

**CW 3410 – ASPHALTIC CONCRETE PAVEMENT WORKS****TABLE OF CONTENTS**

1.	GENERAL CONDITIONS	1
3.	DESCRIPTION	1
5.	MATERIALS	1
	5.1 General	1
	5.2 Handling and Storage of Materials	1
	5.3 Testing and Approval	1
	5.4 Asphaltic Concrete Constituent Materials	1
	5.4.1 Aggregates.....	1
	5.4.2 Asphalt Cement .....	2
	5.4.3 Mineral Filler .....	3
	5.5 Incidental Materials	6
	5.5.1 Prime Coat .....	6
	5.5.2 Tack Coat .....	6
	5.5.3 Miscellaneous Materials.....	6
	5.5.4 Reclaimed Asphalt Pavement.....	6
	5.5.5 Recycled Asphalt Shingles .....	6
6.	DESIGN REQUIREMENTS FOR ASPHALTIC CONCRETE PAVING MIX	6
	6.1 Mix Design Statement	6
	6.2 Aggregate Gradation Requirements	7
	6.3 Allowable Deviation from Job Mix Formula	7
	6.3.1 Aggregate Gradation.....	7
	6.3.2 Asphalt Cement Content.....	7
	6.4 Physical Requirements	7
	6.5 Method of Testing	7
	6.6 Reclaimed Asphalt Pavement Content	8
	6.7 Recycled Asphalt Shingles	8
7.	SUPPLY OF ASPHALTIC CONCRETE PAVING MIX	8
	7.1 Mixing Plant	8
	7.2 Batch Mix and Continuous Mix Plant Operations	9
	7.2.1 Aggregate Storage.....	9
	7.2.2 Preparation of Asphalt Cement.....	9
	7.2.3 Preparation of Mineral Aggregate .....	9
	7.2.4 Preparation of Asphaltic Concrete Paving Mix .....	9
	7.2.5 Mixing Plant Inspection .....	9
	7.3 Drum Mix Plant Operations	9
	7.4 Transportation of Asphaltic Concrete Paving Mix	11
8.	EQUIPMENT	11
9.	CONSTRUCTION METHODS	11
	9.1 Base Preparation	11
	9.1.1 Preparation of Base for Asphaltic Concrete Pavement .....	11
	9.1.2 Preparation of Existing Pavement for Asphaltic Concrete Overlay.....	11
	9.2 Placing Asphaltic Concrete Paving Mixture	12
	9.3 Main Line Paving, Tie-Ins and Approaches	13
	9.3.1 Main Line Paving .....	13
	9.3.2 Tie-Ins and Approaches .....	13
	9.4 Asphalt Patching	13
	9.5 Joints	14
	9.5.1 Location of Joints .....	14
	9.5.2 Preparation of Joints .....	15
	9.5.3 Construction of Joints .....	15
	9.6 Compaction of Asphaltic Concrete Paving Mixture	15
	9.6.1 Static Rolling .....	16

9.6.2	Vibratory Rolling.....	16
9.6.3	Compaction of Areas Inaccessible to Rollers .....	17
9.7	Requirements After Final Rolling	17
9.8	Opening to Traffic	17
10.	QUALITY CONTROL	17
10.1	Inspection	17
10.2	Access	17
10.3	Materials	17
10.4	Quality of Asphaltic Concrete Paving Mixture	17
10.5	Quality of Asphaltic Concrete Pavement	18
10.6	Quality Assurance	19
10.7	Corrective Action	19
12.	METHOD OF MEASUREMENT	19
12.1	Construction of Asphaltic Concrete Pavement	20
12.2	Construction of Asphaltic Concrete Overlay	20
12.3	Construction of Asphaltic Concrete Base Course	20
12.4	Construction of Asphalt Patches	20
13.	BASIS OF PAYMENT	20
13.1	Construction of Asphaltic Concrete Pavement	20
13.2	Construction of Asphaltic Concrete Overlay	20
13.3	Construction of Asphaltic Concrete Base Course	21
13.4	Construction of Asphalt Patches	21

## **CW 3410 - ASPHALTIC CONCRETE PAVEMENT WORKS**

### **1. GENERAL CONDITIONS**

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

### **3. DESCRIPTION**

This Specification shall cover the preparation of hot-mixed, hot-laid, asphaltic concrete paving mix for, and all placing operations relating to, the construction of asphaltic concrete base courses, pavements, overlays and other related pavement works.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

### **5. MATERIALS**

#### **5.1 General**

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.

#### **5.2 Handling and Storage of Materials**

All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

#### **5.3 Testing and Approval**

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

The Contract Administrator shall approve all materials before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

#### **5.4 Asphaltic Concrete Constituent Materials**

##### **5.4.1 Aggregates**

The Contractor shall furnish in writing to the Contract Administrator the location of the sources where aggregate will be obtained in order that same may be inspected and tentatively approved by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract will not be permitted without notification in writing to and the express approval of the Contract Administrator.

**(a) Fine Aggregate**

Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, soft or flaking particles, shale, alkali, organic matter, loam or other deleterious substances.

**(b) Coarse Aggregate**

Coarse aggregate shall consist of natural gravel, crushed stone or other approved materials of similar characteristics having clean, hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter.

Crushed stone shall consist of angular, cubical fragments of aggregate of uniform quality throughout. It shall be produced from rock formations or from boulders and stones and shall be from sources of approved nature and origin. Coarse aggregate will not be accepted from rock formations or from boulders and stones containing intrusions or stratifications of an undesirable nature or from source showing signs of disintegration from the elements or other causes.

Coarse aggregate shall conform to the following additional requirements:

- (i)** Soundness - Coarse aggregate when subjected to five cycles of the soundness test shall have a weighted loss of not more than twelve (12%) percent when sodium sulphate is used or not more than eighteen (18%) percent when magnesium sulphate is used, or have in the opinion of the Contract Administrator a satisfactory soundness record. The method of testing shall be in accordance with ASTM Standard C88, Test for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- (ii)** Abrasion - Coarse aggregate when subjected to the abrasion test shall have a loss of **not more than thirty-five (35%) percent** by weight, of any hand picked portion of a sample containing a minimum of one and a half (1.5%) percent by weight of the original sample. The method of testing shall be in accordance with ASTM Standard C131, Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.
- (iii)** Crushed Aggregate - Aggregate retained on a No. 5 000 sieve shall contain not less than the percent of crushed aggregate as determined by actual particle count and as shown in Table 1 CW 3410.R5.1.

