, or may contain landscaping materials subject to the

review and approval of the Site Engineer. Area with landscaping features may require a thicker lift of topsoil as directed by the City Engineer.

#### 3.2.1.3 Option 3 - Granular Fill (Section 02226)

This method shall be used for all excavations wider than 1.2 m.

Granular fill shall be placed for the full depth of the excavation, to within 1.2 m of the finished surface grade. The top 300 mm of the backfill may contain landscaping materials subject to the review and approval of the Site Engineer. The top 1.2 m shall be compacted to a minimum 95% modified proctor density; below this level 90% modified proctor density is required.

- 3.2.2 The Contractor is reminded that there are frequently special circumstances that should be discussed with the City Engineer for approval in advance of placement.

## 4.0 TESTING

### 4.1 General

- 4.1.1 The Site Engineer shall undertake sufficient testing as the Site Engineer deems necessary so as to be able to provide the letters of assurance.

### 4.2 Gradation Testing for Mineral Aggregates

- 4.2.1 The Site Engineer shall obtain representative tests of gradation for any granular material placed (fill sand, road base or pea-gravel), shall establish that the material which has been placed conforms to the requirements of these specifications, and shall submit copies of all gradation test results.

### 4.3 Additional Testing Requirements

- 4.3.1 Density testing of placed backfill material is required on representative locations for all placed backfill materials.
- 4.3.2 Dynamic cone penetration testing is an acceptable compaction checking method for pea-gravel, as long as a Professional Engineer certifies that the test results are meeting the specified minimum 90% modified proctor density requirement.

## 5.0 LETTERS OF ASSURANCE

- 5.1 At the end of the project, the City requires that the Site Engineer provide a written "Schedule C-B - Assurance of Professional Field Review and Compliance" to the satisfaction of the City Engineer. Additionally, during the project, an interim letter

may be submitted by the Site Engineer covering only a portion of the excavation backfill in order to facilitate construction of street works such as sidewalks over or adjacent to portions of the backfill.

5.2 In both cases, the letter must be supported by the following materials:

- All daily field review reports
- Gradation test results on each type of backfill material used
- Batching slips for all Controlled Density Fill material delivered to the site.
- Density test results on backfill placed on days in which the Site Engineer (or representative) was not in attendance, accompanied by an explanation of why the Site Engineer was not in attendance, and a description of what remedial steps were taken to satisfy the Site Engineer as to the adequacy of the backfill and its compaction where compliance with the job specifications had not been attained.

## **6.0 ANCHOR ROD REMOVAL AND DETENSIONING**

6.1 All anchors or portions of anchors encroaching into City property must be removed if within 1.5 m of City building grades. Below 1.5 m, anchor rods must be fully grouted along their entire length or detensioned. Refer also to relevant City by-laws for further information.

6.2 Damaged pavement, sidewalks and driveway crossings caused by any work activities related to the anchors shall be permanently restored to a condition as near as possible to or better than the original condition unless otherwise specified by the City Engineer. Restoration shall be carried out in accordance with Section 02590 Clause 1.5 of this manual or as directed by applicable City by-laws.

## **7.0 SHOTCRETE REMOVAL**

7.1 Shotcrete must be removed from excavations within 1.5 m of City building grades prior to backfilling. Shotcrete in area near any City service connections (sewer, water and any other City utility services) shall be further removed to 1.5 m around the top and sides and just below the lowest point of the connections unless other directed by the City Engineer.

## Section 02666 Waterworks

**DELETE:** Section 02666 Waterworks and superceded in entirty by the City of Vancouver's "Waterworks Standards", available by contacting CoV Water Design Branch at 604-871-6109.



## Section 02721 Storm Sewers

**DELETE:** Section 02721 Storm Sewers and superceded in entirty by the City of Vancouver's "Sewer and Drainage Design Standards", available by contacting CoV Sewer and Drainage Design Branch at 604-873-7357.

## Section 02725 Manholes and Catchbasins

**DELETE:** Section 02725 Manholes and Catchbasins and superceded in entirty by the City of Vancouver's Sewer and Drainage Design Standards, available by contacting CoV Sewer and Drainage Design Branch at 604-873-7357.

## Section 02731 Sanitary Sewers

**DELETE:** Section 02725 Sanitary Sewers and superceded in entirty by the City of Vancouver's Sewer and Drainage Design Standards, available by contacting CoV Sewer and Drainage Design Branch at 604-873-7357.

## Section 02732 Sewage Force mains

**DELETE:** Section 02732 Sewage Force mains and superceded in entirety by the City of Vancouver's Sewer and Drainage Design Standards, available by contacting CoV Sewer and Drainage Design Branch at 604-873-7357.

## Section 02921 Topsoil and Finish Grading

**DELETE: 1.0.1 under 1.0 GENERAL and replace with the following:**

- 1.0.1 Section 02921 refers to those portions of the work that are unique to the supply and placement of growing medium (topsoil) and subsequent finished grading. In this Section, the term “growing medium” is used in place of the generic and commonly used term “topsoil”. The term “topsoil” in this section is used where appropriate to identify imported natural material conforming to 2.4 - Imported Topsoil. This Section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

**DELETE: 1.1.5 PLANTING of TREES, SHRUBS and GROUND COVERS under 1.1 RELATED WORK:**

**ADD: 1.3.3, 1.3.4 and 1.3.5 under 1.3 SOURCE QUALITY CONTROL**

- 1.3.3 The bidding Contractor will test, or have the supplier test, the proposed growing medium and include the required modifications in the price of the work.
- 1.3.4 Failure to test and provide appropriate documentation of test results may be considered grounds for rejection of a proposed growing medium and may result in removal of the rejected material at the Contractor's expense.
- 1.3.5 The Contractor guarantees that the growing medium submitted for laboratory analysis is a representative sample taken from the growing medium to be delivered to the site.

**DELETE: 1.4.3 under 1.4 MEASUREMENT AND PAYMENT:**

**DELETE: 2.1.1 under 2.1 GENERAL and replace with the following:**

- 2.1.1 In this Section, a range of measurable physical and chemical properties are set out as being acceptable in a growing medium. Compliance with this section is to be determined by testing for these properties. All topsoil or growing medium is to be tested and modified as necessary by admixture of other components to bring its properties within the ranges set in 2.10 for growing medium.

**DELETE: 2.2 APPLICATIONS**

**DELETE: 2.3 NATIVE TOPSOIL**

**DELETE: 2.4.1, 2.4.2 and 2.4.3 under 2.4 IMPORTED TOPSOIL and replace with the following:**

- 2.4.1 Imported topsoil to be a sandy loam or loamy sand texture (no less than 50% sand by mass) containing between 5% to 10% organic matter (dry mass basis). No particles in the topsoil shall be larger than 2 mm and 50% to 80% of the total dry mass shall be sandy particles between 0.053 mm to 2 mm in sizes. The combined silty and clayey size particles (smaller than 0.053 mm) shall be 5% to 15% with no more than 5% in clayey particles (smaller than 0.02 mm). Import topsoil shall be free of subsoil, roots, noxious grass, weeds, toxic materials, stones over 12.5 mm, foreign objects, and with an acidity range (pH) of 6.0 to 7.0. The in-place minimum saturated hydraulic conductivity of the topsoil shall not be less than 2 cm/hr. No crabgrass, couchgrass, equisetum, convulvulus or other noxious weeds or seeds shall be presented.
- 2.4.2 Population of any single species of plant pathogenic nematode to not exceed 1000 per litre of growing medium.

**DELETE: 2.5.1 under 2.5 PEAT MOSS and replace with the following:**

- 2.5.1 Peat moss to be Horticultural grade, partially decomposed fibrous or cellular stems and leaves of Sphagnum Mosses with texture varying from porous to spongy fibrous, fairly elastic and substantially homogenous with pH value of not less than 3.5 and not greater than 6.5, free of decomposed colloidal residue, wood, sulphur and iron, brown in colour and medium to coarse shredded, suitable for horticultural purposes.

**DELETE: 2.7.1 and 2.7.2 under 2.7 MANURE and replace with the following:**

- 2.7.1 Manure to be well-rotted farm animal manure or mushroom manure, rotted to the extent that liquids have been eliminated, and material is crumbly, free from weed seeds, rocks, sticks, rubble and containing not more than 40% sawdust, straw or shavings. Total carbon to nitrogen ratio shall not exceed 40:1.
- 2.7.2 Manure to be free of harmful chemicals such as any used to artificially hasten decomposition, and to have salt content that gives an electrical conductivity reading of less than 3.0 mmho/cm.

**DELETE: 2.10.8, 2.10.9 and 2.10.10 under 2.10 GROWING MEDIUM and replace with the following:**

- 2.10.8 Total Nitrogen: to be 0.2% to 0.6% by mass.

2.10.9 Available Phosphorous: to be 20 to 100 ppm.

2.10.10 Available Potassium: to be 50 to 250 ppm.

**ADD: 2.11.1 COMPOST**

2.11.1 Commercially prepared compost to be a uniform blend of natural-source organic materials free from subsoil, chemical and toxic contaminants, coliform, pathogens, noxious weeds, and seeds or parts thereof. Physical contaminants such as rocks, plastic, metal or glass to not exceed 0.5%. Total carbon to nitrogen ratio shall not exceed 40:1.

**DELETE: TABLE 2 PROPERTIES of GROWING MEDIUM for DIFFERENT APPLICATIONS under 2.10 GROWING MEDIUM and replace with the following:**

**TABLE 2: PROPERTIES OF GROWING MEDIUM**

The textural classification for this growing medium by the Canadian System of Soil Classification is “Loamy Sand” to “Sandy Loam”.

PROPERTIES		LIMITS
TEXTURE (Particle Size)	GRAVEL: • larger than 2 mm	0% by Dry Mass
	Percent of Dry Weight Specified Below Excluding Gravel	
	SAND: • between 2 mm to 0.053 mm	50% - 80% by Dry Mass
	SILT: • between 0.053 mm to 0.002 mm	5% - 15% by Dry Mass
	CLAY: • smaller than 0.002 mm	1% - 5% by Dry Mass
	CLAY & SILT Combined:	Maximum 15% by Dry Mass
ORGANIC CONTENT	Total Organic	5% - 10% by Dry Mass
ACIDITY	pH Level	6.0 - 7.0
DRAINAGE	Minimum In Place Saturated Hydraulic Conductivity	2.0 cm/hr

**DELETE: 3.3.2 under 3.3 PROCESSING GROWING MEDIUM and replace with the following:**

Ensure moisture content of peat moss at time of mixing is between 60% and 75%. Peat moss to form a ball when squeezed and retain shape upon release of pressure. Insufficient moisture will result in peat moss not holding together, while excessive moisture is evident when ball formed is pliable with clear water sheen on surface.

**DELETE: TABLE 3: MINIMUM GROWING MEDIUM DEPTHS under 3.4 PLACING GROWING MEDIUM and replace with the following:**

**TABLE 3  
MINIMUM GROWING MEDIUM DEPTHS**

Application	Minimum Depths		
	Over Prepared Subsoil		Over Structures
	Medium (loamy) Textured Subsoil	Coarse (sandy) or Fine (clayey) Textured Subsoil	
Boulevard Lawn Areas:			
• irrigated	100 mm	150 mm	150 mm
• not irrigated	100 mm	150 mm	225 mm

**DELETE: 3.5.1 under 3.5 APPLYING FERTILIZERS and replace with the following:**

- 3.5.1 Add fertilizers to bring growing medium fertility within ranges set out in this Section, and as recommended on the basis of testing of the growing medium.

**DELETE: 3.5.4 under 3.5 APPLYING FERTILIZERS and replace with the following:**

- 3.5.4 Ensure fertilizers are fully incorporated to a minimum depth of 50 mm.



## Section 02938 Sodding

**DELETE: 2.1.2 under 2.1 SOD and replace with the following:**

- 2.1.2 The sod shall consist of Canada No. 1 seed mixture consisting of 20-30% Perennial Rye grass, 40% Kentucky Blue grass and 20-40% Chewing Fescue or an alternative approved by the City Engineer.

**ADD: 2.1.8 under 2.1 SOD and replace with the following:**

- 2.1.8 No netting to be added to the sodding.

**ADD: 2.3.2 under 2.3 FERTILIZER with the following:**

- 2.3.2 Prior to placing sod, 50 g/m<sup>2</sup> of 12-4-8 fertilizer shall be placed on the topsoil below the sod.

**DELETE: 3.4.1 under 3.4 GRASS MAINTENANCE and replace with the following:**

- 3.4.1 The sod shall be thoroughly watered within reasonable time of placement.

**DELETE: 3.4.2 under 3.4 GRASS MAINTENANCE**

**DELETE: 3.5.5 under 3.5 CONDITIONS for TOTAL PERFORMANCES and replace with the following:**

- 3.5.5 Sodded areas to be smooth, level and even after sod and topsoil have consolidated.

## Section 02950 Planting of Trees, Shrubs and Ground Covers

**DELETE:** Section 02950 Planting of Trees, Shrubs and Ground Covers and superceded in entirety by the City of Vancouver's "Street Tree and Landscape Guidelines" (currently under review). For more information contact City of Vancouver Streets Administration Branch at 604-873-7448.

## DIVISION 3 - CONCRETE

### Section 03300 Precast and Cast-in-Place Concrete

**ADD: 2.1.10 under 2.1 MATERIALS:**

- 2.1.10 All concrete used under this specification shall be ready-mixed concrete, proportioned and mixed in an approved mixing plant.

**DELETE: 2.2.1 under 2.2 Concrete Mixes and replace with the following:**

- 2.2.1 All concrete supplied shall meet the requirements of CSA-A23.1-04 and City of Vancouver specified mix requirements unless other allowed by the City Engineer. Concrete shall be normal weight and the contractor and its supplier shall assume responsibility for the quality and performance of the concrete as per CSA-A23.1-04 Table 5 Alternative 1. Submit mix design to the City Engineer for review and record upon request.

**ADD: 3.5 FIELD QUALITY CONTROL & QUALITY ASSURANCE INSPECTION OR TESTING**

3.5 Field Quality Control & Quality Assurance Inspection or Testing

- 3.5.1 The City may require proof documentation on QC inspection or testing by an independent testing laboratory. The cost of this QC testing shall be covered by the contractor. The City may also elect to carry out periodic QA checks at its own cost. If QA inspection results indicated non-compliance, subsequent confirmation inspection and corrective measures shall be paid for by the contractor unless confirmation inspection showing conformance.

## STANDARD DETAIL DRAWINGS INDEX

All drawings referred to in this index are either as contained in the latest edition of MMCD Volume II, or as deleted and supplemented by City of Vancouver (C. of V.) Standards as indicated below:

### GENERAL DETAILS

- \*G1: General Legend for Contract Drawings
- \*G2: Legend for Materials
- \*G3: Legend for Streetlight and Traffic Signal Drawings

\*The legends shown in the MMCD drawings G1, G2, and G3 do not always match that of the City Of Vancouver Supplemental Drawings.

- DELETE** G4: Utility Trench
- DELETE** G5: Pavement Restoration
- ADD** MF-137-AE-1: Pavement Standards - Utility Trench Backfill (G4)
- ADD** MF-137-AE-2: Pavement Standards - Light Duty Residential Asphalt Surfaced Roads (G5)
- ADD** MF-137-AE-3: Pavement Standards - Higher Zoned Routes
- ADD** MF-137-AE-4: Pavement Standards - Full Depth Arterial, Industrial & Transit Routes (G5)
- ADD** MF-137-AE-5: Pavement Standards - Portland Cement Concrete Pavements
- G6: Concrete Encasement for Watermain / Sewer Separation
- G7: Concrete Protection for Underground Utilities
- G8: Pipe Anchor Blocks
- ADD** CoV Figure 1: Backfill Density Specifications - Detailed Illustrations
- ADD** CoV Figure H1: Building Site Backfilling Options
- ADD** CoV Figure 2: Cut Repairs - Edge Treatment

### STORM AND SANITARY SEWERS

- DELETE** MMCD standard drawings S0 to S15 and replace with Standard Sewer Drawings in

City's "Sewer and Drainage Design Standards", available by contacting Sewer and Drainage Design Branch at 604-873-7357.

