City of
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**Engineering Design and Construction**
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Dear Sir/Madam:

**Re: Amendments to City of Richmond Quality Control Program**

The City of Richmond Quality Control Program has been amended to include the following changes:

- Quantities for Sieve Analysis of Aggregates (ASTM C-117 and C-136) and Modified Proctor Density in Table 1.
- Quantities for Sieve Analysis of Aggregates (ASTM C-117 and C-136) and Modified Proctor Density in Table 2.

Yours truly,

Jim V. Young, P. Eng.
*Manager Engineering Design and Construction*

JVY:mts



Richmond

# CITY OF RICHMOND QUALITY CONTROL PROGRAM

Construction Materials Testing - Revision 1
Effective January 01, 2012

This document forms and becomes part of the City's Supplementary Specifications and Detail Drawings (April 2011).

## 1. Purpose

This document specifies **minimum material testing requirements** and frequencies for concrete, aggregates, asphalt and topsoil used for municipal infrastructure construction in Richmond. All testing herein shall be provided by the contractor at the contractor's cost, as required to meet:

- The requirements contained in this document;
- Any additional tests or inspection requirements for compliance to geotechnical reports and recommendations;
- Other tests, inspection requirements or recommendations by the engineer of record;
- Any testing or inspection requirements specified in the contract documents and design drawings.

## 2. Testing and Inspections

Additional testing may be requested as permitted by MMCD General Condition 3.4. Testing and Inspections and the payment thereof shall be in accordance with MMCD General Condition 4.12 - Tests and Inspections. Correction of deficient work shall be completed as per MMCD General Condition 4.13 - Rejected Work.

At the City's sole discretion, the Quality Control Requirements may be reduced on a project specific basis subject to the contractor's performance.

**'Small construction'** will not be required to meet the minimum testing requirements specified by the Quality Control Program. Such construction may be tested by an independent agency at the City's cost through the Quality Assurance Program. Contractors will permit such testing to occur and must provide reasonable assistance to the City to complete this testing. MMCD General Conditions 4.12 - Tests and Inspections and 4.13 - Rejected Works will apply to such projects.

For large or unique projects the City may require the Contractor to prepare, implement and maintain a project specific quality control program. This program must be approved by the City prior to construction.

## 3. Certification

All testing shall be completed by a Canadian Standards Association (CSA) and/or Canadian Council of Independent Laboratories (CCIL) certified laboratory. Technicians must be certified to carry out the particular testing procedure.

## 4. Material Testing Minimum Standards

### 4.1. EARTHWORKS

#### 4.1.1. Excavation, Trenching and Backfilling

A sieve analysis and a modified proctor density test for each type of material being delivered from each source or supplier shall be submitted a minimum of one (1) week prior to delivery of material to the site. The testing shall have been performed by an independent testing agency and shall have been completed not more than three (3) months prior to the date of delivery. If the material source or supplier changes during construction, the above requirements shall apply.

During placement of aggregates and granular materials in trench applications, the testing shall be carried out as described in Table 1.

**Table 1 – Testing of Granular Materials and Placement for Trench Applications**

| | |
|---|---|
| Sieve Analysis of Aggregates (ASTM C-117 and C-136) | One (1) test per **2000 tonnes** (1000m³) produced and delivered and each change in source or supplier |
| Modified Proctor Density | One (1) test per **2000 tonnes** (1000m³) produced and delivered and each change in source or supplier |
| Field Density - Nuclear Method | One (1) test per 20 linear metres per lift (or thickness as specified by a geotechnical engineer);<br>Minimum one (1) test per trench.* |
| Moisture Content - Nuclear Method | Same as Field Density Test. |

***Notes:**

1. Total project trench length less than 5m is considered '**Small Construction**'.
2. The Contract Administrator or Inspector may request additional sieve analysis and modified proctor tests during construction to verify material specification conformance.
3. During construction only, sieve and proctor samples shall be taken at the time of material delivery; therefore, the requirement to provide test results one (1) week prior to delivery shall not be in effect.

4.2. Roads and Site Improvements

4.2.1. Aggregates and Granular Materials

A sieve analysis and a modified proctor density test for each type of material being delivered from each source or supplier shall be submitted a minimum of one (1) week prior to delivery of material to the site. The testing shall have been performed by an independent testing agency and shall have been completed not more than three (3) months prior to the date of delivery. If the material source or supplier changes during construction, the above requirements shall apply.

The Contract Administrator or Inspector may request the results of an aggregate soundness test to confirm the quality of material being supplied.

During placement of aggregates and granular materials, the testing of subgrade, subbase and base materials for roads, sidewalks and pathways, and curb and gutter shall be carried out as described in Table 2.