**5.4.2 Asphalt Cement**

The asphalt cement shall be prepared by the refining of petroleum, it shall be uniform in character and shall not foam when heated to 175°C.

150 - 200(A) Grade asphalt cement shall conform to the requirements specified in the following table:

Test Characteristics	A.S.T.M. TEST Methods	150-200 (A)															
Kinematic Viscosity, 135°C, mm <sup>2</sup> /s	D2171	The viscosity and penetration values must fall within the area bounded by A to B to C to D to A, plotted as straight lines on a full logarithmic plot (log-log) as shown on Fig. CW 3410.1-R5, with the co-ordinates of the points as follows:															
Penetration, 25°C, 100 g, 5 s in dmm	D5																
		<table border="1"> <thead> <tr> <th data-bbox="797 499 857 527"><u>Point</u></th> <th data-bbox="971 499 1084 527"><u>Abs. Visc.</u></th> <th data-bbox="1224 499 1279 527"><u>Pen.</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="818 527 836 554">A</td> <td data-bbox="1029 527 1073 554">360</td> <td data-bbox="1224 527 1268 554">150</td> </tr> <tr> <td data-bbox="818 554 836 581">B</td> <td data-bbox="1029 554 1073 581">255</td> <td data-bbox="1224 554 1268 581">150</td> </tr> <tr> <td data-bbox="818 581 836 609">C</td> <td data-bbox="1029 581 1073 609">205</td> <td data-bbox="1224 581 1268 609">200</td> </tr> <tr> <td data-bbox="818 609 836 636">D</td> <td data-bbox="1029 609 1073 636">285</td> <td data-bbox="1224 609 1268 636">200</td> </tr> </tbody> </table>	<u>Point</u>	<u>Abs. Visc.</u>	<u>Pen.</u>	A	360	150	B	255	150	C	205	200	D	285	200
<u>Point</u>	<u>Abs. Visc.</u>	<u>Pen.</u>															
A	360	150															
B	255	150															
C	205	200															
D	285	200															
Flash Point, Cleveland Open Cup, min. °C.	D92	205															
Solubility in Trichloroethylene, min. %	D2042	99.5															
Tests on Residue from Thin-Film Oven Test:	D1754																
Ratio of Absolute Viscosity of Residue from Thin-Film Oven Test to Original Absolute Viscosity, max.	D2171	4.0															
Ductility, 25°C, 5 cm/min., min., cm 15.56°C, 5 cm/min., min., cm	D113	100 --															

#### 5.4.3 Mineral Filler

Mineral filler, when required, shall consist of finely divided mineral matter such as rock dust, slag dust, hydrated lime, hydraulic cement, fly ash, loess or other suitable mineral matter, and shall conform to the requirements of ASTM Standard D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures.