## **WATERWORKS**

**DELETE** MMCD standard drawings **W0 to W10** and replace with Standard Waterworks Drawings in City's "Waterworks Standards", available by contacting Water Design Branch at 604-873-7357.

## **CONCRETE AND MISCELLANEOUS DETAILS**

<b>DELETE</b>	<b>C0:</b>	Drawing Index
<b>DELETE</b>	<b>C1:</b>	Concrete Sidewalk, Infill And Barrier Curb
<b>DELETE</b>	<b>C2:</b>	Concrete Sidewalk And Barrier Curb
<b>DELETE</b>	<b>C3:</b>	Concrete Sidewalk And Rollover Curb
<b>DELETE</b>	<b>C4:</b>	Concrete Curbs - Narrow Base
	<b>C5:</b>	Concrete Curbs - Wide Base
<b>DELETE</b>	<b>C6:</b>	Concrete Median Curb and Interim Curbs
<b>DELETE</b>	<b>C7:</b>	Driveway Crossing for Barrier Curbs
<b>DELETE</b>	<b>C8:</b>	Wheelchair Ramp for Sidewalk, Infill and Barrier Curbs
<b>DELETE</b>	<b>C9:</b>	Wheelchair Ramp for Sidewalk and Barrier Curbs
<b>DELETE</b>	<b>C10:</b>	Concrete Walkway
	<b>C11:</b>	Bicycle Baffle
	<b>C12:</b>	Removable Restriction Post
	<b>C13:</b>	Chain Link Fence for Walkway
	<b>C14:</b>	Handrail on Concrete Retaining Wall
<b>ADD</b>	<b>MF-137-A-1:</b>	Details of Curbs (Type A & AX)
<b>ADD</b>	<b>MF-137-A-2:</b>	Details of Curbs (Type B & BX)
<b>ADD</b>	<b>MF-137-A-3:</b>	Details of Curbs (Type C & CX)
<b>ADD</b>	<b>MF-137-B-1:</b>	Details of Drains & Backfill

<b>ADD</b>	<b>MF-137-D-1:</b>	Construction Details
<b>ADD</b>	<b>MF-137-F-2:</b>	Typical Commercial Sidewalk 1.8 m - 2.4 m (Standard Markings)
<b>ADD</b>	<b>MF-137-F-3:</b>	Typical Commercial Sidewalk > 2.4 m (Standard Markings)
<b>ADD</b>	<b>MF-137-F-4:</b>	Typical Residential Sidewalk (Standard Markings)
<b>ADD</b>		Curb Ramp Design Standards
<b>ADD</b>	<b>MF-137-L-5:</b>	Double Curb Ramp Design
<b>ADD</b>	<b>MF-137-L-3:</b>	Large Single Curb Ramp Design
<b>ADD</b>	<b>MF-137-L-6:</b>	Right Angle Lane Curb Ramp Design
<b>ADD</b>	<b>MF-137-AF:</b>	Standard Commercial Crossing
<b>ADD</b>	<b>MF-137-AG:</b>	Residential Crossing Types
<b>ADD</b>	<b>MF-137-AH:</b>	Typical Road Cross-Section over Peat
<b>ADD</b>	<b>MF-137-Z:</b>	Details of Four Piece Tree Surround
<b>ADD</b>	<b>MF-137-AN:</b>	Concrete Medians
<b>ADD</b>	<b>MF-137-AO:</b>	Parking Meter, Traffic Sign & TransLink Sleeves
<b>ADD</b>	<b>MF-137-AP:</b>	Bus Slab
<b>ADD</b>	<b>MF-137-AQ:</b>	Pedestrian Lane Crossing Standard
<b>ADD</b>	<b>MF-137-AS-1:</b>	Infiltration Bulge Design
<b>ADD</b>	<b>MF-137-AS-2:</b>	Infiltration Bulge Detail
<b>ADD</b>	<b>MF-137-AT:</b>	Typical Traffic Circle Detail
<b>ADD</b>	<b>MF-137-AU:</b>	Typical Residential Bulge Design
<b>ADD</b>	<b>MF-137-AV:</b>	Typical Lane Entrance

## **ROADWORKS**

<b>R0:</b>	Drawing Index
<b>R1:</b>	Paved Shoulders

ISSUE (DATE) APPROVED	PAVEMENT STANDARDS UTILITY TRENCH BACKFILL (G4) NOT TO SCALE	STANDARD SECTION PAGE
<div data-bbox="190 378 1435 1533"> <p>CLASS 'B' BACKFILL (TYPICAL)</p> <p>CLASS 'A' BACKFILL (TYPICAL)</p> <p>ASPHALTIC CONCRETE PAVEMENT. (PAVEMENT DEPTHS DEPENDENT ON TYPE OF ROAD; REFER TO DWGS MF137-AE-2 THROUGH 4 FOR DEPTH AND MATERIALS REQUIREMENTS).</p> <p>MIN. 175mm (7") PORTLAND CEMENT CONCRETE BASE (WHERE APPLICABLE) AS PER SECTION 02592.</p> <p>150mm (6") MINIMUM OF 19mm GRANULAR BASE MATERIAL IN ACCORDANCE WITH SECTION 02226, PARA. 2.10 TO 95% MODIFIED DENSITY.</p> <p>450mm (18") OF EITHER 19mm (PARA. 2.10) OR 75mm (PARA. 2.9) CRUSHED AGGREGATE AS INDICATED IN SECTION 02226 TO 95% MODIFIED DENSITY.</p> <p>IMPORTED GRANULAR BACKFILL AS PER SECTION 02226 COMPACTED TO 95% MODIFIED PROCTOR DENSITY TO 1.2m DEPTH FROM SURFACE; 85% OF MODIFIED PROCTOR DENSITY FROM DEPTH OF 1.2m TO PIPE ZONE. (*)</p> <p>PIPE ZONE COMPACTED TO SATISFACTION OF THE CITY ENGINEER.</p> <p>GRANULAR PIPE ZONE</p> <p>MAX. D+1000</p> <p>100 MIN</p> <p>MAX. D+600</p> <p>D</p> <p>SURFACE RESTORATION AND TYPE OF MATERIAL USED TO MATCH EXISTING, OR AS SPECIFIED BY CITY ENGINEER.</p> <p>APPROVED NATIVE BACKFILL COMPACTED TO 85% * MODIFIED PROCTOR DENSITY</p> <p>NOTE: ALTERNATIVE ENGINEERED PAVEMENT STRUCTURES MAY BE CONSIDERED, UPON APPROVAL OF THE CITY ENGINEER.</p> <p>NOTE: FOR REQUIRED WIDTHS OF SURFACE RESTORATION, RELATIVE TO ORIGINAL TRENCH WIDTH FOR LONGITUDINAL CUTS, REFER TO SECTION 02590, PARAGRAPHS 1.6 &amp; 1.7.</p> <p><b>RESTORATION OF CUTS IN ASPHALTIC CONCRETE (A.C.) PAVEMENTS (SECTIONS 02591 &amp; 02592)</b></p> <p>* UNDER REVIEW</p> </div>		
<p>APPROVED</p> <p>GENERAL MANAGER OF ENGINEERING SERVICES</p> <p>CITY OF VANCOUVER ENGINEERING SERVICES</p>	<p>STREETS – STANDARDS</p>	<p>REVISED TO LATEST DATE SHOWN</p> <p>MF137-AE-1</p>

ISSUE (DATE) APPROVED	PAVEMENT STANDARDS – LIGHT DUTY RESIDENTIAL ASPHALT SURFACED ROADS (G5) NOT TO SCALE	STANDARD SECTION PAGE
<div data-bbox="267 361 1421 1281"> <p>ASPHALTIC CONCRETE PAVEMENT TO BE IN ACCORDANCE WITH SECTION 02512 FOR 12.5mm NOMINAL MIX.</p> <p>50mm MIN.</p> <p>MATCH EXISTING PAVEMENT THICKNESS UP TO 100mm MAX, 50mm MIN.</p> <p>200mm MIN. SHOULDER</p> <p>150mm (6") MINIMUM OF 19mm GRANULAR BASE AS PER SEC. 02226, PARA. 2.10 COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY.</p> <p>450mm (18") MINIMUM OF EITHER 19mm (PARA. 2.10) OR 75mm (PARA. 2.9) CRUSHED AGGREGATE AS PER SECTION 02226 COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY.</p> <p>IMPORTED GRANULAR BACKFILL AS PER SECTION 02226 COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY IN TOP 1.2m. BELOW 1.2m TO BE COMPACTED TO A MINIMUM OF 85% MODIFIED PROCTOR DENSITY. *</p> <p>TEMPORARY RESTORATION      PERMANENT RESTORATION</p> <p>NOTE: FOR REQUIRED WIDTHS OF SURFACE RESTORATION, RELATIVE TO ORIGINAL TRENCH WIDTH FOR LONGITUDINAL CUTS, REFER TO SECTION 02590, PARAGRAPHS 1.6 &amp; 1.7.</p> <p style="text-align: center;"><u>RESTORATION OF CUTS</u> <u>IN ASPHALTIC CONCRETE (A.C.) PAVEMENTS</u> <u>(SECTION 02591)</u></p> </div>		
* UNDER REVIEW		
APPROVED GENERAL MANAGER OF ENGINEERING SERVICES		REVISED TO LATEST DATE SHOWN
CITY OF VANCOUVER ENGINEERING SERVICES	STREETS – STANDARDS	MF137-AE-2



ISSUE (DATE) APPROVED	PAVEMENT STANDARDS HIGHER ZONED ROUTES NOT TO SCALE	STANDARD SECTION PAGE
<p>NOTE: REFER TO SECTION 02592, PARA. 1.1 FOR DEFINITION OF HIGHER ZONED ROUTES.</p> <div data-bbox="292 451 1435 1276"> <p>TEMPORARY RESTORATION</p> <p>PERMANENT RESTORATION</p> <p>50mm MIN.</p> <p>50mm (2"), OF ASPHALTIC CONCRETE SURFACE PAVEMENT IN ACCORDANCE WITH SECTION 02512 FOR 12.5mm NOMINAL SURFACE MIX.</p> <p>MATCH EXISTING; MINIMUM 90mm (3.5") OF ASPHALTIC CONCRETE 25mm NOMINAL BASE PAVEMENT IN ACCORDANCE WITH SECTION 02512. MAXIMUM LIFT THICKNESS NOT TO EXCEED 90mm (3.5")</p> <p>0.2 METRE MIN. SHOULDER</p> <p>150mm (6") MINIMUM OF 19mm GRANULAR BASE AS PER SEC. 02226, PARA. 2.10 COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY.</p> <p>450mm (18") MINIMUM OF EITHER 19mm (PARA. 2.10) OR 75mm (PARA. 2.9) CRUSHED AGGREGATE AS PER SECTION 02226 COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY.</p> <p>IMPORTED GRANULAR BACKFILL AS PER SECTION 02226 COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY IN TOP 1.2m. BELOW 1.2m TO BE COMPACTED TO A MINIMUM OF 85% MODIFIED PROCTOR DENSITY. *</p> </div> <p>NOTE: FOR REQUIRED WIDTHS OF SURFACE RESTORATION, RELATIVE TO ORIGINAL TRENCH WIDTH FOR LONGITUDINAL CUTS, REFER TO SECTION 02590, PARAGRAPHS 1.6 &amp; 1.7.</p> <p style="text-align: center;"><u>RESTORATION OF CUTS</u> <u>IN ASPHALTIC CONCRETE (A.C.) PAVEMENTS</u> <u>(SECTION 02592)</u></p>		
<p>* UNDER REVIEW</p> <p>APPROVED</p> <p>GENERAL MANAGER OF ENGINEERING SERVICES</p> <p>CITY OF VANCOUVER ENGINEERING SERVICES</p>	<p>STREETS – STANDARDS</p>	<p>REVISED TO LATEST DATE SHOWN</p> <p>MF137-AE-3</p>

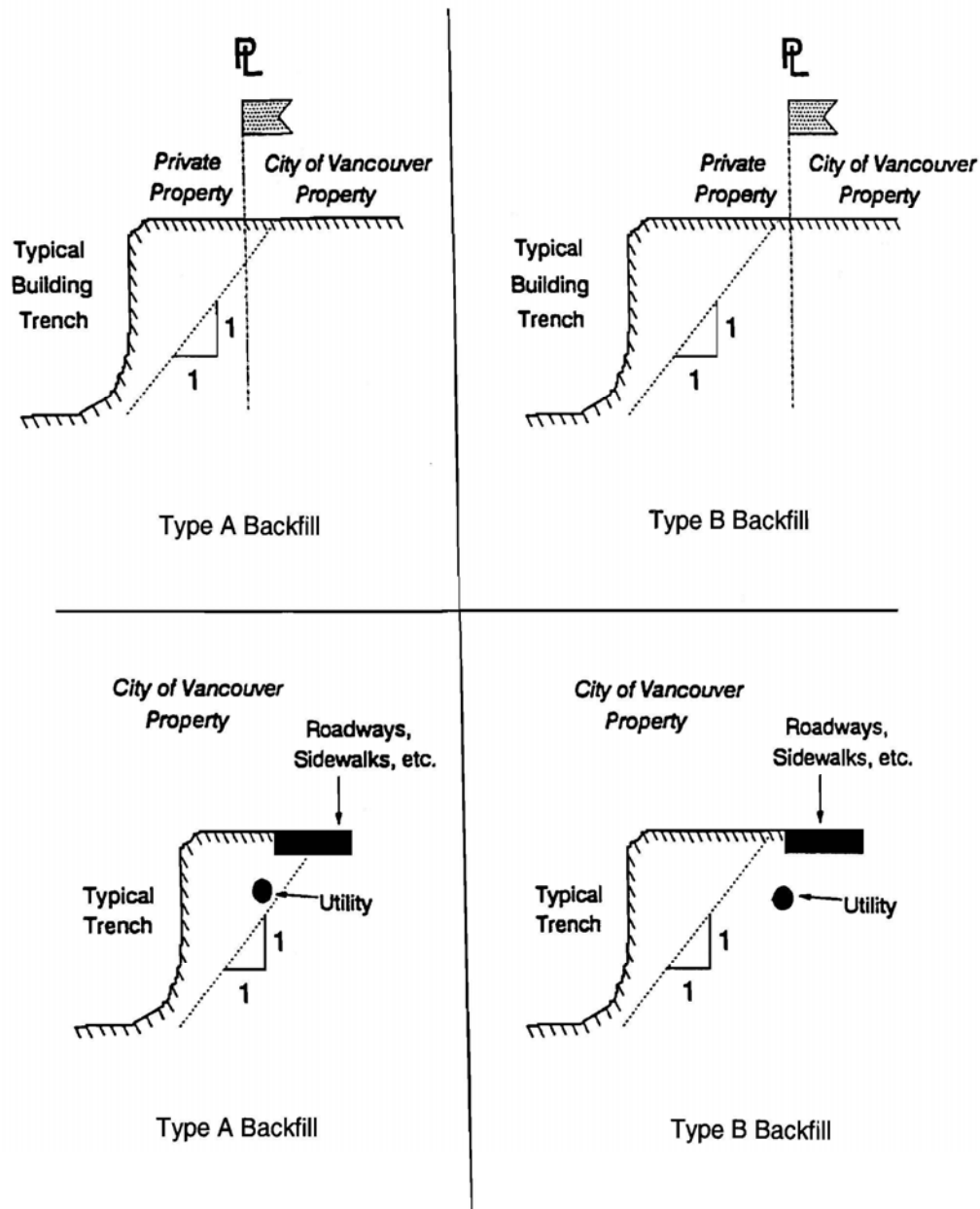
ISSUE (DATE) APPROVED	PAVEMENT STANDARDS – FULL DEPTH ARTERIAL, INDUSTRIAL & TRANSIT ROUTES(G5) NOT TO SCALE	STANDARD SECTION PAGE
<div data-bbox="207 443 1433 1413"> <p>50mm (2") OF 12.5mm NOMINAL SURFACE MIX, PLUS 3" OF 25mm NOMINAL BASE MIX AS PER SECTION 02512.</p> <p>MINIMUM 175mm (7") P.C. CONCRETE BASE AS PER SECTION 02592.</p> <p>ORIGINAL TRENCH LINE</p> <p>TRIM BACK LINE</p> <p>MINIMUM 75mm ASPHALTIC CONCRETE ON 95% MODIFIED PROCTOR DENSITY COMPACTED GRANULAR BASE</p> <p>P.C.C. BASE</p> <p>EXISTING PAVEMENT STRUCTURE</p> <p>REMOVE IF UNDER 0.5 METRE</p> <p>0.2 METRE MIN. SHOULDER</p> <p>150mm (6") MINIMUM OF 19mm GRANULAR BASE MATERIAL IN ACCORDANCE WITH SECTION 02226, PARA. 2.10, COMPACTED TO MINIMUM 95% MODIFIED PROCTOR DENSITY.</p> <p>450mm (18") OF EITHER 19mm (PARA. 2.10) OR 75mm (PARA. 2.9) CRUSHED AGGREGATE IN ACCORDANCE WITH SECTION 02226, COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY.</p> <p>TEMPORARY RESTORATION</p> <p>PERMANENT RESTORATION</p> <p>IMPORTED GRANULAR BACKFILL AS PER SECTION 02226, COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY IN TOP 1.2m. BELOW 1.2m TO BE COMPACTED TO A MINIMUM OF 85% MODIFIED PROCTOR DENSITY. *</p> <p>NOTE: FOR REQUIRED WIDTHS OF SURFACE RESTORATION, RELATIVE TO ORIGINAL TRENCH WIDTH FOR LONGITUDINAL CUTS, REFER TO SECTION 02590, PARAGRAPHS 1.6 &amp; 1.7.</p> <p>NOTE: ALTERNATIVE PAVEMENT STRUCTURES MAY BE CONSIDERED, UPON APPROVAL OF THE CITY ENGINEER.</p> <p><b>RESTORATION OF CUTS IN ASPHALTIC CONCRETE (A.C.) PAVEMENTS (SECTION 02592)</b></p> </div>		
* UNDER REVIEW		
APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES  CITY OF VANCOUVER ENGINEERING SERVICES	STREETS – STANDARDS	REVISED TO LATEST DATE SHOWN  MF137-AE-4