**Table 2 – Aggregates and Granular Materials for Roads and Site Improvements**

| | |
|---|---|
| Sieve Analysis of Aggregates (ASTM C-117 and C-136) | One (1) test per **2000 tonnes** (1000m³) produced and delivered and each change in source or supplier |
| Modified Proctor Density | One (1) test per **2000 tonnes** (1000m³) produced and delivered and each change in source or supplier |
| Field Density - Nuclear Method | Subgrade:<br>One (1) test per 20m per lane per 500mm depth;<br>Locations of tests to be staggered across the width of the lane;<br>Minimum one (1) test per site.†<br><br>Subbase and Base:<br>One (1) test per 20m per lane per lift;<br>Locations of tests to be staggered across the width of the lane;<br>Minimum one (1) test per lift.†<br><br>Sidewalk, pathways and curb and gutter:<br>One (1) test per 40 linear metres and one test at each driveway;<br>Locations of tests to be chosen at random across the width<br>Minimum one (1) test per location.† |
| Moisture Content - Nuclear Method | Same as field density test. |

†**Notes:**

1. The Contract Administrator or Inspector may request additional sieve and modified proctor tests during construction to verify material specification conformance.
2. Road segments less than 20m in length are considered '**Small Construction**'.
3. Sidewalk segments less than 10m in length are considered '**Small Construction**'.
4. Curb segments less than 15m in length are considered '**Small Construction**'.
5. During construction only, sieve and proctor samples shall be taken at the time of material delivery; therefore, the requirement to provide test results one (1) week prior to delivery shall be not be in effect.

4.2.2. Paving

Hot-Mix Asphalt Concrete Paving

One (1) week prior to delivery on site, results from one (1) set of tests to demonstrate that the materials and mix design(s) meet the MMCD specifications for Hot-Mix Asphalt Concrete Paving (Section 32 12 16) shall be submitted for each blend/each mix type/each asphalt cement type to be used. This testing shall include but is not limited: to aggregate testing, asphalt cement testing, Marshall Mix design tests and trial mix tests.

During placement of Hot-Mix Asphalt Concrete Paving, the testing of materials shall be carried out as described in Table 3.

**Table 3 - Testing of Hot-Mix Asphalt Concrete Materials and Placement**

| | |
|---|---|
| Density of Hot-Mix Asphalt Concrete – Nuclear Method | For each day of operation, one (1) test every 20m stationing per lane per lift;<br>minimum one (1) test per lift, minimum two (2) locations per test‡ |
| Full Marshall Test | One (1) set of tests per 500 tonnes;<br>Minimum one (1) set of tests per lot per day‡ |

Superpave Hot Mix Asphalt Paving

One (1) week prior to delivery on site, results from one (1) set of tests to demonstrate that the materials and mix designs(s) meet the MMCD specifications for Superpave Hot Mix Asphalt Paving (section 32 12 17) shall be submitted for each unique mix to be used. This testing shall include but is not limited to: aggregate testing, performance-graded binder testing, mineral filler testing, Superpave mix design and trial mix testing.

During Production, Delivery and Placement the testing shall be carried out as described in Table 4.

**Table 4 – Testing of Superpave Hot Mix Asphalt Paving**

| | |
|---|---|
| Density of Bituminous Concrete – Nuclear Method | For each day of operation, one (1) test every 20m stationing per lane per lift;<br>minimum one (1) test per lift, minimum two (2) locations per test‡ |
| Materials testing to meet MMCD specifications and Superpave Mix Design SP2 | One (1) set of tests per 500 tonnes;<br>Minimum one (1) set of tests per lot per day‡ |

‡**Note**: '**Small Construction**' paving projects are as follows.
Local Road – less that 1 lane width and less than 20m long or less than 20 tonnes.
Collector Road – less than 1 lane width and less than 20m long or less than 40 tonnes.
Arterial Road – less than 1 lane width and less than 20m long or less than 25 tonnes.

Coring

Coring may be requested by the Inspector or Contract Administrator to verify the properties of the placed asphalt mix.

For street paving operations, core locations will be selected for each pass of the paving machine by the Inspector or the CA as follows:

- Across the width, core locations will be selected randomly.
- Along the length, core locations will have a randomly selected starting station with subsequent cores spaced at approximately 50m intervals.

For all other operations:

- A minimum of one core for every 250m² of asphalt mix placed.

## 4.3. CONCRETE

### 4.3.1. Concrete Reinforcement

Mill certificates including heat numbers and CSA conformance shall be provided for each delivery to the site

### 4.3.2. Cast-in-Place Concrete

Aggregate soundness test results, admixture(s) and chemical mixture(s) and Portland cement certification may be requested by the CA or Inspector.

Compressive Strength, Air Content, Slump and Temperature shall be tested starting with the first load of concrete delivered and continue as follows:

- Sidewalks and pathways
  - One (1) set of tests per 225m² placed; minimum one (1) test per day.
  - Sidewalk construction less than 15m² is consider '**Small Construction**'.

- Curb and gutter
  - One (1) set of tests per 150 linear metres placed; minimum one (1) test per day.
  - Placement of less than 15 linear meters of curbing is considered '**Small Construction**'.

Batching slips from the plant shall be provided for each load at the time of delivery.

4.3.3. Pre-Cast Concrete

The Inspector or CA may require the contractor to provide quality control documentation or physical testing of pre-cast concrete products.

4.4. Topsoil and Finish Grading

Topsoil and finish grading testing shall be conducted as described in Section 32 91 21 of the City's Supplementary Specifications and Detail Drawings (April 2011).