FIGURE CW 3410.1-R5

SPECIFICATIONS FOR 150-200(A) GRADE ASPHALT CEMENT  
ABSOLUTE VISCOSITY VS. PENETRATION

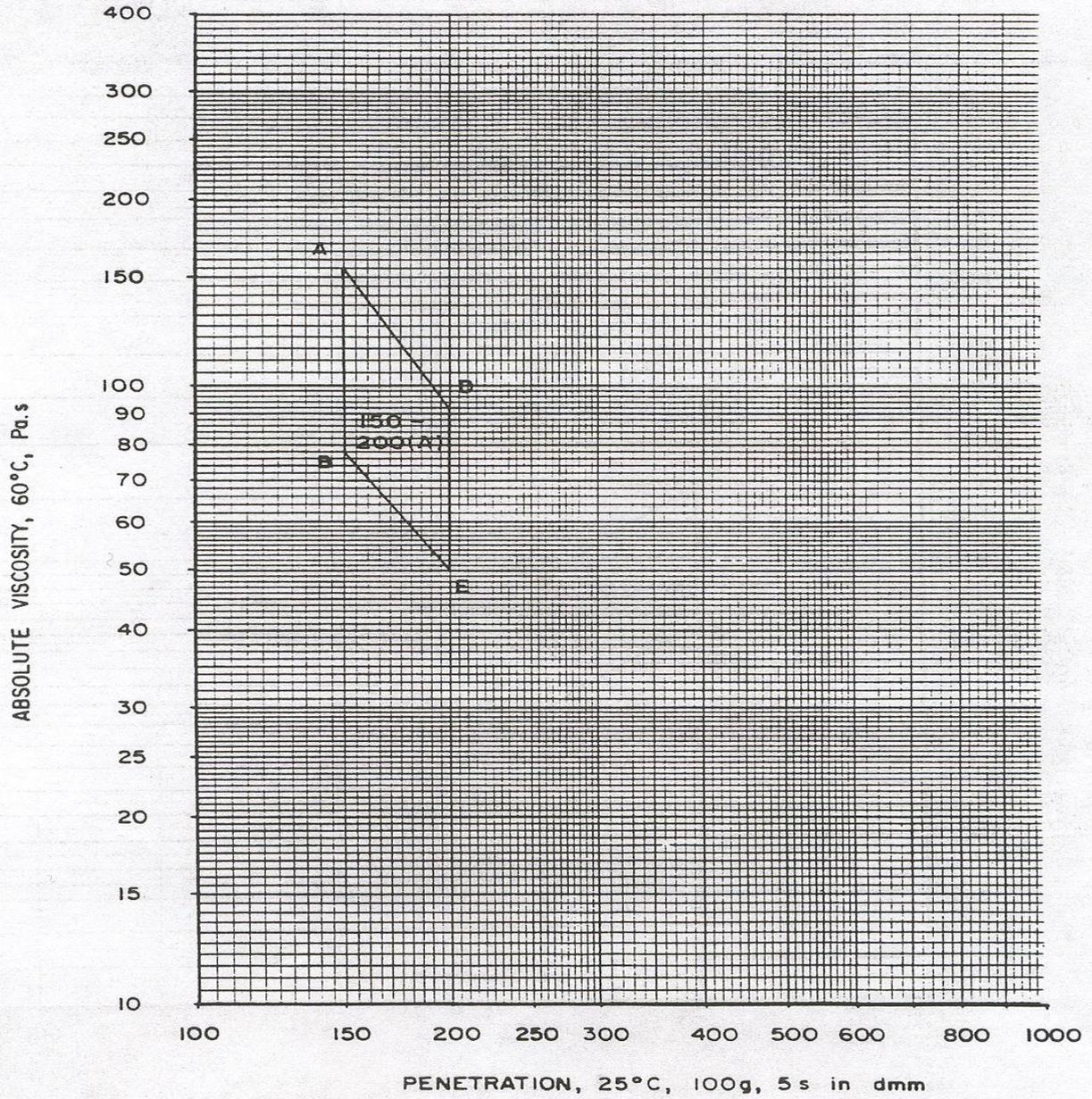
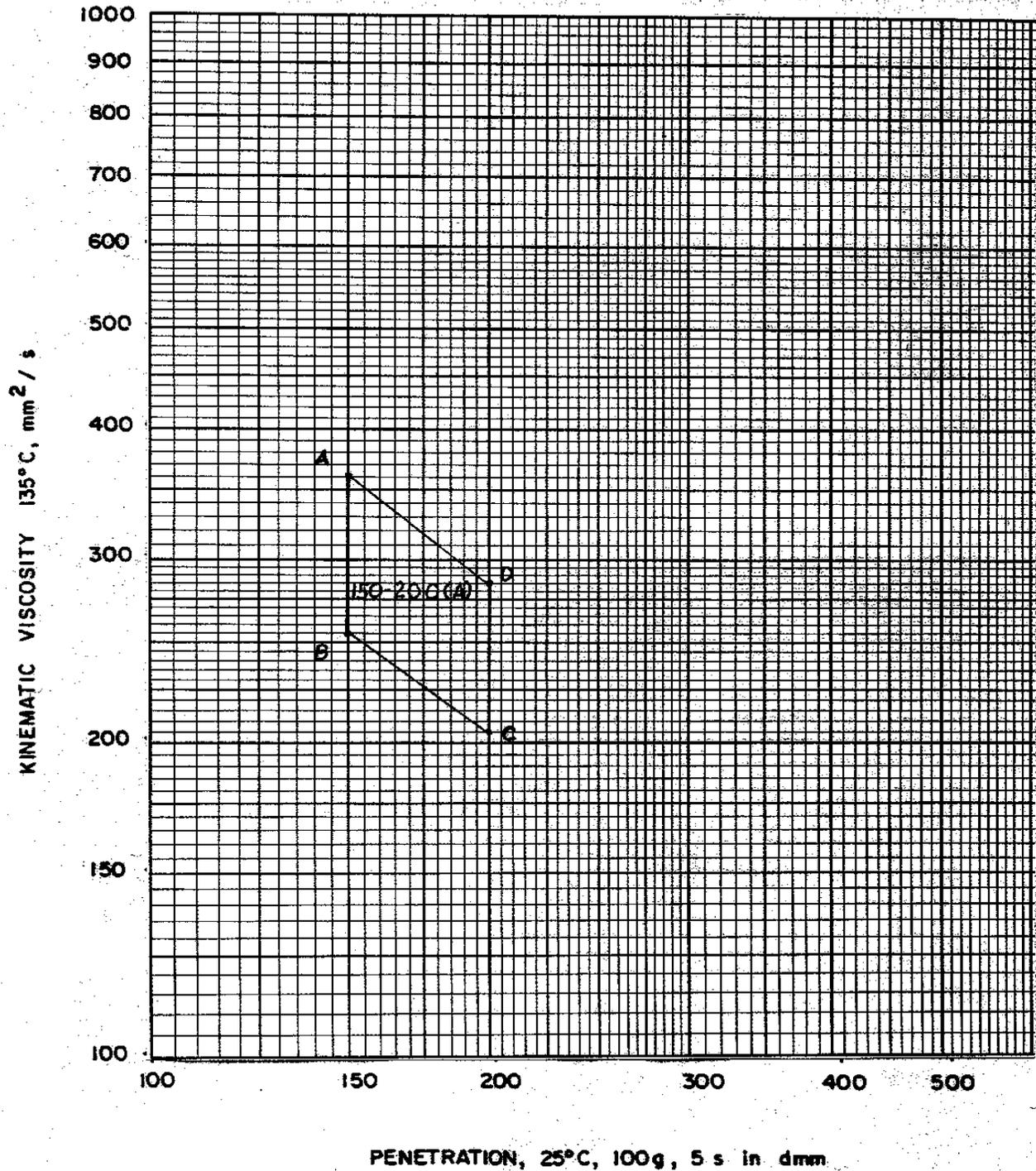


FIGURE CW 3410.2-R5

SPECIFICATIONS FOR 150-200(A) GRADE ASPHALT CEMENT  
KINEMATIC VISCOSITY VS. PENETRATION



## 5.5 Incidental Materials

### 5.5.1 Prime Coat

Prime coat shall consist of either an emulsified or cutback asphalt. Selection shall be based upon existing field conditions and shall be subject to the approval of the Contract Administrator. Method of application shall conform to manufacturer's recommendations.

### 5.5.2 Tack Coat

Tack coat shall consist of either an emulsified or cutback asphalt. Selection shall be based upon existing field conditions and shall be subject to the approval of the Contract Administrator. Method of application shall conform to manufacturer's recommendations.

### 5.5.3 Miscellaneous Materials

Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

### 5.5.4 Reclaimed Asphalt Pavement

Reclaimed asphalt pavement (RAP) shall be processed hot mix asphaltic concrete material recovered from planing or full depth removal.

The reclaimed asphalt pavement material shall consist of sound durable particles produced by crushing and screening.

### 5.5.5 Recycled Asphalt Shingles

Blending of recycled asphalt shingles (RAS) material shall be during production of the asphalt and the mix produced shall consist of a uniform blend of all materials.

## 6. DESIGN REQUIREMENTS FOR ASPHALTIC CONCRETE PAVING MIX

### 6.1 Mix Design Statement

For each type of asphaltic paving mix to be used, the Contractor shall provide the Contract Administrator with a Mix Design Statement certifying the constituent materials and mix proportions that will be used in the asphaltic concrete paving mix. The Contractor shall also supply reasonable evidence to the Contract Administrator that the mix proportions selected will produce asphaltic concrete conforming to the requirements specified in Sections 6.2, 6.3 and 6.4 of this Specification.