ISSUE (DATE) APPROVED	PAVEMENT STANDARDS P.C. CONCRETE PAVEMENTS NOT TO SCALE	STANDARD SECTION PAGE
<div data-bbox="444 470 1435 1507"> <p><b>STEP 2</b></p> <p>TEMPORARY RESTORATION</p> <p>PERMANENT RESTORATION</p> <p>50 mm TEMPORARY ASPHALT PATCH</p> <p>P.C.C. PAVEMENT</p> <p>COMPACTED BACKFILL</p> <p>TRIM BACK LINE</p> <p>0.25 METRE</p> <p>0.2 METRE MINIMUM SHOULDER (BOTH SIDES)</p> <p>150mm (6") MINIMUM OF 19mm GRANULAR BASE MATERIAL IN ACCORDANCE WITH SECTION 02226, PARA. 2.10, COMPACTED TO MINIMUM OF 95% MODIFIED PROCTOR DENSITY.</p> <p>450mm (18") OF EITHER 19mm (PARA. 2.10) OR 75mm (PARA. 2.9) CRUSHED AGGREGATE IN ACCORDANCE WITH SECTION 02226, COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY.</p> <p>IMPORTED GRANULAR BACKFILL, AS PER SECTION 02226, COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY IN TOP 1.2m. BELOW 1.2m TO BE COMPACTED TO A MINIMUM OF 85% MODIFIED PROCTOR DENSITY. *</p> <p>NOTE: SURFACE FINISH AND EXPANSION/CONTROL JOINTS TO CONFORM WITH SURFACE FINISH/JOINTS IN EXISTING SURFACE.</p> <p>NOTE: FOR REQUIRED WIDTHS OF SURFACE RESTORATION, RELATIVE TO ORIGINAL TRENCH WIDTH FOR LONGITUDINAL CUTS, REFER TO SECTION 02590, PARAGRAPHS 1.6 &amp; 1.7.</p> </div>		
<p style="text-align: center;"><b>RESTORATION OF CUTS IN PORTLAND CEMENT CONCRETE PAVEMENTS (SECTION 02593)</b></p>		
* UNDER REVIEW		
APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES		REVISED TO LATEST DATE SHOWN
CITY OF VANCOUVER ENGINEERING SERVICES	STREETS – STANDARDS	MF137-AE-5

City Of Vancouver  
STREET RESTORATION MANUAL

FIGURE 1

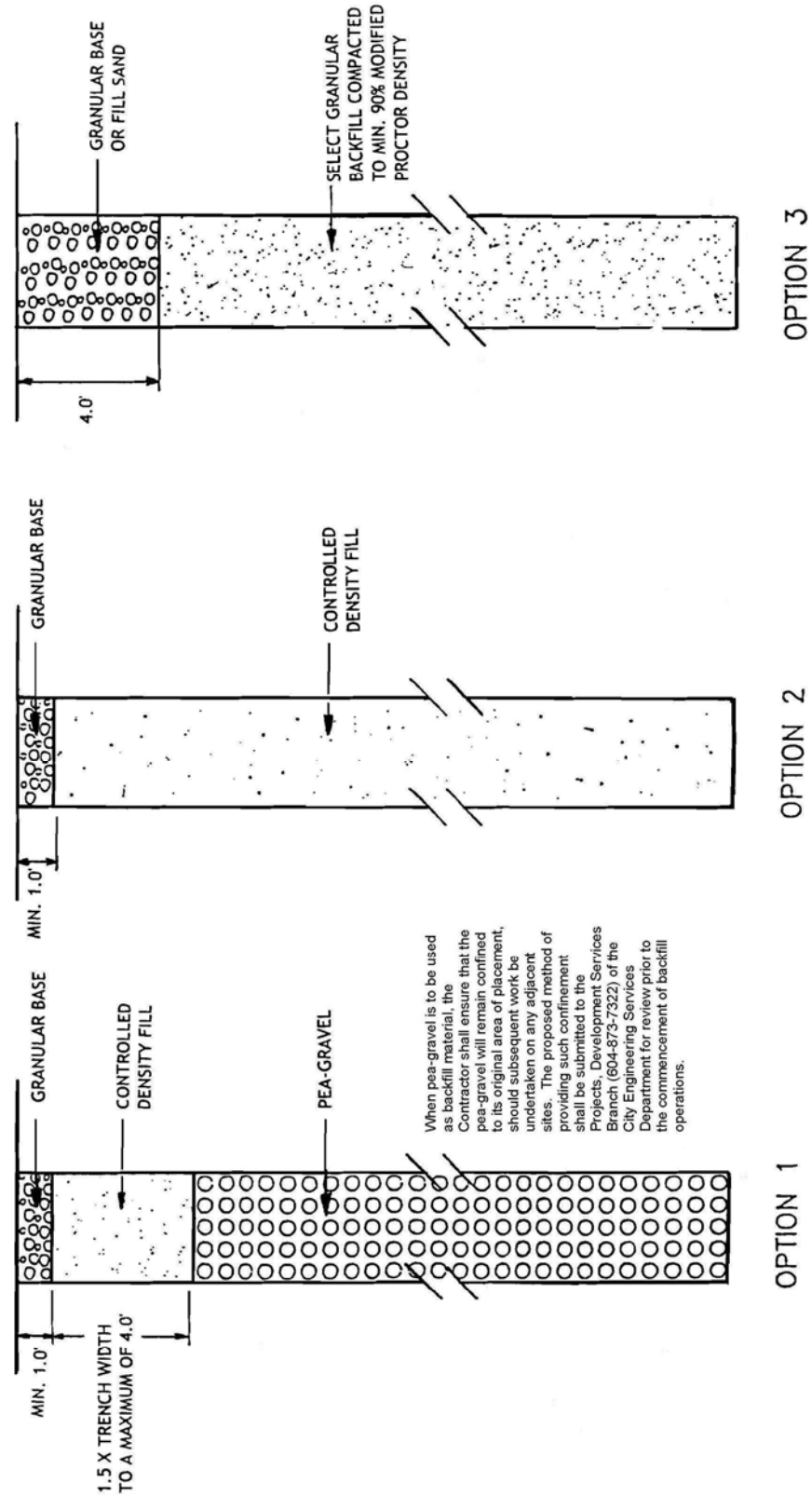
BACKFILL DENSITY CLASSIFICATIONS - DETAILED ILLUSTRATIONS



City Of Vancouver

FIGURE H1

BUILDING SITE BACKFILLING OPTIONS



City of Vancouver  
STREET RESTORATION MANUAL

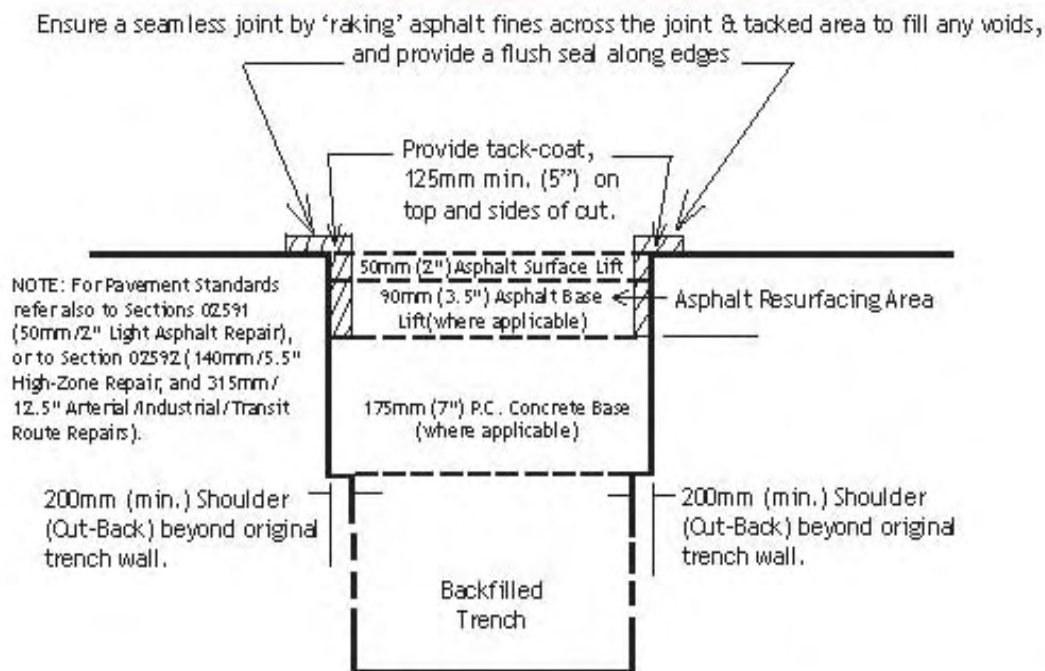
**FIGURE 2 - CUT REPAIRS - EDGE TREATMENT\***

Prior to asphalt placement, the edges must be 'painted' (tacked) with either 85-100 asphaltic cement, or a suitable coating of asphalt emulsion to ensure a seamless bond in the cross-hatched areas in the diagram below, along the surface for a minimum of 125mm / 5" (all instances), as well as 50mm / 2" (Section 02591), or 140mm / 5.5" (Section 02592) on the upper side-walls of the cut as shown in the picture below.

'Painted' edges prior to final Surface Repair.



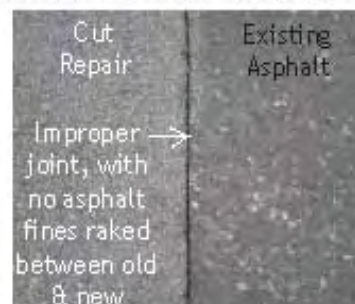
'Painted' edges prior to final Surface Repair.



