INDEX FOR
MATERIAL SPECIFICATION FOR AGGREGATE – BITUMINOUS PAVEMENT

MATERIAL SPECIFICATION FOR AGGREGATE - BITUMINOUS PAVEMENT

921. 1 SCOPE

This Specification covers all operations necessary for and pertaining to the production and supply of aggregate for hot mixed Bituminous Pavement.

921. 2 DEFINITIONS

Appeals: Request from Contractor for retesting of material property or attribute for the purpose of resolving disagreement on acceptance test results and pay adjustments.

Asphalt Cement Content: The quantity of asphalt cement in the mix, expressed as a percentage of total weight of Bituminous Mix.

Bituminous Mix: Plant produced hot mixture of aggregate, asphalt cement and any other approved additives.

Bituminous Pavement: Bituminous Mix placed and compacted in-place.

Deleterious Material: Material that can affect the performance of the structure and/or prevent binder-aggregate bond or cause degrading.

Job Mix Formula (JMF): The aggregate proportions, combined aggregate gradation, asphalt cement content, VMA additives content (if any), mineral filler content (if any) and the volumetric properties of a Bituminous Mix, proposed by the Contractor and accepted by the Contract Administrator, to be used for the production of a hot mixed Bituminous Mix.

Lot: One (1) day's scheduled plant Bituminous Mix production of at least 1,800 tonnes where no changes have occurred to the accepted Job Mix Formula. If one day's plant production of Bituminous Mix is less than 1,800 tonnes, it will be combined with the previous or subsequent Lot at the discretion of the Contract Administrator.

Physical Property: Inherent attribute or feature of an aggregate material.

Quality Assurance: Testing and inspection performed by the Contract Administrator to monitor the properties of the materials delivered to the project and the quality of placement and workmanship.

Quality Control: Testing and inspection performed by the Contractor to monitor the properties of the materials produced and incorporated into the Work and the quality of placement and workmanship.

Reclaimed Asphalt Pavement (RAP): Bituminous Pavement that has been removed and processed for the purpose of recycling in a new hot mixed Bituminous Mix or reuse.

Reject: Unacceptable material for use in the project, and/or unacceptable quality of placement or workmanship.

921. 3 MATERIALS

3.1 General

Aggregate for Bituminous Pavement shall meet the requirements of the Specification for the Bituminous Mix type specified in the Contract.

Aggregate shall consist of sound and durable particles of crushed rock, gravel, stone, sand and fines free from injurious quantities of sod, roots, clay lumps and friable particles, organics or other Deleterious Materials.

3.2 Aggregate Requirements

3.2.1 Marshall Mixes

Table 3.1 Combined Gradation and Source Properties Requirements for Marshall Mixes

Passing Sieve Size		Class “B”	
Metric, mm	Imperial	Lower Limit	Upper Limit
19.0	3/4"	100	100
16.0	5/8"	90	100
12.5	1/2"	75	95
9.5	3/8"	70	90
4.75	#4	55	70
2.00	#10	35	55
0.425	#40	17	32
0.180	#80	4	12
0.075	#200	3	7
Fractured Faces, Min. %		50	
Ironstone Content, Max. % (Note 1) Final Lift		11	
Lightweight Particles Content, Max. % (Note 2) Final Lift Other Lift		 3 7	
L.A. Abrasion Loss, Max. %		35	
Clay Lumps and Friable Particles Content, Max %		1	

Note 1: The ironstone content is the percentage of ironstone particles by weight of all particles retained on 4.75mm sieve.

Note 2: The lightweight particle content is the percentage of lightweight particles by weight of all particles retained on 4.75mm sieve.