One (1) week prior to the start of paving the Contractor shall provide the Contract Administrator with the results of three (3) separate sets of Marshall Tests to show that the requirements of the mix design statement have been met. Where a correction of the mix design statement is necessary to reflect actual production, the Contractor will submit to the Contract Administrator a minimum of five (5) separate sets of Marshall test results for approval of the corrected mix design statement. This mix design statement, or revised mix design statement, as necessary, will be called the Job Mix Formula.

Should a change occur in the Job Mix Formula during the course of the work, the Contractor shall re-submit to the Contract Administrator a minimum of five (5) separate sets of Marshall test results to support approval of the revision.

Should a lengthy break occur in the paving operation, the Contract Administrator may request that the Contractor submit the results of three (3) recent, separate sets of Marshall test results as evidence that the Job Mix Formula is being achieved.

No changes in the Job Mix Formula will be permitted without following the above procedure.

**6.2 Aggregate Gradation Requirements**

For each type of paving mixture, the mineral constituents shall be combined in such proportions so as to fall within the Gradation Limits shown in Table 1 - CW 3410-R5.1, unless the Contractor can conclusively show to the Contract Administrator that he can meet the physical requirements specified in Section 6.4 only by deviating from these gradation limits.

**6.3 Allowable Deviation from Job Mix Formula**

**6.3.1 Aggregate Gradation**

The aggregate gradation of the asphaltic concrete supplied by the Contractor shall not deviate from that of the Job Mix Formula by more than the Allowable Deviations shown hereafter and shall fall within the gradation limits shown in Clause 2.04 Table 1 - CW 3410-R5.1.

<b>MAXIMUM ALLOWABLE DEVIATION FROM JOB MIX FORMULA</b>	
<b>CANADIAN METRIC SIEVE SIZE</b>	<b>PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE</b>
10 000	± 5%
5 000	± 5%
2 500	± 4%
1 250	± 4%
630	± 4%
315	± 4%
160	± 2%
80	± 2%

**6.3.2 Asphalt Cement Content**

The asphalt cement content of the asphaltic concrete supplied by the Contractor shall not deviate from that of the Job Mix Formula by more than ± 0.4%, provided that the asphalt cement content requirements are maintained in accordance with Table 2 - CW 3410-R5.2 of this Specification.

**6.4 Physical Requirements**

For each type of paving mixture, the asphaltic concrete paving mix shall conform to the physical requirements shown in Table 2 - CW 3410-R5.2.

**6.5 Method of Testing**

The aggregate gradation and physical properties of asphaltic concrete paving mix shall be determined in accordance with the requirements of Sections 10.4 and 10.5 of this Specification.

#### **6.6 Reclaimed Asphalt Pavement Content**

Reclaimed asphalt pavement (RAP) material may be incorporated to a maximum of 10% by mass of total mix into the Type 1A mix design for asphalt pavements and overlays.

Blending of the reclaimed asphalt pavement material shall be during production and the mix produced shall consist of a uniform blend of all materials.

A mix design statement in accordance with section 6.1 shall be submitted to the Contract Administrator for approval.

All physical requirements and combined aggregate gradation limits shall meet the requirements of Table 1 – CW 3410-R5.1 and Table 2 – CW 3410-R5.2.

#### **6.7 Recycled Asphalt Shingles**

RAS material shall consist of sound durable particles produced from recovered organic asphalt shingles, asphalt caps and asphalt rolled roofing. Fiberglass shingles are not allowed.

Recycled asphalt shingles (RAS) material shall be incorporated to a maximum 3% by weight of the total mix into Type 1A mix design asphalt.

RAS particles shall be a maximum size of 10mm and otherwise shall meet the grading limits in Table 3410-R5.1 and physical requirements in Table 3410-R5.2.

RAS shall be free of chemical contaminants. Deleterious substances shall be a maximum of 3% of RAS by weight. Deleterious substances include fiberglass shingles, metal, glass, rubber, nails, soil, brick, tars and asbestos.

A mix design statement in accordance with section 6.1 shall be submitted to the Contract Administrator for approval.

### **7. SUPPLY OF ASPHALTIC CONCRETE PAVING MIX**

#### **7.1 Mixing Plant**

The asphaltic concrete paving mix shall be supplied from an approved mixing plant. The mixing plant shall be a batch mix plant, a continuous mix plant or a drum mix plant, conforming to the requirements of ASTM Standard D995, Specifications for Requirements for Mix Plants for Hot-Mixed, Hot-Laid, Bituminous Paving Mixtures.

Table 1  
CW 3410-R5.1

COMBINED AGGREGATE GRADATION LIMITS				
Percent of Total Dry Weight Passing Each Sieve				
Canadian Metric Sieve Size	Type 1A (Surface Course) %	Type I (Surface Course) %	Type II (Surface Course) %	Type III (Base Course) %
40 000				100%
25 000	99% to 100%	100%		90% to 100%
16 000	--	--		60% to 90%
12 500			100%	56% to 80%
10 000	70% to 88%	70% to 85%		--
5 000	55% to 70%	45% to 70%	90% to 95%	29% to 59%
2 500	40% to 60%	25% to 55%	74% to 80%	20% to 50%
1 250	25% to 50%	20% to 40%	55% to 64%	--
630	15% to 40%	15% to 30%	35% to 46%	15% to 30%
315	5% to 28%	5% to 20%	22% to 30%	5% to 17%
160	4% to 11%	--	--	--
80	3% to 7%	3% to 6%	8% to 11%	1% to 7%
Crush Count: (Clause 5.4.1 (b) (iii))	60% min. (2 fractured faces)	50% min. (1 fractured face)	--	60% min. (2 fractured faces)

Table 2  
CW 3410-R5.2

PHYSICAL REQUIREMENTS	
	Type III (Base Course) %
Asphalt Cement, % total sample weight	4.0% to 5.5%
Voids in Mineral Aggregate, VMA	12.0% min.
Air Voids	2.5% to 5.0%
Marshall Stability, kN at 60°C	5 min.
Flow Index, units of 250 µm	6.0 to 16.0

## **7.2 Batch Mix and Continuous Mix Plant Operations**

### **7.2.1 Aggregate Storage**

The different sizes of aggregate used shall be kept separate and adequate provision shall be made to keep them from becoming mixed or otherwise contaminated.