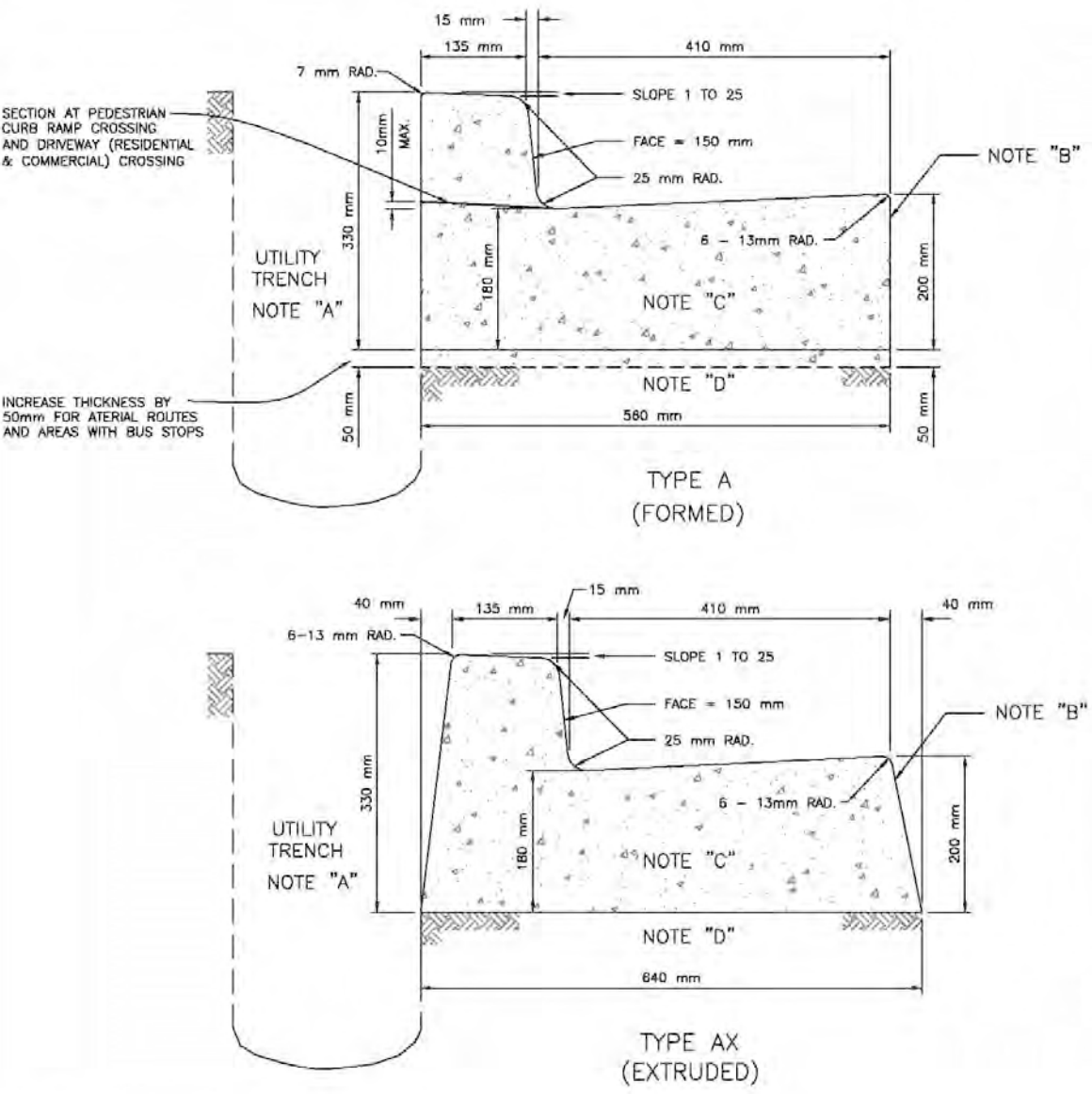
Acceptable Sealed Edge of Cut Repair\*

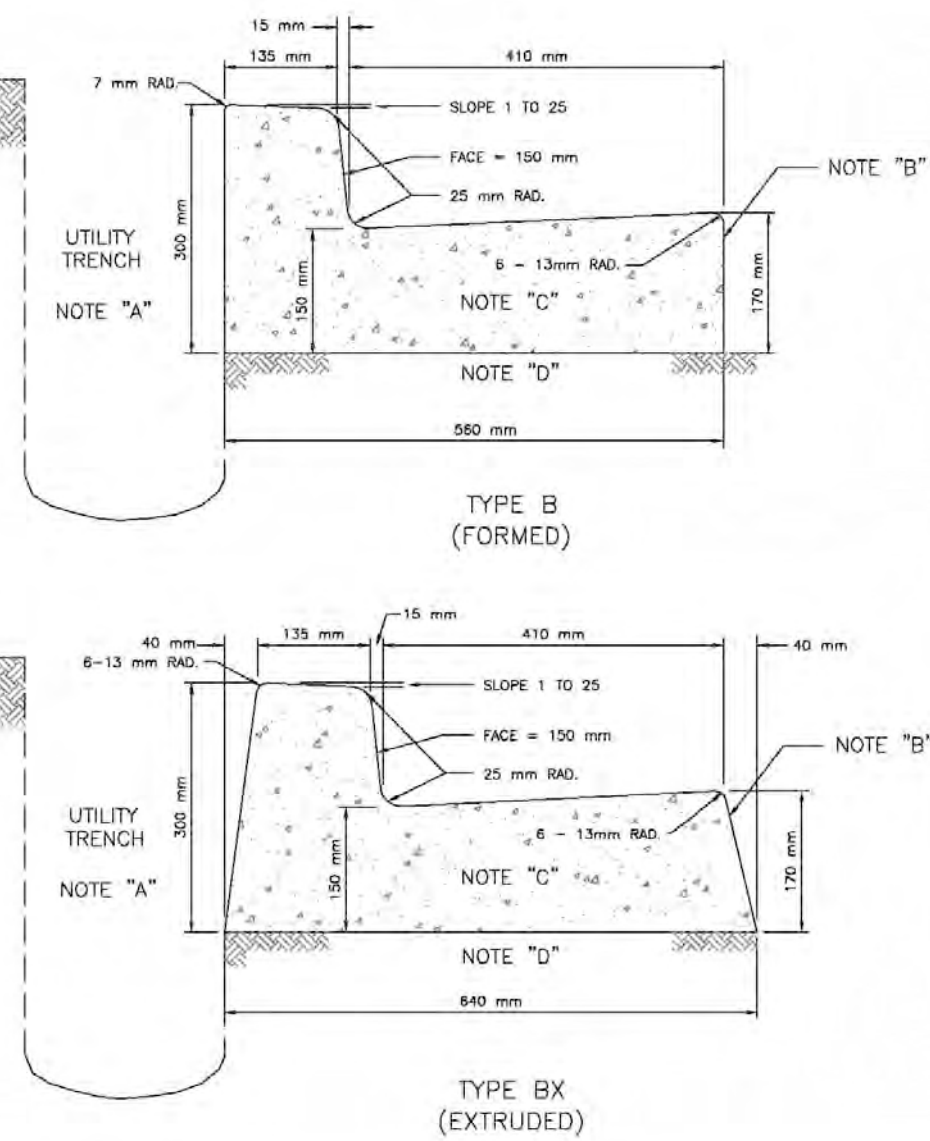


Unacceptable Sealed Edge of Cut Repair\*

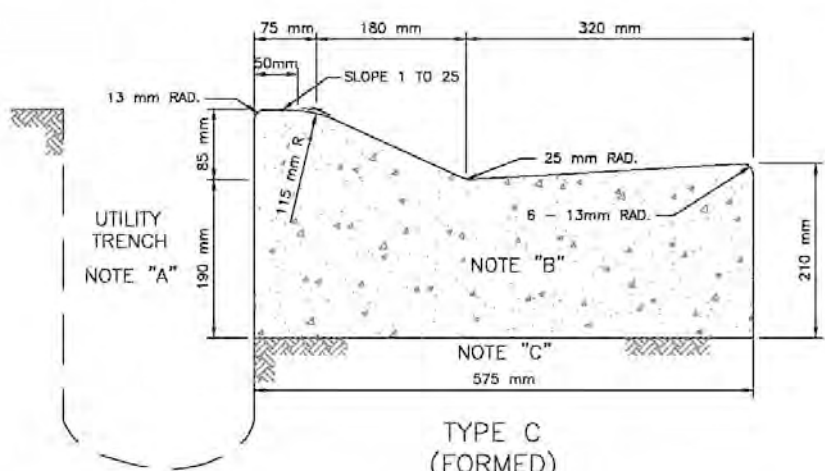
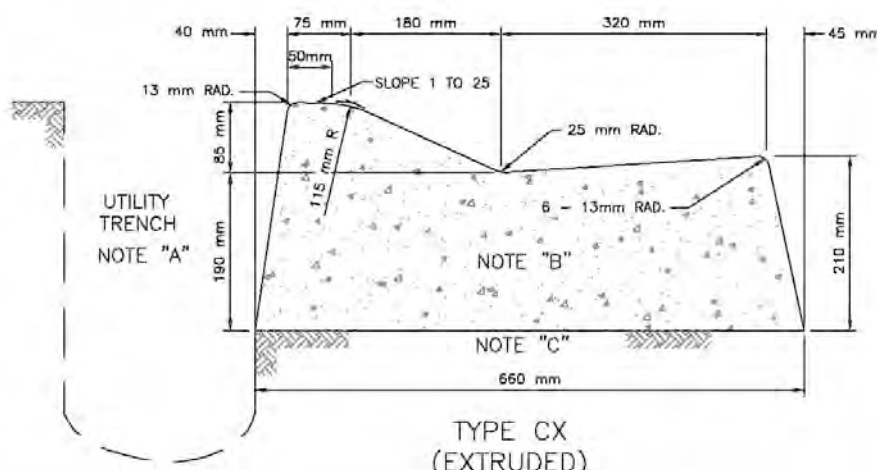


\* This same treatment of edges applies to all situations (i.e. asphalt aprons in lanes) where new asphalt is placed adjacent to existing asphalt.

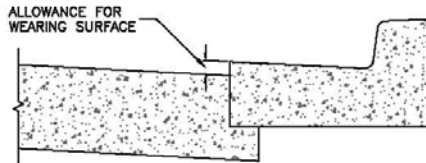
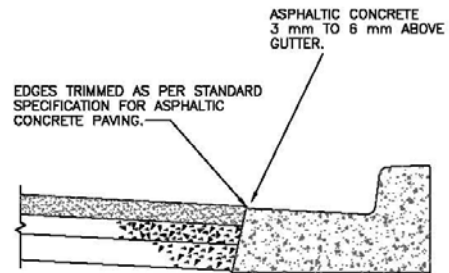
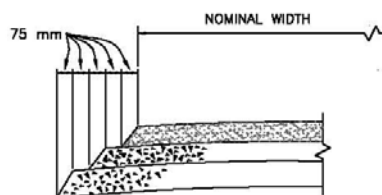
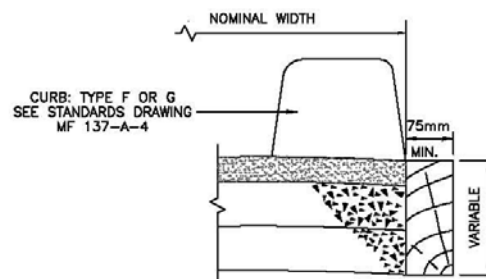
ISSUE (DATE) APPROVED	DETAILS OF CURBS NOT TO SCALE	STANDARD SECTION PAGE
	 <p>SECTION AT PEDESTRIAN CURB RAMP CROSSING AND DRIVEWAY (RESIDENTIAL &amp; COMMERCIAL) CROSSING</p> <p>UTILITY TRENCH NOTE "A"</p> <p>INCREASE THICKNESS BY 50mm FOR ATERIAL ROUTES AND AREAS WITH BUS STOPS</p> <p>15 mm</p> <p>135 mm</p> <p>410 mm</p> <p>7 mm RAD.</p> <p>10mm MAX.</p> <p>330 mm</p> <p>180 mm</p> <p>200 mm</p> <p>50 mm</p> <p>560 mm</p> <p>50 mm</p> <p>SLOPE 1 TO 25</p> <p>FACE = 150 mm</p> <p>25 mm RAD.</p> <p>6 - 13mm RAD.</p> <p>NOTE "B"</p> <p>NOTE "C"</p> <p>NOTE "D"</p> <p>TYPE A (FORMED)</p> <p>40 mm</p> <p>135 mm</p> <p>15 mm</p> <p>410 mm</p> <p>40 mm</p> <p>6-13 mm RAD.</p> <p>330 mm</p> <p>180 mm</p> <p>200 mm</p> <p>50 mm</p> <p>640 mm</p> <p>50 mm</p> <p>SLOPE 1 TO 25</p> <p>FACE = 150 mm</p> <p>25 mm RAD.</p> <p>6 - 13mm RAD.</p> <p>NOTE "B"</p> <p>NOTE "C"</p> <p>NOTE "D"</p> <p>TYPE AX (EXTRUDED)</p> <p>NOTE "A" FOR DETAILS SEE STANDARDS DRAWING MF 137-B-1</p> <p>NOTE "B" WHERE P.C. CONCRETE PAVEMENT BASE IS USED, CURB CONSTRUCTION SHALL BE AS SHOWN ON STANDARDS DRAWING MF 137-D-1</p> <p>NOTE "C" CONTROL JOINTS CUT AT 4500 mm INTERVALS (MIN. 50 mm DEPTH)</p> <p>NOTE "D" PLACE A MINIMUM OF 150mm GRANULAR BASE AT 95% MPD (20mm MINUS GRANULAR) EXCAVATE 1.2m WIDE FOR CURB &amp; GUTTER</p>	<p>08/04/28</p> <p>84/03/07</p> <p>78/07/12</p> <p>REVISED TO LATEST DATE SHOWN</p>
<p>APPROVED</p> <p>GENERAL MANAGER OF ENGINEERING SERVICES</p> <p>CITY OF VANCOUVER ENGINEERING SERVICES</p>	<p>STREETS – STANDARDS</p>	<p>MF137-A-1</p>

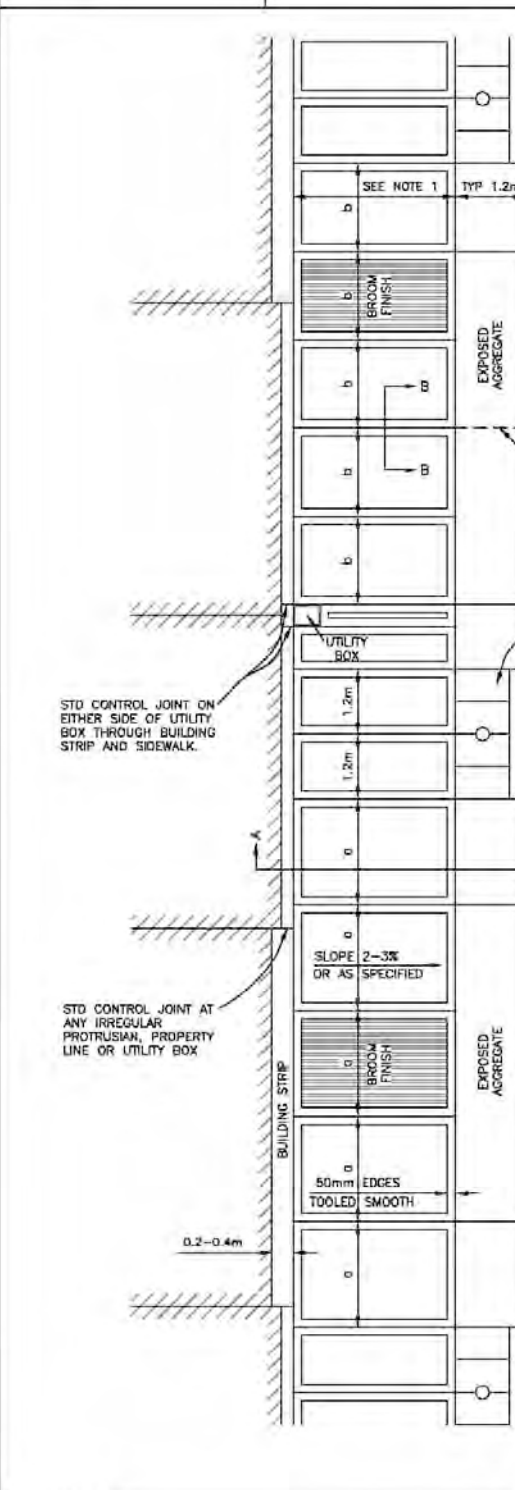
ISSUE (DATE) APPROVED	DETAILS OF CURBS NOT TO SCALE	STANDARD SECTION PAGE
	 <p>UTILITY TRENCH</p> <p>NOTE "A"</p> <p>NOTE "B"</p> <p>NOTE "C"</p> <p>NOTE "D"</p> <p>TYPE B (FORMED)</p> <p>UTILITY TRENCH</p> <p>NOTE "A"</p> <p>NOTE "B"</p> <p>NOTE "C"</p> <p>NOTE "D"</p> <p>TYPE BX (EXTRUDED)</p> <p>NOTE "A" FOR DETAILS SEE STANDARDS DRAWING MF 137-B-1</p> <p>NOTE "B" WHERE P.C. CONCRETE PAVEMENT BASE IS USED, CURB CONSTRUCTION SHALL BE AS SHOWN ON STANDARDS DRAWING MF 137-D-1</p> <p>NOTE "C" CONTROL JOINTS CUT AT 4500 mm INTERVALS (MIN. 50 mm DEPTH)</p> <p>NOTE "D" PLACE A MINIMUM OF 150mm GRANULAR BASE AT 95% MPD (20mm MINUS GRANULAR) EXCAVATE 1.2m WIDE FOR CURB &amp; GUTTER</p>	<p>08/04/24</p> <p>84/03/07</p> <p>78/07/12</p> <p>REVISED TO LATEST DATE SHOWN</p>
<p>APPROVED</p> <p>GENERAL MANAGER OF ENGINEERING SERVICES</p> <p>CITY OF VANCOUVER ENGINEERING SERVICES</p>	<p>STREETS – STANDARDS</p>	<p>MF137-A-2</p>

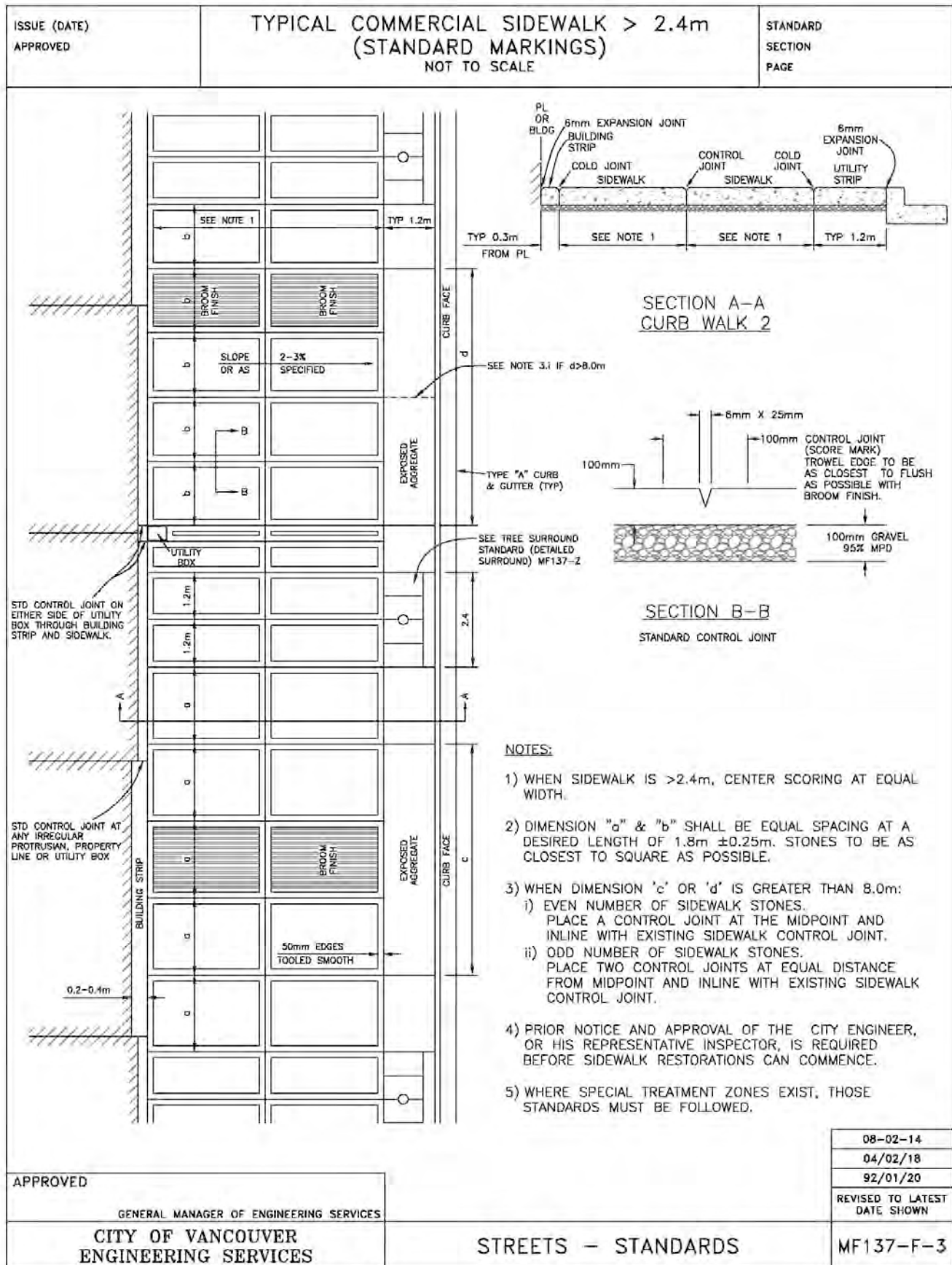


ISSUE (DATE) APPROVED	DETAILS OF CURBS NOT TO SCALE	STANDARD SECTION PAGE
<div><p>TYPE C (FORMED)</p></div> <div><p>TYPE CX (EXTRUDED)</p></div>		
<p>NOTE "A" FOR DETAILS SEE STANDARDS DRAWING MF 137-B-1</p> <p>NOTE "B" CONTROL JOINTS CUT AT 4500 mm INTERVALS (MIN. 50 mm DEPTH)</p> <p>NOTE "C" PLACE A MINIMUM OF 150mm GRANULAR BASE AT 95% MPD (20mm MINUS GRANULAR) EXCAVATE 1.2m WIDE FOR CURB &amp; GUTTER</p>		
APPROVED		08/04/24 84/05/25 78/07/12 REVISED TO LATEST DATE SHOWN
GENERAL MANAGER OF ENGINEERING SERVICES	STREETS – STANDARDS	MF137-A-3

ISSUE (DATE) APPROVED	DETAILS OF DRAINS AND BACKFILL NOT TO SCALE	STANDARD SECTION PAGE										
	<div><p>TOPSOIL - 100mm MIN.</p><p>CURB</p><p>SUITABLE NATIVE MATERIAL</p><p>NOTE 'A'</p><p>200mm MIN.</p><p>200mm</p><p>FILTER FABRIC TO COVER FULL WIDTH OF DRAIN GRAVEL SURFACES</p><p>DRAIN GRAVEL</p><p>100mm OR 150mm PERFORATED P.V.C. PIPE</p><p>150mm 150mm 50mm</p><p>ADJACENT TO CURB</p></div> <div><p>CHOKER COURSE</p><p>TOPSOIL - 75 mm MIN.</p><p>100mm</p><p>50mm</p><p>100mm</p><p>NOTE 'A'</p><p>DRAIN GRAVEL</p><p>100mm OR 150mm PERFORATED P.V.C. PIPE</p><p>150mm 150mm 50mm</p><p>ADJACENT TO SIDEWALK</p></div> <div><p>PAVEMENT SURFACE</p><p>NOTE 'A'</p><p>DRAIN GRAVEL</p><p>100mm NON-PERFORATED P.V.C. PIPE</p><p>VARIES</p><p>50mm</p><p>150mm 150mm</p><p>SECTION 'A-A' LANE ENTRANCES</p></div> <div><p>SIDEWALK</p><p>PERFORATED PIPE</p><p>LANE</p><p>A A</p><p>NON-PERFORATED PVC PIPE</p><p>SIDEWALK</p><p>PERFORATED PIPE</p></div> <div><p>NOTE 'A'</p><p>DRAINAGE MATERIAL SHALL CONFORM TO THE STANDARD SPECIFICATION FOR MATERIALS AND TESTS.</p></div>	<table><tr><td>08/03/10</td></tr><tr><td>87/07/30</td></tr><tr><td>86/07/28</td></tr><tr><td>85/01/31</td></tr><tr><td>81/05/11</td></tr><tr><td>80/02/13</td></tr><tr><td>80/01/28</td></tr><tr><td>79/02/13</td></tr><tr><td>78/07/24</td></tr><tr><td>REVISED TO LATEST DATE SHOWN</td></tr></table>	08/03/10	87/07/30	86/07/28	85/01/31	81/05/11	80/02/13	80/01/28	79/02/13	78/07/24	REVISED TO LATEST DATE SHOWN
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APPROVED	GENERAL MANAGER OF ENGINEERING SERVICES											
CITY OF VANCOUVER ENGINEERING SERVICES	STREETS – STANDARDS	MF137-B-1										

ISSUE (DATE) APPROVED	CONSTRUCTION DETAILS NOT TO SCALE	STANDARD SECTION PAGE
 <p>ALLOWANCE FOR WEARING SURFACE</p> <p>P.C. CONCRETE PAVEMENT BASE AT CURB (NOTE VERTICAL EDGE)</p>	 <p>ASPHALTIC CONCRETE 3 mm TO 6 mm ABOVE GUTTER.</p> <p>EDGES TRIMMED AS PER STANDARD SPECIFICATION FOR ASPHALTIC CONCRETE PAVING.</p> <p>ASPHALTIC CONCRETE PAVEMENT AT CURB (NOTE INCLINED EDGE)</p>	
FOR CONSTRUCTION JOINT IN P.C. CONCRETE PAVEMENT AND P.C. CONCRETE BASE		
 <p>75 mm</p> <p>NOMINAL WIDTH</p> <p>STEP TREATMENT FOR EDGES OF ASPHALTIC CONCRETE PAVED STRIPS</p>	 <p>NOMINAL WIDTH</p> <p>CURB: TYPE F OR G SEE STANDARDS DRAWING MF 137-A-4</p> <p>75mm MIN.</p> <p>VARIABLE</p> <p>ROUGH TIMBER FORM FOR PAVED STRIPS WITH SURFACE-APPLIED CURB</p>	
APPROVED	GENERAL MANAGER OF ENGINEERING SERVICES	08/05/22 89/07/12 81/05/11 78/07/24 REVISED TO LATEST DATE SHOWN
CITY OF VANCOUVER ENGINEERING SERVICES		STREETS – STANDARDS
		MF137-D-1

ISSUE (DATE) APPROVED	TYPICAL COMMERCIAL SIDEWALK 1.8m–2.4m (STANDARD MARKINGS) NOT TO SCALE	STANDARD SECTION PAGE
 <p>STD CONTROL JOINT ON EITHER SIDE OF UTILITY BOX THROUGH BUILDING STRIP AND SIDEWALK.</p> <p>STD CONTROL JOINT AT ANY IRREGULAR PROTRUSION, PROPERTY LINE OR UTILITY BOX</p> <p>0.2–0.4m</p> <p>50mm EDGES TOOLED SMOOTH</p> <p>BROOM FINISH</p> <p>EXPOSED AGGREGATE</p> <p>CURB FACE</p> <p>SEE NOTE 1</p> <p>TYP 1.2m</p> <p>SEE NOTE 3, IF <math>d &gt; 8.0m</math></p> <p>SEE TREE SURROUND STANDARD (DETAILED SURROUND) MF137-Z</p> <p>TYPE "A" CURB &amp; GUTTER (TYP)</p> <p>SLOPE 2–3% OR AS SPECIFIED</p> <p>BUILDING STRIP</p> <p>UTILITY BOX</p> <p>1.2m</p> <p>1.2m</p> <p>2.4</p> <p>SEE NOTE 1</p> <p>TYP 1.2m</p> <p>8mm EXPANSION JOINT</p> <p>PL OR BLDG</p> <p>BLDG</p> <p>8mm EXPANSION JOINT</p> <p>2–3% OR AS SPECIFIED</p> <p>8mm EXPANSION JOINT</p> <p>COLD JOINT</p> <p>COLD JOINT</p> <p>UTILITY STRIP</p> <p>5mm EXPANSION JOINT</p> <p>TYP 0.3m FROM PL</p> <p>SEE NOTE 1</p> <p>TYP 1.2m</p> <p>SECTION A-A CURB WALK 1</p> <p>100mm</p> <p>6mm X 25mm</p> <p>100mm</p> <p>CONTROL JOINT (SCORE MARK) TROWEL EDGE TO BE AS CLOSEST TO FLUSH AS POSSIBLE WITH BROOM FINISH.</p> <p>100mm GRAVEL 95% MPD</p> <p>SECTION B-B STANDARD CONTROL JOINT</p> <p>NOTES:</p> <ol style="list-style-type: none"> <li>1) SIDEWALK TYP. 2.0m OR AS DIRECTED BY CITY ENGINEER (MIN 1.8m).</li> <li>2) DIMENSION "a" &amp; "b" SHALL BE EQUAL SPACING AT A DESIRED LENGTH OF 1.5m–2.1m. STONES TO BE AS CLOSEST TO SQUARE AS POSSIBLE.</li> <li>3) WHEN DIMENSION 'c' OR 'd' IS GREATER THAN 8.0m: <ol style="list-style-type: none"> <li>i) EVEN NUMBER OF SIDEWALK STONES. PLACE A CONTROL JOINT AT THE MIDPOINT AND INLINE WITH EXISTING SIDEWALK CONTROL JOINT.</li> <li>ii) ODD NUMBER OF SIDEWALK STONES. PLACE TWO CONTROL JOINTS AT EQUAL DISTANCE FROM MIDPOINT AND INLINE WITH EXISTING SIDEWALK CONTROL JOINT.</li> </ol> </li> <li>4) PRIOR NOTICE AND APPROVAL OF THE CITY ENGINEER, OR HIS REPRESENTATIVE INSPECTOR, IS REQUIRED BEFORE SIDEWALK RESTORATIONS CAN COMMENCE.</li> <li>5) WHERE SPECIAL TREATMENT ZONES EXIST, THOSE STANDARDS MUST BE FOLLOWED.</li> </ol>		
<p>APPROVED</p> <p>GENERAL MANAGER OF ENGINEERING SERVICES</p> <p>CITY OF VANCOUVER ENGINEERING SERVICES</p>	<p>STREETS – STANDARDS</p>	<p>08/03/10</p> <p>04/02/18</p> <p>92/01/20</p> <p>REVISED TO LATEST DATE SHOWN</p> <p>MF137-F-2</p>



ISSUE (DATE)

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## TYPICAL RESIDENTIAL SIDEWALK (STANDARD MARKINGS)

NOT TO SCALE

STANDARD

SECTION

PAGE

PL

CURB FACE

TYP GRASS

CURB FACE

2-3% OR AS SPECIFIED

SEPARATE WALK  
SECTION A-A

CURB WALK  
SECTION A-A

SECTION B-B  
STANDARD CONTROL JOINT

OUTSIDE EDGE DETAIL

**NOTES:**

- 1) SIDEWALK TYP. 1.5m/1.8m OR AS DIRECTED BY CITY ENGINEER.
- 2) DIMENSION "a" SHALL BE EQUAL SPACING FOR THE ENTIRE SIDEWALK BLOCK AT A DESIRED LENGTH OF 1.5m/1.8m. STONES TO BE AS CLOSEST TO SQUARE AS POSSIBLE.
- 3) PRIOR NOTICE AND APPROVAL OF THE CITY ENGINEER, OR HIS REPRESENTATIVE INSPECTOR, IS REQUIRED BEFORE SIDEWALK RESTORATIONS CAN COMMENCE.

APPROVED

GENERAL MANAGER OF ENGINEERING SERVICES

**CITY OF VANCOUVER  
ENGINEERING SERVICES**

**STREETS – STANDARDS**

08-03-10

REVISED TO LATEST  
DATE SHOWN

MF137-F-4

## **CURB RAMP DESIGN STANDARDS**

### **GENERAL CONSIDERATIONS**

Curb ramps are designed for the access of wheelchairs (they also accommodate scooters, strollers and people with poor mobility).

Ramps should land wheelchair users safely in the crosswalk and in the desired direction of travel.

The preferred design is to install 2 ramps per corner with directional score lines wherever possible.

The scoring pattern is designed to assist people with visual impairments.

- Directional score lines shall guide someone safely into the crosswalk, lining up with the ramp across the street and be parallel with the crossing or marked crosswalk.

### **DOUBLE CURB RAMP DESIGN (Preferred) - Standard Drawing MF137-L-5**

- The ramp and the directional score lines shall lead into the crosswalk, lining up with the ramp across the street and be parallel with the crossing or marked crosswalk.
- Where a greener treatment is desired grass can be installed between the two ramps where there is a reasonable expectation that the adjacent property owner will mow the additional grass.
- Minimum 1 meter full curb between the two ramps.