### **7.2.2 Preparation of Asphalt Cement**

The asphalt cement shall be heated at the paving plant to a temperature of 135°C to 160°C before mixing with the aggregates. The temperature of the asphalt cement and aggregates immediately prior to mixing shall be approximately that of the completed batch. In no case shall the temperature of the asphalt and aggregates differ by more than 15°C when placed in the pug mill. The penetration of the asphalt cement shall be maintained within the limits of penetration specified.

### **7.2.3 Preparation of Mineral Aggregate**

The coarse and fine aggregate shall be fed by feeders to the cold elevators in their proper proportions and at a rate to permit correct and uniform temperature control of the heating and drying operation. The aggregates shall be dried and delivered to the mixer at a temperature between 135°C and 160°C. The temperature between these limits shall be regulated according to the penetration grade of the asphalt, temperature of the atmosphere and workability of the mixture, but shall be as low as possible consistent with proper mixing and laying. Immediately after heating, the aggregates shall be screened into bins with separation on such coarse sieves as the number of bins permits. All aggregates in the bins that contain sufficient moisture to cause foaming in the mixture shall be removed and replaced in their respective stockpiles.

### **7.2.4 Preparation of Asphaltic Concrete Paving Mix**

Each size of hot aggregate and the asphalt cement shall be measured separately and accurately to the proportions in which they are to be mixed. When the mixture is prepared in a twin pug mixer, the volume of mineral aggregate and asphalt cement shall not be so great as to extend above the tips of the mixer blades when these blades are in a vertical position. For batch mixing, the aggregates shall be mixed dry for a period of not less than 15 seconds, after which the asphalt cement shall be added and the mixing continued for a period of at least 30 seconds or longer if necessary to produce a uniform homogeneous mixture in which all particles of the mineral aggregate are thoroughly and uniformly coated. For continuous mixing, the total mixing time shall be not less than 45 seconds when calculated by the formula in Section 4.4 of ASTM Standard D995 or longer if necessary to produce a homogeneous mixture.

### **7.2.5 Mixing Plant Inspection**

The Contract Administrator shall have access at any time to all parts of the mixing plant in order to ensure the manufacture of the mixture in strict accordance with this Specification.

## **7.3 Drum Mix Plant Operations**

Drum mix plants, as approved by the Contract Administrator, shall conform to the requirements of Section 5.4 of Manitoba Highways and Transportation Specification Number 800 for Bituminous Pavement.

**7.4 Transportation of Asphaltic Concrete Paving Mix**

The mixture shall be transported from the mixing plant to the work in tight vehicles with metal bottoms previously cleaned of all foreign materials. The Contractor shall ensure that the vehicles are suitably insulated, as required. Each vehicle shall be equipped with a tarpaulin or other suitable covering material of sufficient size to overhang the truck box on three sides when the vehicle is fully loaded. Such tarpaulins shall be on the truck at all times and shall be used to cover the mixture completely as directed by the Contract Administrator. The inside surface of all vehicles used for hauling mixture may be lightly lubricated with thin fuel oil, paraffin oil, lime water or soap solution just before loading, but an excess of lubricant will not be permitted. No loads of mixture shall be dispatched from the plant after sunset or during hours of darkness unless loads can be placed and compacted in accordance with this Specification and suitable artificial illumination is provided, all of which shall be subject to approval of the Contract Administrator. In no case shall temperatures be increased above 165°C at the plant to offset long distance hauling.

**8. EQUIPMENT**

All equipment shall be of a type approved by the Contract Administrator. The equipment shall be in good working condition and shall be so maintained for the duration of the Contract.

**9. CONSTRUCTION METHODS****9.1 Base Preparation****9.1.1 Preparation of Base for Asphaltic Concrete Pavement**

The placing of the asphaltic concrete paving mixture shall not commence until the construction of the sub-grade, sub-base and base course has been completed in accordance with the requirements of Specification CW 3110, and the installation of pavement and boulevard structures and appurtenances has been completed to the satisfaction of the Contract Administrator.

**9.1.2 Preparation of Existing Pavement for Asphaltic Concrete Overlay****(a) Existing Asphaltic Concrete Surface**

A layer of the existing asphaltic concrete surface course shall be removed to such depth as is specified on the Drawings or as directed by the Contract Administrator. This work will be done and paid for in accordance with Specification CW 3450.

If the existing asphaltic concrete overlay is removed down to the existing Portland cement concrete pavement, the preparation of existing Portland cement concrete pavement for asphaltic concrete overlay shall be in accordance with Section 9.1.2 (b) of this Specification.

If the surface remaining after the removal of the specified layer of asphaltic concrete surface course is asphaltic concrete, the Contractor shall proceed to fill any remaining holes and depressions with asphaltic concrete paving mixture and compact said areas with a steel wheel roller. The asphaltic concrete surface upon which the asphaltic concrete overlay is to be placed shall be as true to grade and cross-section as possible, as approved by the Contract Administrator. At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall make adjustment to existing structures and appurtenances, reconstruct sections of curb, seal all cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the curb renewal, crack sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

**(b) Existing Portland Cement Concrete Pavement**

At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall make adjustments to the existing structures and appurtenances, reconstruct sections of concrete pavement, reconstruct sections of curb, seal all joints and cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the pavement reconstruction, curb renewal, joint and crack sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

**9.2 Placing Asphaltic Concrete Paving Mixture**

The Contract Administrator shall approve the surface upon which new asphaltic concrete paving mix is to be placed before the paving operations for that course may begin.

The first course shall be laid upon a surface which is dry, clean and free from standing water, and only when weather conditions are suitable. The cleaning operation shall be done with a mechanical street sweeper.

In the case of placing new asphaltic concrete pavement, the base course shall have been previously prepared with one uniform application of Prime Coat prior to the delivery of the asphaltic concrete paving mixture.

In the case of asphaltic concrete overlay, the existing pavement surface shall have been previously prepared with one uniform application of Tack Coat prior to the delivery of the asphaltic concrete paving mixture. The Tack Coat shall be applied in small quantities only sufficient to wet the pavement surface on which the overlay is to be placed.

The type and amount of Prime Coat/Tack Coat applied, and the method of application, shall be as recommended by the manufacturer and shall be subject to the approval of the Contract Administrator.

No paving course shall be started until any frost or moisture from previous inclement weather has evaporated to leave a dry surface. The surface course shall be laid only under such conditions that the Contract Administrator determines to be conducive to obtaining the specified results.