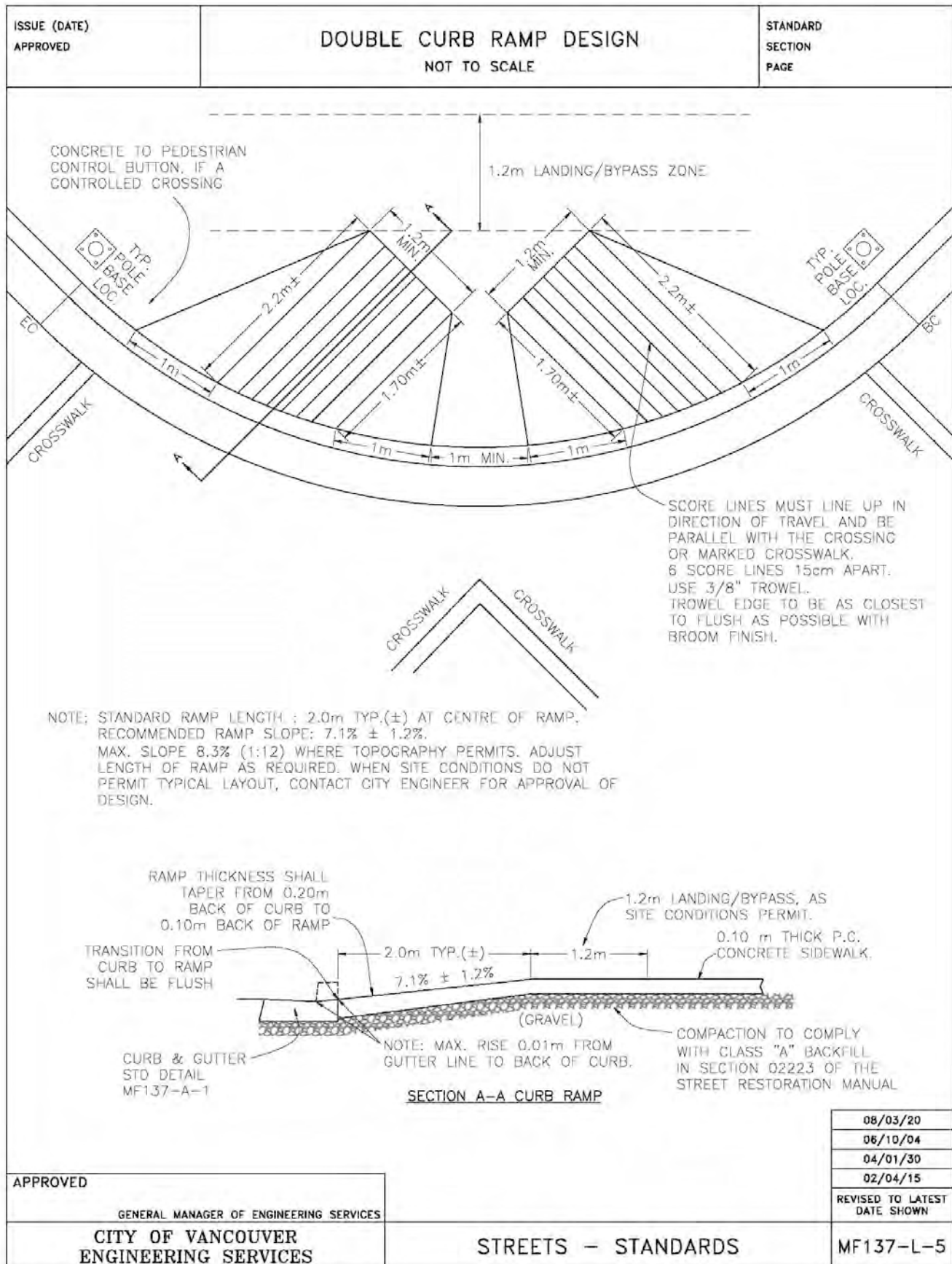
### **LARGE SINGLE CURB RAMP DESIGN (Alternative) - Standard Drawing MF137-L-3**

- Used when double curb ramps cannot be accommodated due to obstructions such as poles, utility boxes, property lines, etc. that would result in less than 1 meter full curb between the two ramps.
- The ramp must adequately land a pedestrian in either crosswalk.
- Directional score lines shall lead the user over the curb and into the crosswalk, lining up with the ramp across the street and be parallel with the crossing or marked crosswalk.

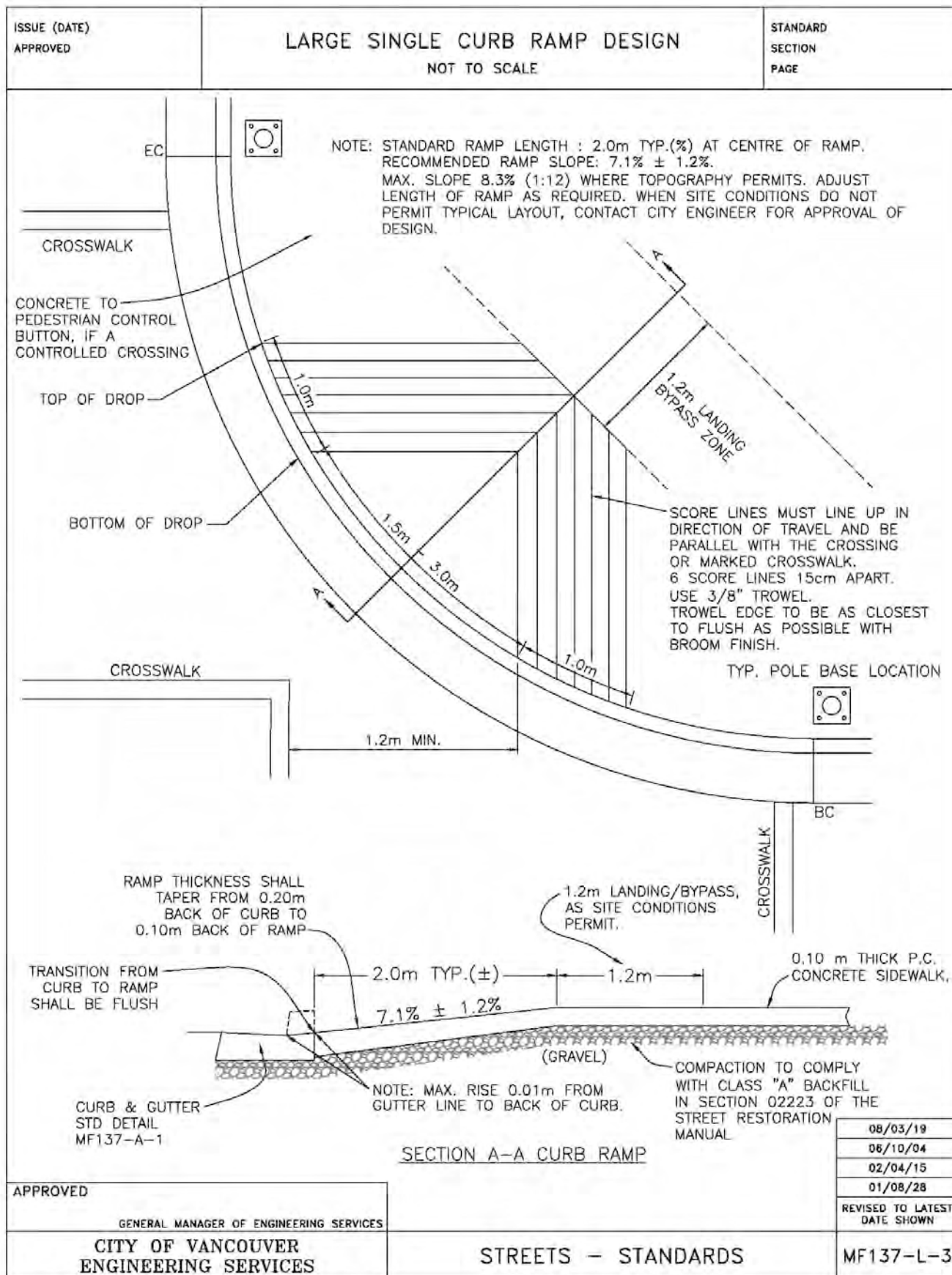
### **LANE CURB RAMP DESIGN - Standard Drawing MF137-L-6**

- Used at lane intersections. However, consideration can be given to running the sidewalk through the lane (this would generally be a crossing as opposed to a raised sidewalk).
- The ramp and the directional score lines shall line up with the ramp across the lane and be parallel with the crossing.
- In residential areas, the flares may be installed in grass to match the boulevard treatment.

In the event that none of these designs can be implemented please contact the Project Coordinator in Streets Design or Eileen Curran (604.871.6131) in Streets.







[illegible]

ISSUE (DATE) APPROVED	<b>STANDARD COMMERCIAL CROSSINGS</b> <b>(SECTION 02594)</b> NOT TO SCALE	STANDARD SECTION PAGE
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TROWEL EDGE TO BE AS CLOSEST TO FLUSH AS POSSIBLE WITH BROOM FINISH.

INSTALL CONTROL JOINT WITHOUT A TROWEL EDGE AND ALIGN SCORE PATTERN WHEN CROSSING IS POURED AS TWO SECTIONS

3.65m (12')

6.10m (20')

PROPERTY LINE

200mm THICK (PORTLAND CEMENT) CONCRETE MIX NO. 1503 AS PER SECTION 02594

1/2" DEEP SCORE LINES AT 150mm SPACING

0.90m (3') RAMP

CURB 0.90m (3') RAMP

FLARE 1.85m (6')

7.30m (24')

9.75m (32')

LEADING TO/FROM AN ARTERIAL STREET CARRYING LESS THAN 10 VEHICLE PARKING SPACES.

LEADING TO/FROM AN ARTERIAL STREET CARRYING 10 OR MORE VEHICLE PARKING SPACES.

TYPE "A" CURB & GUTTER

TRANSITION FROM CURB TO CROSSING SHALL BE FLUSH

200mm MIN

150mm

300mm

150mm MIN.-20mm MINUS CRUSHED GRANULAR BASE MMCD 02233 (MIN. 95% M.P.D.)

300mm MIN.-80mm MINUS SELECT GRANULAR SUBBASE OR COV 75mm CRUSHED TAILINGS MMCD 02233 (MIN. 95% M.P.D.)

**SECTION A-A**

NOTE: 1. FOR WIDER CROSSINGS, RAMP AND FLARE WIDTHS SHALL REMAIN AS ABOVE.

2. CONTRACTOR SHALL ENSURE THAT CROSSING LAYOUT IS APPROVED BY CITY INSPECTORS PRIOR TO POURING OF CONCRETE.

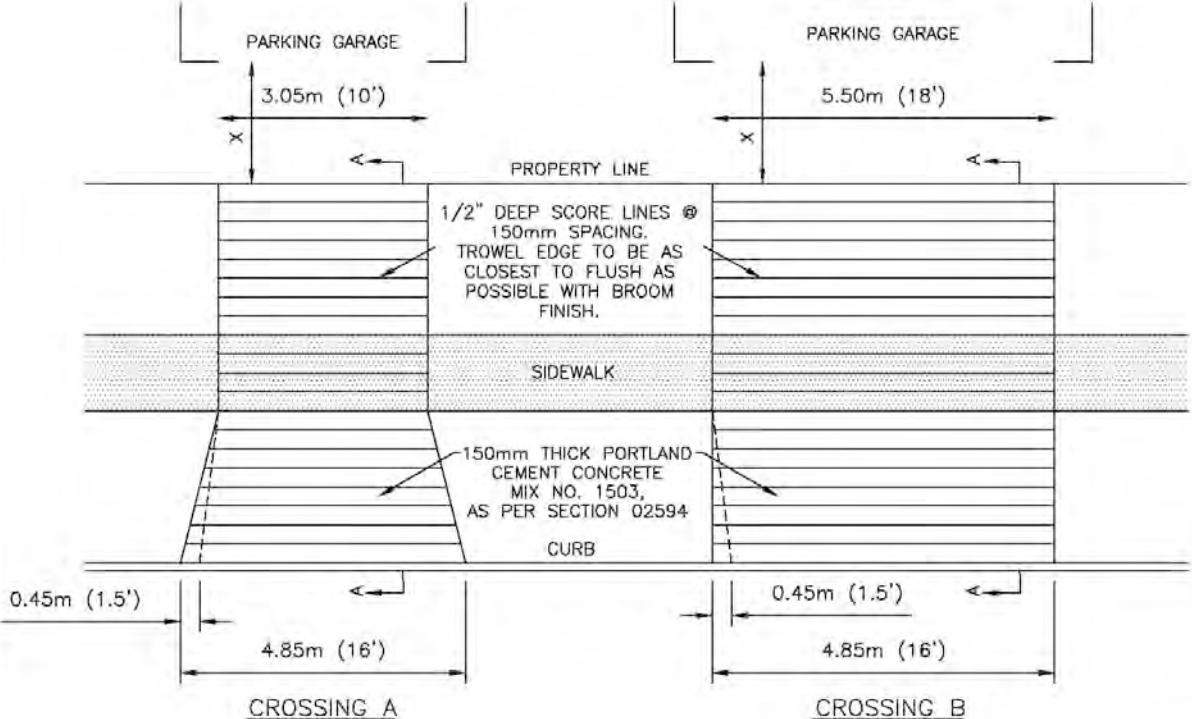
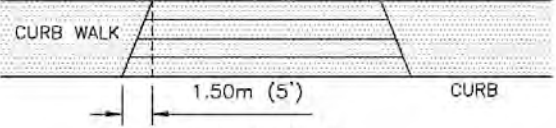
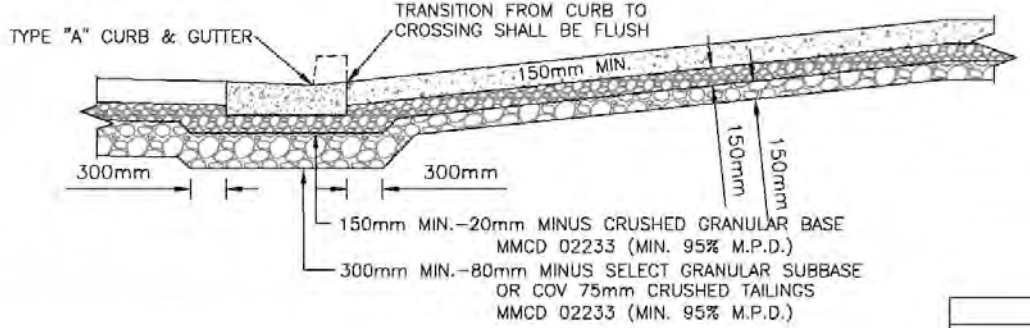
3. CURB AND GUTTER STANDARD DRAWING MF137-A-1 (TYPE "A")

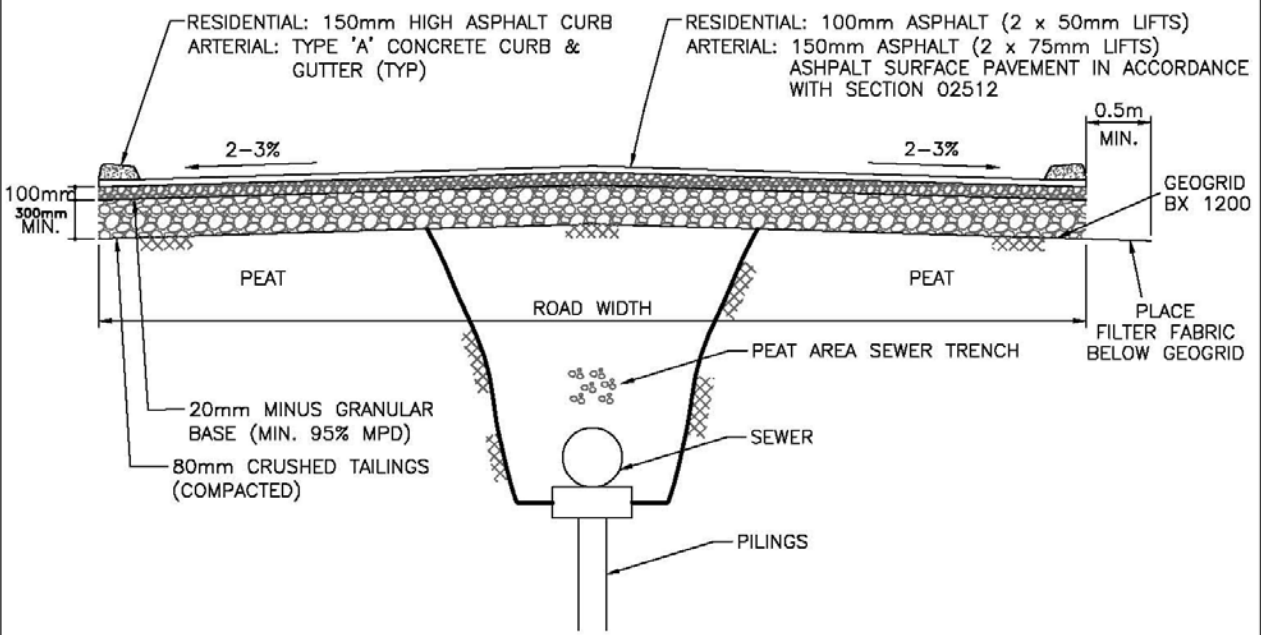
4. CONCRETE MIX:

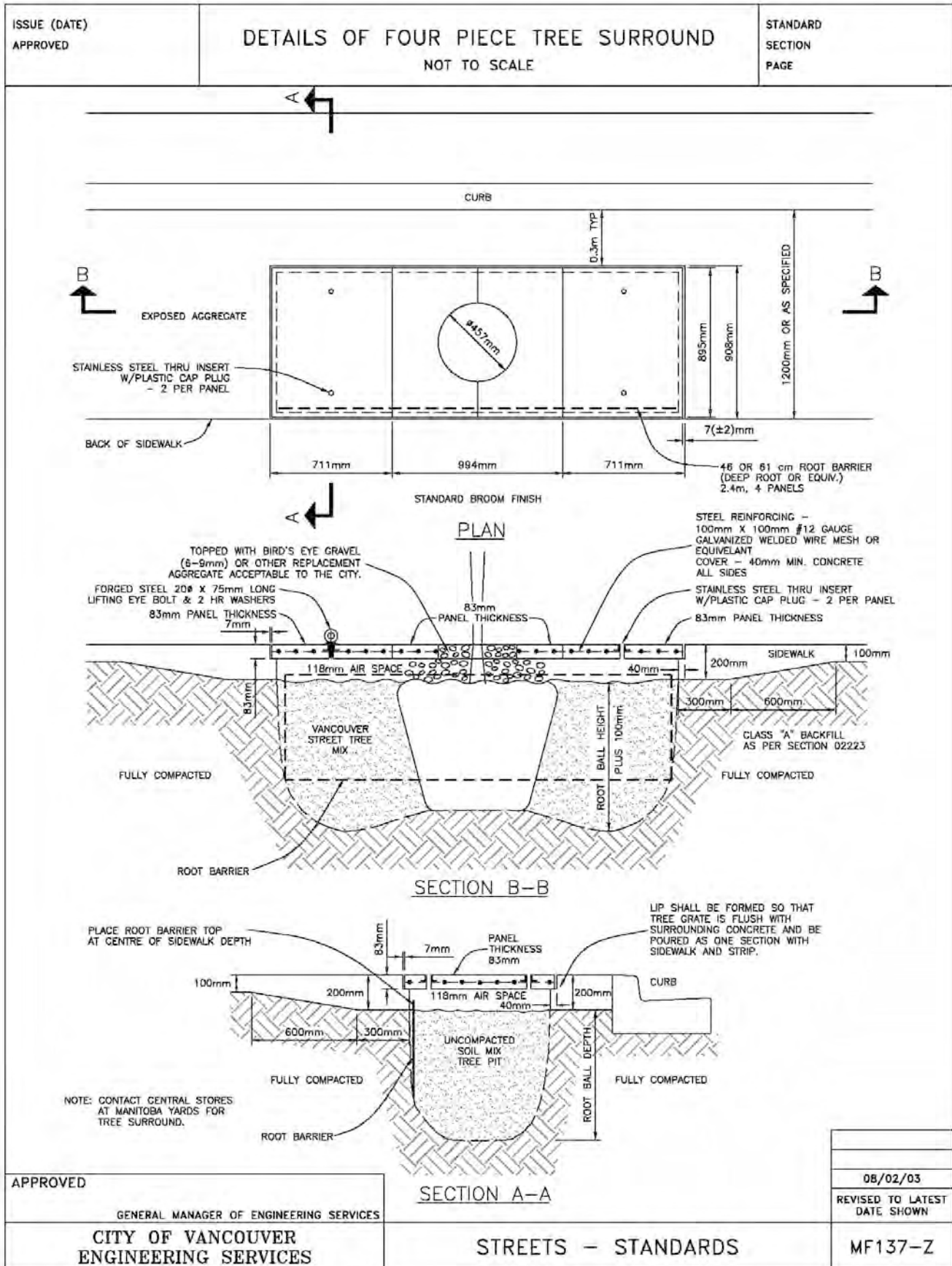
A) CITY MIX NO. 1503 CAN BE USED AS LONG AS NO TRAFFIC OR WEIGHT LOAD IS PUT ON THE CROSSING FOR 3 DAYS AFTER POUR.

B) CITY MIX NO. 20MPa IN 24 HRS. CAN BE USED AS LONG AS NO TRAFFIC OR WEIGHT LOAD IS PUT ON THE CROSSING FOR 25 HOURS AFTER POUR.

APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES  <b>CITY OF VANCOUVER</b> <b>ENGINEERING SERVICES</b>	<b>STREETS – STANDARDS</b>	08/03/10 REVISED TO LATEST DATE SHOWN <b>MF137-AF</b>
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ISSUE (DATE) APPROVED	RESIDENTIAL CROSSING TYPES (SECTION 02594) NOT TO SCALE	STANDARD SECTION PAGE																
 <p style="text-align: center;"><b>CROSSING A</b>                      <b>CROSSING B</b></p>																		
<p><b>NOTE:</b> CONTRACTOR SHALL ENSURE THAT CROSSING LAYOUT IS APPROVED BY CITY INSPECTORS PRIOR TO POURING OF CONCRETE.</p>																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">GARAGE ENTRANCE</th> <th style="width: 40%;">DISTANCE X</th> <th style="width: 45%;">CROSSING TYPE</th> </tr> </thead> <tbody> <tr> <td>SINGLE</td> <td>ANY DISTANCE</td> <td>A</td> </tr> <tr> <td rowspan="2">DOUBLE</td> <td>4.25m (14') &amp; GREATER</td> <td>A</td> </tr> <tr> <td>LESS THAN 4.25m (14')</td> <td>B</td> </tr> <tr> <td rowspan="2">TRIPLE</td> <td>6.70m (22') &amp; GREATER</td> <td>A</td> </tr> <tr> <td>LESS THAN 6.70m (22')</td> <td>B</td> </tr> </tbody> </table>			GARAGE ENTRANCE	DISTANCE X	CROSSING TYPE	SINGLE	ANY DISTANCE	A	DOUBLE	4.25m (14') & GREATER	A	LESS THAN 4.25m (14')	B	TRIPLE	6.70m (22') & GREATER	A	LESS THAN 6.70m (22')	B
GARAGE ENTRANCE	DISTANCE X	CROSSING TYPE																
SINGLE	ANY DISTANCE	A																
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TRIPLE	6.70m (22') & GREATER	A																
	LESS THAN 6.70m (22')	B																
 <p style="text-align: center;"><b>CROSSING C</b></p> <p>(SHOWS WIDTH OF FLARES WHEN A CURB WALK IS INVOLVED)</p>																		
 <p style="text-align: center;"><b>SECTION A-A</b></p>																		
<p>APPROVED</p> <p style="text-align: center;">GENERAL MANAGER OF ENGINEERING SERVICES</p> <p style="text-align: center;"><b>CITY OF VANCOUVER ENGINEERING SERVICES</b></p>	<p><b>STREETS – STANDARDS</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">08/03/28</td> </tr> <tr> <td style="text-align: center;">REVISED TO LATEST DATE SHOWN</td> </tr> <tr> <td style="text-align: center;">MF137-AG</td> </tr> </table>	08/03/28	REVISED TO LATEST DATE SHOWN	MF137-AG													
08/03/28																		
REVISED TO LATEST DATE SHOWN																		
MF137-AG																		

ISSUE (DATE) APPROVED	TYPICAL ROAD CROSS SECTION OVER PEAT NOT TO SCALE	STANDARD SECTION PAGE
<p>APPROVED</p> <p>GENERAL MANAGER OF ENGINEERING SERVICES</p> <p>CITY OF VANCOUVER ENGINEERING SERVICES</p>	 <p>RESIDENTIAL: 150mm HIGH ASPHALT CURB ARTERIAL: TYPE 'A' CONCRETE CURB &amp; GUTTER (TYP)</p> <p>RESIDENTIAL: 100mm ASPHALT (2 x 50mm LIFTS) ARTERIAL: 150mm ASPHALT (2 x 75mm LIFTS) ASHPALT SURFACE PAVEMENT IN ACCORDANCE WITH SECTION 02512</p> <p>2-3%</p> <p>100mm 300mm MIN.</p> <p>PEAT</p> <p>ROAD WIDTH</p> <p>PEAT AREA SEWER TRENCH</p> <p>SEWER</p> <p>PILINGS</p> <p>0.5m MIN.</p> <p>GEOGRID BX 1200</p> <p>PLACE FILTER FABRIC BELOW GEOGRID</p> <p>20mm MINUS GRANULAR BASE (MIN. 95% MPD)</p> <p>80mm CRUSHED TAILINGS (COMPACTED)</p>	<p>GEOGRID/GEOFABRIC INSTALLATION</p> <ol style="list-style-type: none"> <li>1. PLACE GEOFABRIC (AMOCO 4551) DIRECTLY ON PEAT, FOLLOWED BY GEOGRID (TENSAR BIAXIAL "BX-1200").</li> <li>2. OVERLAP SHEETS OF GEOGRID A MINIMUM OF 900mm AND IN THE DIRECTION THAT THE FILL WILL BE SPREAD.</li> <li>3. OVERLAPPED SHEETS OF GEOGRID MUST BE TIED TOGETHER ACCORDING TO NILEX INSTALLATION MANUAL.</li> <li>4. EXTEND GEOGRID/GEOFABRIC A MINIMUM OF 500mm BEYOND BACK OF CURB.</li> <li>5. PLACE 300mm OF AGGREGATE ROAD BASE IN TWO 150mm LIFTS.</li> </ol> <p>GEOGRID CUT REPAIR</p> <ol style="list-style-type: none"> <li>1. RETAIN A MINIMUM OF 1000mm EXISTING GEOGRID AROUND THE EXCAVATION FOR CONNECTION OF THE PATCH-GEOGRID.</li> <li>2. PLACE GEOFABRIC (AMOCO 4551) FOLLOWED BY GEOGRID (TENSAR BIAXIAL "BX-1200") DIRECTLY ON BACKFILLED TRENCH AT THE SAME ELEVATION AS THE EXISTING GEOFABRIC AND GEOGRID.</li> <li>3. OVERLAP GEOGRID A MINIMUM OF 300mm AND CONNECT WITH NYLON CABLE TIES.</li> </ol> <p>NOTE: CONTACT SEWER OPERATIONS AT MANITOBA YARD FOR GEO-MATERIAL.</p> <p>08/04/28 REVISED TO LATEST DATE SHOWN</p> <p>MF137-AH</p>





ISSUE (DATE) APPROVED	<h2 style="margin: 0;">CONCRETE MEDIANS</h2> <p style="margin: 0;">NOT TO SCALE</p>	STANDARD SECTION PAGE
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**PLAN**

IF <1.0m THEN CONTINUE STEEL TROWEL FINISH FROM NOSE TO FIRST BREAK

15M RE-BAR DRIFT PIN  
10M RE-BAR 150mm

DEEPER NOSE PORTION OF MEDIAN

2.5m  
300mm  
600mm

DRIFT PINS TO BE SET AS SHOWN FOR NOSE OF MEDIAN AND ALTERNATE FROM FRONT OF CURB TO BACK OF CURB AT 2.5m-3.0m INTERVALS FOR THE REST OF THE MEDIAN.

**SECTION A-A**

DIG-OUT AROUND SIGN SLEEVE SEE STD DWG MF 137-AO

DRIFT PINS TO BE 275mm LENGTHS OF 15M RE-BAR.

600mm

DRIFT PINS

CENTRE OF MEDIAN NOSE TO BE DUG OUT BEFORE PAVING TO A DEPTH OF 75mm LEAVING 100-125mm AROUND THE OUTSIDE PERIMETER AT END CLOSEST TO INTERSECTION.

**SECTION B-B**

8% CROWN (TYP)

LANDSCAPE AREA TO BE COMPLETELY FILLED WITH APPROVED CoV PLANTING/TREE SOIL MIX (IF PLANTED).

60mm MIN. COVER

PAVEMENT/ROAD STRUCTURE

BREAK OUT EXISTING PAVEMENT/BASE AND EXCAVATE PLANTING TRENCH (IF PLANTED).

**NOTES:**

- A) THE CONCRETE FINISH IS TO ALTERNATE FROM MEDIUM BROOM FINISH TO STEEL TROWEL FINISH AT EQUAL SPACING, CLOSEST TO 3.0m INTERVALS AS POSSIBLE, FOR THE LENGTH OF 'X'.  
B) IF 'X' IS LESS THAN 6.0m IN LENGTH ONLY STEEL TROWEL FINISH IS TO BE USED ON THIS PORTION.
- BARRIER CURB AND GUTTERS TO BE PROVIDED SURROUNDING MEDIAN IF GRADE OF ROAD IS LESS THAN 1.0% LENGTHWISE ALONG MEDIAN. (SEE STD DETAIL MF137-A-1)
- CONCRETE TO HAVE A 28 DAY COMPRESSIVE STRENGTH OF 32 MPa. ONLY NON-CHLORIDE BASED ADMIXTURES CAN BE USED FOR CONCRETE IN THIS APPLICATION.

APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES  <b>CITY OF VANCOUVER ENGINEERING SERVICES</b>	<b>STREETS – STANDARDS</b>  <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 40%; text-align: right;">           08/04/28            REVISED TO LATEST            DATE SHOWN         </div> <div style="width: 60%; text-align: left;"> <b>MF137-AN</b> </div> </div>
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ISSUE (DATE) APPROVED	<b>PARKING METER, TRAFFIC SIGN &amp; TRANSLINK SLEEVES</b> NOT TO SCALE	STANDARD SECTION PAGE												
<div style="text-align: center;"> </div>														
<p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1. CAUTION MUST BE TAKEN TO ENSURE THAT <u>NO CONCRETE OR DEBRIS GET INSIDE THE SLEEVE.</u></li> <li>2. THE SLEEVE IS TO BE ABSOLUTELY PLUMB.</li> <li>3. BUS STOP ID SIGN SLEEVES FROM TRANSLINK.</li> <li>4. PARKING METER SLEEVES FROM PARKING OPERATIONS AND ENFORCEMENT.</li> <li>5. TRAFFIC SIGN SLEEVES FROM TRAFFIC AND ELECTRICAL OPERATIONS.</li> </ol>														
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; border-bottom: 1px solid black;">TYPE OF SLEEVE</td> <td style="width: 20%; border-bottom: 1px solid black;">A</td> <td style="width: 20%; border-bottom: 1px solid black;">B</td> </tr> <tr> <td>PARKING METER</td> <td>600mm</td> <td>50mm</td> </tr> <tr> <td>BUS POLE ID</td> <td>500mm</td> <td>75mm</td> </tr> <tr> <td>TRAFFIC SIGN</td> <td>500mm</td> <td>50mm</td> </tr> </table>			TYPE OF SLEEVE	A	B	PARKING METER	600mm	50mm	BUS POLE ID	500mm	75mm	TRAFFIC SIGN	500mm	50mm
TYPE OF SLEEVE	A	B												
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APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES	<b>STREETS – STANDARDS</b>													
CITY OF VANCOUVER ENGINEERING SERVICES		MF 137-A0												



ISSUE (DATE) APPROVED	<h2 style="margin: 0;">BUS SLAB</h2> <p style="margin: 0;">NOT TO SCALE</p>	STANDARD SECTION PAGE
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**NOTES:**

1. THE BUS SLAB SHOULD BE INSTALLED AS A CONTINUOUS POUR. IF THE BUS SLAB IS INSTALLED IN NO MORE THAN TWO SEPARATE POURS, THEN THE EDGE OF THE POUR MUST BE KEYED OR REBAR INSERTS USED TO TIE BOTH PADS TOGETHER.
2. ALL CUT JOINTS ARE TO RUN PERPENDICULAR TO THE CURB. THE CUT JOINTS MUST RUN FROM OUTSIDE EDGE OF BUS SLAB TO BACK OF INTEGRAL CURB.
3. CUT JOINTS SHOULD BE CON SAWS INTO THE BUS SLAB 24 HOURS AFTER THE POUR TO MINIMIZE ANY CRACKING.
4. BUS SLABS THAT CONTAIN MANHOLES, CATCH BASINS, VALVE BOXES, CHAMBERS, MUST HAVE CONTROL CUT JOINTS ON BOTH SIDES OF THE MANHOLE.
5. CUT JOINTS MUST MAINTAIN EQUAL DISTANCE OF 3.0m-4.5m FROM ANY CONSTANTS (I.E., MANHOLE, CATCH BASIN, VALVE BOX, CHAMBERS) WITHIN THE BUS SLAB.
6. INTERNAL VIBRATOR OR POWER SCREED SHALL BE USED WHEREVER PRACTICABLE TO CONSOLIDATE THE CONCRETE. ANY OTHER CONSOLIDATION METHODS MUST BE APPROVED BY THE CITY ENGINEER PRIOR TO THE CONCRETE POUR.
7. CONCRETE MIX:
  - A) CITY MIX NO. 1503 CAN BE USED AS LONG AS NO TRAFFIC OR WEIGHT LOAD IS PUT ON THE BUS SLAB FOR 3 DAYS AFTER POUR.
  - B) CITY MIX NO. 20MPa IN 24 HRS. CAN BE USED AS LONG AS NO TRAFFIC OR WEIGHT LOAD IS PUT ON THE BUS SLAB FOR 24 HOURS AFTER POUR.
  - C) NO CHLORIDE BASED ADDITIVES SHALL BE USED IN CONCRETE SLAB WITH EMBEDDED STEEL.

APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES  <b>CITY OF VANCOUVER ENGINEERING SERVICES</b>	<b>STREETS – STANDARDS</b>  MF 137-AP
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08-06-20  
 REVISED TO LATEST  
 DATE SHOWN

ISSUE (DATE) APPROVED	PEDESTRIAN LANE CROSSING STANDARD NOT TO SCALE	STANDARD SECTION PAGE
<p>NOTE: TO BE INSTALLED WHERE DIRECTED BY CITY ENGINEER.</p>		<p>SEE STD DWG TYPICAL SIDEWALKS MF137-F-2 MF137-F-3 MF137-F-4</p> <p>SEE STD DWG LANE CURB RAMP MF 137-L-6</p> <p>0.25m TYP. STEEL TROWEL FINISH EDGE FINISHING TO BE DETECTABLE BY SOMEONE USING A WHITE CANE</p> <p>LANE TO BE GRADED LEVEL WITH CONCRETE CROSSING</p> <p>EDGE OF CONCRETE CROSSING</p> <p>SCORE LINES: 0.9m x 0.9m PATTERN</p> <p>CENTERED ON CURB RAMPS / SIDEWALKS</p>
<p>APPROVED</p> <p>GENERAL MANAGER OF ENGINEERING SERVICES</p> <p><b>CITY OF VANCOUVER ENGINEERING SERVICES</b></p>	<p><b>STREETS – STANDARDS</b></p>	<p>08-04-24</p> <p>REVISED TO LATEST DATE SHOWN</p> <p><b>MF 137-AQ</b></p>

ISSUE (DATE) APPROVED	<b>INFILTRATION BULGE DESIGN</b> NOT TO SCALE	STANDARD SECTION PAGE
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STEEL CURB INLET (SEE DETAIL 1 & 2)

REMOVE ALL ROAD BASE BETWEEN CURB & SIDEWALK. EXCAVATE TO A MINIMUM OF 80CM BELOW LEVEL OF ADJACENT CURB. BACK FILL WITH THREE PARTS COMPOST AND ONE PART SAND (3:1 MIX). CONTACT LANDFILL OPERATIONS FOR MIX SUPPLY. (SEE SECTIONS A-A & B-B)

FINISHED GRADE TO MATCH EXISTING GUTTER GRADE ALONG SECTION LINE.

ADJUST ELEVATION OF CB TO MAXIMIZE ITS HEIGHT. IT MUST REMAIN A MINIMUM OF 1cm LOWER THAN THE ELEVATION OF THE GUTTER AT THE STEEL INLET AND NO HIGHER THAN 7CM BELOW THE HEIGHT OF THE ADJACENT SIDEWALK. THE SPACER USED TO LIFT THE CB SHOULD BE SEALED WITH MORTAR TO REDUCE THE POSSIBILITY OF WATER MOVING INTO CB WITHOUT SPILLING OVER THE TOP.

PLACE 7.5cm (3") ± RIVER ROCK AROUND THE CB AS SHOWN IN SECTIONS A-A AND B-B. RIVER ROCK TO BE INSTALLED ON LANDSCAPE FABRIC AFTER THE PLACEMENT OF SURROUNDING SOIL. FABRIC TO WRAP UP THE SIDES OF RIVER ROCK TO 2cm BELOW THE FINISHED GRADE. FINISHED GRADE AROUND THE CATCH BASIN (CB) SHOULD REMAIN 10cm BELOW TOP OF ELEVATED CB AND SLOPE UP TO MEET SIDEWALK AND CURB EDGES (SEE SECTION A-A)

SEE DOUBLE CURB RAMP DRAWING MF137-L-5 FOR DETAILS

RIVER ROCK MAY BE REQUIRED ALONG THE BASE OF THE CHANNEL IF THERE IS A STEEP GRADIENT

ALL WASTE / CONCRETE TO BE REMOVED FROM THE PLANTED AREA.

GRASS CAN BE INSTALLED WHERE THERE IS REASONABLE EXPECTATION A RESIDENT WILL MOW THE AREA. SOIL SLOPES WITH CURB TO MEET ELEVATION OF RAMP.

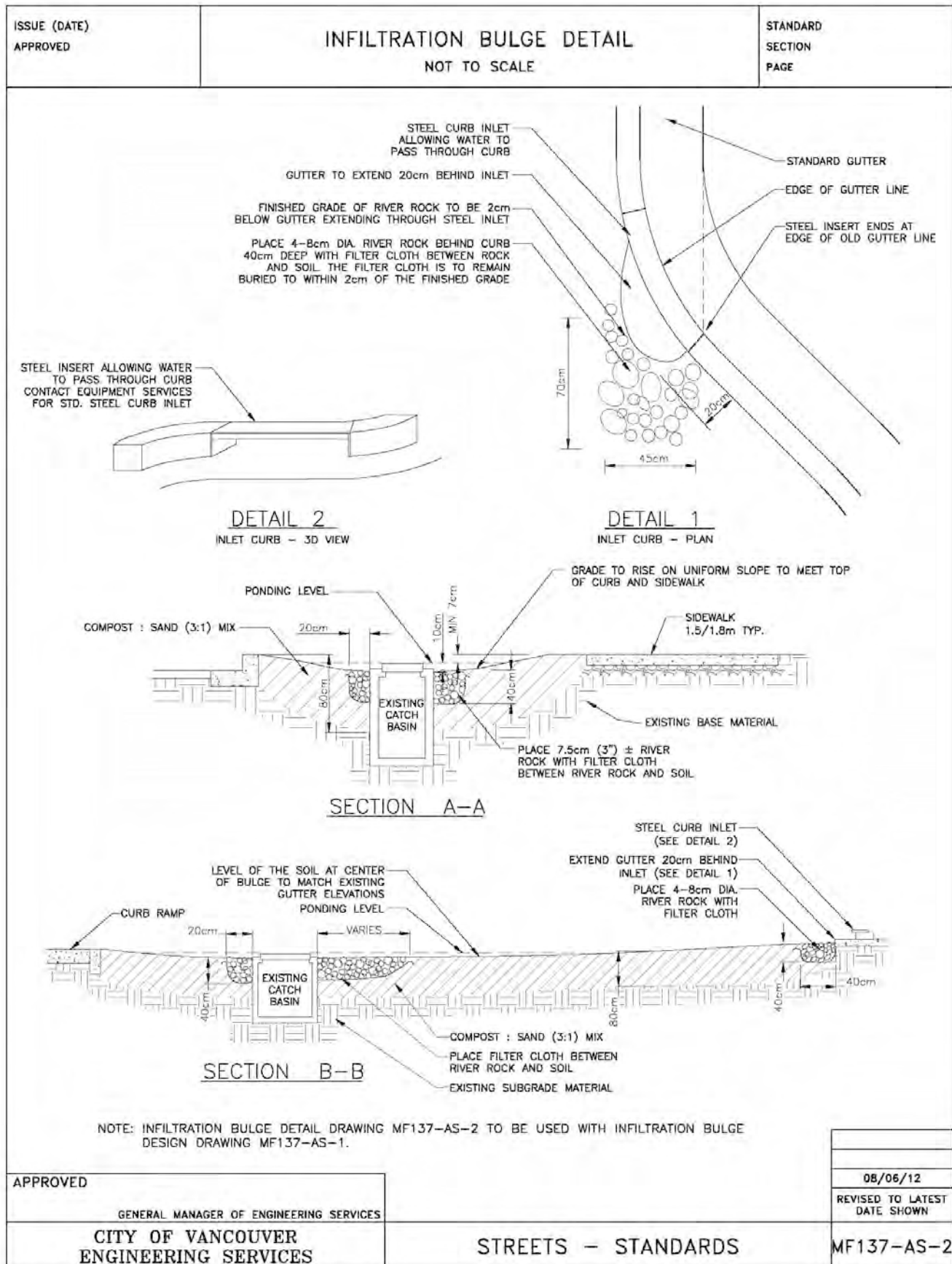
TOP OF DROP  
BOTTOM OF DROP

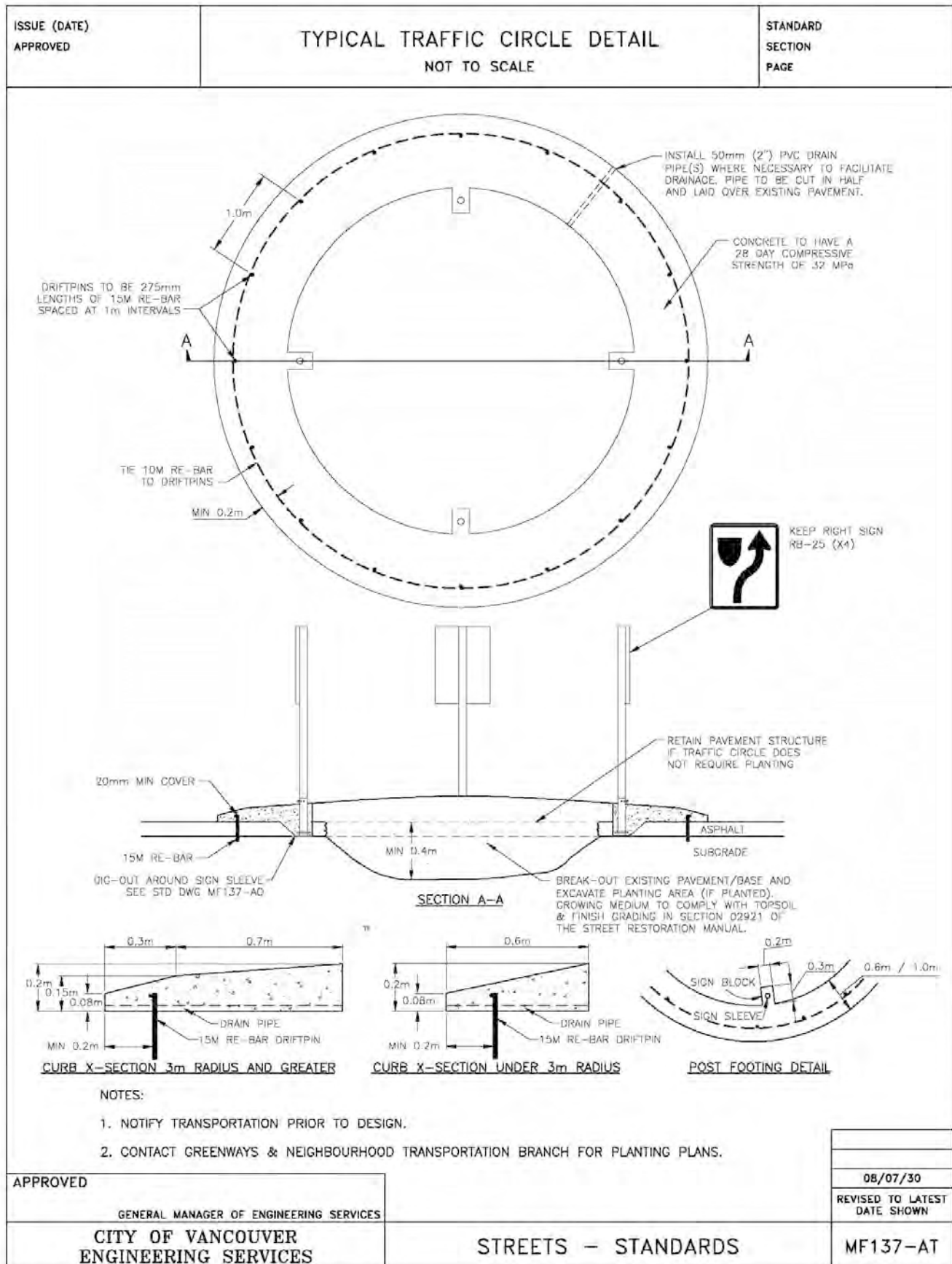
VARIES

NOTES:

1. INFILTRATION BULGE DESIGN DRAWING MF137-AS-1 TO BE USED WITH INFILTRATION BULGE DETAIL DRAWING MF137-AS-2.
2. CONTACT GREENWAYS & NEIGHBOURHOOD TRANSPORTATION BRANCH FOR PLANTING PLANS.
3. STREET TO HAVE A MAXIMUM GUTTER GRADE OF 6%.

APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES  <b>CITY OF VANCOUVER ENGINEERING SERVICES</b>	<b>STREETS – STANDARDS</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td> </td></tr> <tr><td>08/06/12</td></tr> <tr><td>REVISED TO LATEST DATE SHOWN</td></tr> </table> <b>MF137-AS-1</b>		08/06/12	REVISED TO LATEST DATE SHOWN
08/06/12					
REVISED TO LATEST DATE SHOWN					





ISSUE (DATE) APPROVED	<b>TYPICAL RESIDENTIAL BULGE DESIGN</b> NOT TO SCALE	STANDARD SECTION PAGE			
<p>The diagram illustrates a residential bulge design on a sidewalk. A vertical line on the left is labeled '7.0m ±'. A horizontal line is labeled 'P'. A curved line represents the 'TOP OF DROP' and 'BOTTOM OF DROP'. Dimensions include 1.5m, 4.0m, 2.5m, 0.5m, and MIN. 2.0m. An 'OBJECT MARKER WA-36R' is shown. A note states 'GRASS CAN BE INSTALLED WHERE THERE IS SUFFICIENT SPACE.' and 'R5.5m'. A distance of 'MIN. 7.0m' is indicated between two points. A reference to 'SEE DOUBLE CURB RAMP DRAWING MF137-L-S FOR DETAILS' is included. The word 'SIDEWALK' is written vertically on both sides of the bulge.</p>					
<p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1. NOTIFY TRANSPORTATION PRIOR TO DESIGN. COMPLEX DESIGNS, NON RESIDENTIAL, BUS ROUTES ETC. MAY REQUIRE TRANSPORTATION TO DESIGN BULGE.</li> <li>2. STREET DESIGN REQUIRED FOR DRAINAGE.</li> <li>3. INFILTRATION BULGE SHOULD BE CONSIDERED AS AN ALTERNATIVE DESIGN.</li> <li>4. CONTACT GREENWAYS &amp; NEIGHBOURHOOD TRANSPORTATION BRANCH FOR PLANTING PLANS.</li> </ol>					
APPROVED  GENERAL MANAGER OF ENGINEERING SERVICES	<b>CITY OF VANCOUVER ENGINEERING SERVICES</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 20px;"> </td></tr> <tr><td style="text-align: center;">08/07/24</td></tr> <tr><td style="text-align: center;">REVISED TO LATEST DATE SHOWN</td></tr> </table>		08/07/24	REVISED TO LATEST DATE SHOWN
08/07/24					
REVISED TO LATEST DATE SHOWN					
<b>STREETS – STANDARDS</b>		<b>MF137-AU</b>			

ISSUE (DATE) APPROVED	<b>TYPICAL LANE ENTRANCE</b> NOT TO SCALE	STANDARD SECTION PAGE
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ROAD WIDTH	BLVD A
8.5m	5.75m
10.0m	5.0m
11.0m	4.5m
12.0m	4.0m

LANE

LANE (SKEWED)

APPROVED

GENERAL MANAGER OF ENGINEERING SERVICES

**CITY OF VANCOUVER**  
ENGINEERING SERVICES

STREETS – STANDARDS

08-07-24

REVISED TO LATEST  
DATE SHOWN

MF 137-AV