The mixture shall be delivered to the job and placed at a temperature optimum for proper compaction, taking into consideration the weather conditions, the temperature of the surface on which the mixture is to be placed, and the thickness of the lift. In no case shall the mixture be placed at a temperature of less than 125°C nor greater than 155°C.

Unless otherwise permitted by the Contract Administrator, the mixture shall be spread by means of a mechanical self-powered paver capable of spreading the mixture true to the line, grade and crown required.

Pavers shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. The mixture shall be dumped in the centre of the hoppers and care exercised to avoid overloading and slopping over of the mixture upon the base. When laying the mixture, pavers shall operate so as to provide as continuous an operation as possible at a speed of between three metres and six metres per minute as may be decided by the Contract Administrator. They shall be equipped with a quick and efficient steering device and shall have forward and reverse travelling speeds of not less than 30 metres per minute.

Pavers shall be capable of spreading the mixture, without segregation, in thicknesses of not less than 25 mm and not more than 75 mm. Placement widths shall vary from a minimum of 1.5 metres to a maximum of 4.5 metres unless approved by the Contract Administrator. They shall be equipped with blending or joint leveling devices for smoothing and adjusting all longitudinal joints between strips or courses of the same thickness. Pavers shall be equipped with screeds.

The term screed includes any strike-off device operated by cutting, crowding or other practical action which is effective on the mixtures at workable temperature without tearing, shoving or gouging the finished surface.

Where the thickness of the mixture exceeds 75 mm, the mixture shall be placed in two layers. The leveling course, shall be placed such that the final layer or surface course is of uniform thickness and of minimum thickness of 40 mm. Asphalt material shall be removed from curb inlet grates to ensure a minimum 100 mm vertical opening in the curb inlet grate.

### **9.3 Main Line Paving, Tie-Ins and Approaches**

#### **9.3.1 Main Line Paving**

Main line paving shall include the placement of leveling and surface courses for pavements and overlays utilizing mechanical pavers with automatic grade control for; all through and parallel turning lanes greater than 15.0 metres in length, intersections through which the main line continues, and other lanes greater than 15.0 metres in length. Main line paving also includes major and minor intersecting side streets through and turning lanes over 15.0 metres in length.

Main line paving with mechanical pavers shall utilize automatic grade control, except for; intersections through which the main line continues where side street traffic must be maintained, and the side of the paver adjacent to active traffic.

Asphalt materials placed by mechanical pavers shall be placed in accordance with Section 9.2 of this specification.

Hand placed asphalt materials shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator. The Contractor shall ensure that the amount of material delivered to the site is placed within the placement temperatures.

#### **9.3.2 Tie-Ins and Approaches**

Tie-Ins and Approaches shall include the placement of leveling and surface courses for pavements and overlays for all areas other than main line paving lanes. This includes intersecting side streets to the main road under construction except as noted in Section 9.3.1 of this specification, intersection turnouts, right turn cut-offs, median openings, and private approaches. Tie-ins include miscellaneous asphalt for temporary ramping, sidewalk in-fill and isolations.

Tie-Ins and approaches shall utilize mechanical pavers where possible with or without automatic grade control, or hand methods as approved by the Contract Administrator.

Asphalt materials placed by mechanical pavers shall be placed in accordance with Clause 9.2 of this specification.

Hand placed asphalt materials shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator. The Contractor shall ensure that the amount of material delivered to the site is placed within the placement temperatures.

### **9.4 Asphalt Patching**

Remove and replace existing asphalt pavements adjacent to proposed or renewed sidewalks and concrete approaches for grade adjustment to ensure drainage and rideability are maintained. Areas to be considered as asphalt patches shall be less than 1.5 metres in width. The locations requiring asphalt patching shall be shown on the Drawings or as directed by the Contract Administrator.

The Contractor shall saw cut the asphalt pavement full-depth along the limits designated. The asphalt pavement shall be removed and disposed of in accordance with CW 3110. Upon removal of asphalt,

the existing base materials shall be levelled and compacted. The Contractor shall place and compact base course material as required to a maximum thickness of 50 mm. The asphalt shall be Type 1A material and match the thickness of the existing pavement. The material shall be placed and compacted by hand methods in accordance with Clause 9.3 of this specification to the satisfaction of the Contract Administrator.

Any additional excavation or base work shall be paid for in accordance with CW 3110.

All costs incurred for asphalt removal, compaction of existing base materials and placement of base course and asphalt materials shall be included in the unit price for "Construction of Asphalt Patches".

## 9.5 **Joints**

Joints shall be constructed in a careful and workmanlike manner by experienced and competent personnel. Joints shall be smooth, well bonded and tightly sealed. Joints shall conform smoothly and accurately to adjacent pavement surfaces such that when tested with a 3 metre straight edge placed across the joint the distance between the straight edge and the surface of the pavement shall not exceed 5 mm at any point.

Longitudinal joints shall be made true to line and parallel to the pavement edge wherever practicable.

On straight sections the joint line shall not deviate from a straight line by more than 75 mm at any point. On curved or tapered sections the joint shall be shaped so as to be as smooth as possible. Jagged, stepped or wandering edges shall be reshaped to a smooth line, to the satisfaction of the Contract Administrator, before the adjacent mat is laid.

### 9.5.1 **Location of Joints**

The location of joints shall be subject to the approval of the Contract Administrator and in addition shall conform to the following requirements:

#### **(a) Longitudinal Joints**

Longitudinal joints shall not be located within 150 mm of a longitudinal joint in any underlying pavement structure.

#### **(b) Transverse Joints**

Transverse joints shall not be located within 2 m of any other transverse joint in the same paving course or within 1 m of a transverse joint in any underlying pavement structure.

**Note:** Longitudinal cold joints are to be avoided wherever possible. To facilitate this:

- i. Transverse joints shall be established with sufficient frequency to allow the full width of the paving course to be placed in a single shift.
- ii. No paving lane shall progress more than 500 m beyond the end of an adjacent paving lane in the same course without the prior approval of the Contract Administrator.

### 9.5.2 Preparation of Joints

#### (a) Hot Joints

Hot joints shall be considered to be those longitudinal joints between successive mats in which the previously laid mat retains sufficient heat to facilitate good bonding and sealing of the joint. The edge of the previously laid mat shall be inspected prior to laying the new mat. Any areas not conforming to line and grade or having a rounded-off top corner shall be cut out to the full depth of the mat to a minimum width of 100 mm and replaced with fresh material and compacted when laying the new mat.

#### (b) Cold Joints

Cold joints shall be considered to be those longitudinal and transverse joints where the existing pavement mat is at or near ambient temperatures and shall include joints against pavement mats laid on previous days and joints against existing pavement structures. Transverse joints shall be cut back to a straight line for the full depth and width of the mat. The transverse joint shall be cut back to a location such that the pavement immediately before the joint, where checked with a 3 m straight edge, exhibits no tapering or rounding down.

Longitudinal edges of existing mats shall be inspected before laying the new mat. Any areas not conforming to line and grade shall be cut out full depth to a minimum width of 150 mm and replaced with fresh material and compacted when laying the new mat. Any areas with a rounded off top corner shall be cut back to the full depth of the mat to form a vertical face with a square top corner.

Joints against existing asphaltic concrete pavements shall be prepared by saw cutting, cold planing or other method(s) approved by the Contract Administrator, such that the face of the existing pavement is vertical with a square top corner.

All contact surfaces of cold joints shall be painted with a thin uniform coat of tack before the new asphaltic concrete is placed against them.

### 9.5.3 Construction of Joints

Fresh asphaltic concrete shall not be placed against the existing mat until the joint preparation has been completed in accordance with 9.5.2 and is approved by the Contract Administrator. Immediately after placing and before initial rolling the joint shall be checked and "set-up" by experienced and competent personnel so that an absolute minimum of back patching is required after rolling.

The fresh mat shall be laid to an elevation such that, when compacted, it will conform accurately to the grade of the existing pavement. Wherever practicable, this shall be done using mechanical pavers equipped with suitable automatic joints matching controls.

Joints shall always be rolled before the remainder of the mat. Wherever practicable the joint shall be rolled with the roller travelling parallel to the joint and with a minimum of seventy-five (75%) percent of the width of the main roller(s) supported on the existing mat. After the first pass of the roller the joint shall be checked and corrected if necessary before any additional rolling is done.

### 9.6 Compaction of Asphaltic Concrete Paving Mixture

Compaction of the mixture shall be obtained by the methods specified hereinafter.

A rolling pattern shall be established by the Contractor and approved by the Contract Administrator. The Contract Administrator must approve any deviation from the rolling pattern.

**9.6.1 Static Rolling**

A minimum of two approved rollers will be required on every contract. When the output of the mixing plant exceeds 70 tonnes per hour an extra roller will be required for each additional 35 tonnes of mix produced per hour.

The speed of the roller shall not exceed five kilometres per hour and shall at all times be slow enough to avoid displacement of the hot mixture. Any displacements occurring as a result of reversing the direction of the roller or from any other cause shall at once be corrected. Rolling shall proceed continuously until all roller marks are eliminated and no further compression is possible. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened by the use of water, limewater, or approved detergent. An excess of moisture will not be permitted.

Compaction of the paving mixture shall consist of three (3) separate rolling operations as follows:

**(a) Breakdown Rolling**

Breakdown rolling with a tandem steel wheel roller weighing between seven and nine tonnes shall commence as soon as possible after the mixture has been spread without causing undue checking and displacement of the mixture. Delays in rolling freshly spread mixture will not be tolerated. Rolling shall start longitudinally at the sides and proceed toward the centre of the pavement overlapping on successive trips by at least 150 mm. Breakdown rolling shall consist of at least two complete coverages by the roller.

**(b) Intermediate Rolling**

The intermediate rolling shall be performed with a self-propelled pneumatic-tired roller having a minimum wheel load of 1100 kilograms and minimum tire pressure of 450 kPa. Intermediate rolling shall begin while the mix is still of a temperature that will result in the maximum density from this operation.

**(c) Final Rolling**

The final rolling shall be performed with a tandem steel wheel roller weighing not less than nine (9) tonnes, and shall be undertaken while the paving mixture is still warm enough for the removal of roller marks. Where the width permits, the pavement shall be subjected to diagonal rolling in two directions, the second diagonal rolling crossing the lines of the first. Final rolling shall be carried on until there is no further evidence of consolidation.

**9.6.2 Vibratory Rolling**

Vibratory rollers shall be of a type designed for asphalt finish rolling. They shall provide for the adjustment of both amplitude and frequency of vibration, and shall be equipped with an automatic device that positively prevents the drum from vibrating unless the roller is moving.

The optimum combination of amplitude, vibration frequency and roller speed shall be determined by the Contractor and approved by the Contract Administrator except that the maximum rolling speed in m/min. shall not exceed the vibration frequency per minute divided by 40.

$$\text{Maximum rolling speed (m/min.)} = \frac{\text{vibration frequency (VPM)}}{40}$$

Where vibratory rollers are used, the rolling pattern shall in all cases include at least one complete coverage in the static mode as the final rolling pass.

### 9.6.3 **Compaction of Areas Inaccessible to Rollers**

Along curbs, manholes and similar structures and at all places not accessible to the roller, thorough compaction must be secured by means of hot tampers and at all contacts of this character the joints between these structures and the mixture must be effectively sealed.

### 9.7 **Requirements After Final Rolling**

After final rolling the surface of each course shall be smooth and true to the established crown and grade. Any low or defective spots shall immediately be remedied by cutting out the course, or planing to a depth of 40 mm, at such spots and replacing it with a fresh hot mixture that shall be immediately compacted to conform with the surrounding area and shall be thoroughly bonded to it. The surface of the finished pavement shall be free from depressions exceeding 5 mm as measured with a three (3) metre straight edge.

The measured in-place density of the completed course shall be an average of ninety-seven (97%) percent of the 75 Blow Marshall Density of the paving mixture, with no individual test being less than ninety-five (95%) percent.

### 9.8 **Opening to Traffic**

In no case shall traffic or construction equipment be allowed on the asphaltic concrete pavement until completion of quality control testing by the Contract Administrator and until the completed pavement has cooled to atmospheric temperature or to such other temperature, as may be approved by the Contract Administrator, that will ensure no deformation of the pavement surface under traffic loading.

The Contract Administrator's decision as to when the pavement will be opened to traffic shall be final.

## 10. **QUALITY CONTROL**

### 10.1 **Inspection**

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance to the requirements of this Specification.

### 10.2 **Access**

The Contract Administrator shall be afforded full access for the inspection and control testing of asphaltic concrete paving mixture and constituent materials, both at the site of work and at any plant used for the production of asphaltic concrete paving mixture, to determine whether the mixture is being supplied in accordance with this Specification.

### 10.3 **Materials**

All materials supplied under this Specification shall be subject to testing and approval by the Contract Administrator in accordance with Section 5.3 of this Specification.

### 10.4 **Quality of Asphaltic Concrete Paving Mixture**

Quality control tests will be used to determine the acceptability of the asphaltic concrete paving mixture supplied by the Contractor. The latest revisions of the test methods at the time of testing

shall be used.

The Contract Administrator shall obtain samples of asphaltic concrete paving mixture and of the constituent materials required for quality control tests. The Contractor shall make no charge for these materials.

An outline of some of the quality control tests that will be used to check the physical properties of the mixture, and to check the properties, gradations and proportions of the constituent materials is as follows:

Samples of mineral aggregates shall be taken in accordance with ASTM Standard D75, Standard Methods of Sampling Aggregates.

Samples of asphaltic concrete paving mixtures shall be taken in accordance with ASTM Standard D979, Standard Methods of Sampling Bituminous Paving Mixtures.

The determination of the particle size distribution of aggregates shall be made in accordance with ASTM Standard C136, Standard Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.

The specific gravity of aggregates shall be determined in accordance with ASTM Standard C127, Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate, and ASTM Standard C128, Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate.

The determination of the percent of asphalt cement in asphaltic concrete paving mixtures and pavement specimens shall be made in accordance with ASTM D2172, Standard Methods of Test of Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.

The percent air voids, the percent voids in the mineral aggregate, the Marshall density, Marshall stability and flow index shall be determined in accordance with the Standard Marshall Procedure (75 Blows) and in accordance with ASTM Standard D1559, Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures using Marshall Apparatus.

#### **10.5 Quality of Asphaltic Concrete Pavement**

Quality control tests will be used to determine the acceptability of the compacted asphaltic concrete pavement, as placed and compacted by the Contractor. The latest revisions of the test methods at the time of testing shall be used.

Pavement specimens will be taken from each compacted pavement course by the Contract Administrator and the holes made by the removal of said specimens shall be carefully filled by the contractor with the approved asphaltic concrete paving mixture and thoroughly compacted, so as to conform in every way with the adjoining undisturbed pavement.

**10.6 Quality Assurance**

The Contract Administrator shall ensure the frequency and number of quality assurance tests for each type of asphalt as follows:

1. Marshall test:  
A minimum of 1 test for every 300 tonnes of production.
2. Densometer Density test:  
Frequency of tests below shall be per type of asphalt and per lift of asphalt:

Production < 500t: A minimum of one field density test for every 50m per lane with a minimum of three (3) tests per site visit by the test lab.

Production ≥ 500t: A minimum of one field density test for every 100m per lane.

3. Core Sample for thickness and density:  
For all production quantities per day below: A minimum of 3 core samples shall be sufficient for the entire contract if the type of asphalt produced, remains unchanged and production continues from day to day.

Frequency of tests below shall be per type of asphalt and per lift of asphalt:

Production <500t: A minimum of 3 core samples per day.

Production ≥500t: One core sample for every 400m per lane with a minimum of 3 core samples per day.

Additional number and frequency of testing shall be determined by the Contract Administrator.

Copies of test results shall be sent to the Research and Standards Engineer at the Public Works Department and to the Contract Administrator in a timely manner.

An outline of the quality assurance tests that will be used to check the compaction of the completed asphaltic concrete pavement is as follows:

In-place density determinations shall be made in accordance with ASTM Standard D2950, Standard Method of Test for Density of Bituminous Concrete in Place by Nuclear Method.

Density determinations on pavement specimens shall be made in accordance with ASTM Standard D2726, Standard Method of Test for Bulk Specific Gravity of Compacted Bituminous Mixtures using Saturated Surface-Dry Specimens.

**10.7 Corrective Action**

The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

**12. METHOD OF MEASUREMENT**

As a requirement of this Specification the Contractor, at his own expense, shall provide, install and operate a weigh scale convenient to the mixing plant and of such capacity as to accurately weigh any single loaded truck leaving the plant. The scale shall be tested by the proper authority at the Contractor's expense prior to any paving mix being weighed on said scale and the customary certificate shall be exhibited to the Contract Administrator upon request. Whenever considered

necessary by the Contract Administrator, the scale shall be re-tested at the Contractor's expense.

#### **12.1 Construction of Asphaltic Concrete Pavement**

Construction of asphaltic concrete pavement will be measured on a weight basis. The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

#### **12.2 Construction of Asphaltic Concrete Overlay**

Construction of asphaltic concrete overlay will be measured on a weight basis. The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

#### **12.3 Construction of Asphaltic Concrete Base Course**

Construction of asphaltic concrete base course will be measured on a weight basis. The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

#### **12.4 Construction of Asphalt Patches**

Construction of asphalt patches will be measured on an area basis. The area to be paid for shall be the total number of square metres removed and placed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

### **13. BASIS OF PAYMENT**

#### **13.1 Construction of Asphaltic Concrete Pavement**

Construction of asphaltic concrete pavement will be paid for at the Contract Unit Price per tonne for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

##### **Items of Work:**

Construction of Asphaltic Concrete Pavement

- i) Main Line Paving (\*)
- ii) Tie-ins and Approaches (\*)

\* Specify either Type I, Type IA, or Type II

#### **13.2 Construction of Asphaltic Concrete Overlay**

Construction of asphaltic concrete overlay will be paid for at the Contract Unit Price per tonne for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

##### **Items of Work**

Construction of Asphaltic Concrete Overlay

- i) Main Line Paving (\*)
- ii) Tie-ins and Approaches (\*)

\* Specify either Type I, Type IA, or Type II

**13.3 Construction of Asphaltic Concrete Base Course**

Construction of asphaltic concrete base course will be paid for at the Contract Unit Price per tonne for "Construction of Asphaltic Concrete Base Course (Type III)", measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

**13.4 Construction of Asphalt Patches**

Construction of asphalt patches will be paid for at the Contract Unit Price per square metre for "Construction of Asphalt Patches", measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.