3.2.2 Superpave Mixes

Table 3.2 Combined Gradation and Source Properties Requirements for Superpave Mixes

Passing Sieve Size		SP19		SP12.5		SP9.5		SP4.75	
Metric, mm	Imperial	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
25.0	1”	100	100						
19.0	3/4"	90	100	100	100				
12.5	1/2"	72	90	90	100	100	100	100	100
9.5	3/8"	60	81	76	90	90	100	95	100
4.75	#4	39	62	48	71	57	90	90	100
2.36	#8	23	49	28	58	32	67	55	74
1.18	#16	16	35	19	41	22	48	30	55
0.60	#30	11	25	13	30	14	34	21	39
0.30	#50	7	17	8	21	9	23	14	28
0.15	#100	4	13	4	15	5	17	10	20
0.075	#200	2	8	2	10	2	10	6	13
Ironstone Content. Max. % (Note 1)		11		11		11		11	
Lightweight Particles Content, Max. % (Note 2)		7		3		3		3	
L.A. Abrasion Loss, Max. %		35		35		35		35	
Clay Lumps and Friable Particles Content, Max %		1		1		1		1	

Note 1: The ironstone content is the percentage of ironstone particles by weight of all particles retained on 4.75mm sieve. .

Note 2: The lightweight particle content is the percentage of lightweight particles by weight of all particles retained on 4.75mm sieve.

Table 3.3 Consensus Property Requirements

Traffic Category (Note 1)	Combined Aggregate Retained on the 4.75mm Sieve		Combined Aggregate Passing the 4.75mm Sieve	
	Fractured Faces, % Minimum (Note 2)	Flat and Elongated Particles, % Maximum (Note 2)	Uncompacted Void Content of Fine Aggregate, % Minimum	Sand Equivalent, % Minimum (Note 4)
A	55	10	40	40
B	75	10	40 (Note 3)	40
C	85	10	45 (Note 5)	45
D	95	10	45 (Note 5)	45
E	**100**	**10**	**45**	**50**

Note 1: Traffic Category is based on the 20 years design traffic loading

"A" = <0.3 million ESALs

"B" = 0.3 to <3 million ESALs

"C" = 3 to <10 million ESALs

"D" = **10 to <30** million ESALs

"E" = ≥ 30 million ESALs

Note 2: Does not apply to SP4.75

Note 3: Uncompacted void content for SP4.75 mix for Class B traffic loading shall be a minimum of 45%

Note 4: Test results shall be based on combined aggregate, prior the addition of RAP

Note 5: Uncompacted void content of 43% is acceptable provided the bituminous mix type meets the Superpave mix requirements in the Construction Specification for Bituminous Pavement (No.801)

921. 4 QUALITY CONTROL

The Contractor shall meet the minimum requirements of the *Specification for Quality Control (No.110).*

921. 5 QUALITY ASSURANCE

5.1 General

The Contract Administrator will conduct Quality Assurance inspection, sampling and testing to ensure that aggregate used in the Work conform to the Contract.

Quality Assurance testing will be conducted on the samples of sufficient quantities from individual components, combined to the percentages stated in the mix design submission.

The Contract Administrator may test for any property, outlined in the Specification.

The Contractor will be provided with results from the completed tests.

Quality Assurance inspection, sampling and testing will be performed at no cost to the Contractor.

The inability of the Contract Administrator to provide Quality Assurance test results within any time frame provided in this Specification shall not relieve the Contractor of their obligation to remedy any defect.

5.2 Sampling

Sample sizes will be in accordance with Table 5.1

Table 5.1 Sample Sizes

Material	Minimum Mass, kg
Fine Aggregate	15
Coarse Aggregate	25
RAP	10
VMA Additive	10
Mineral Filler	2

The Contract Administrator will locate three (3) test sites in each Lot for Quality Assurance testing.

Samples will be collected from the plant site during the production of bituminous hot mix to represent each Lot of bituminous hot mix.

The Contractor shall obtain two (2) samples from each individual stockpiles, in the presence of the Contract Administrator, in accordance with *MEB P047 Sampling Aggregate Materials for Laboratory Testing*. One set of samples will be used for Quality Assurance and the other set will be reserved for the prospective Appeal testing.

5.3 Quality Assurance Testing

5.3.1 Reclaimed Asphalt Pavement (RAP)

RAP samples shall be tested to determine the asphalt cement content for the Bituminous Mix Unit Price adjustment as specified in the *Construction Specification for Bituminous Pavement (No. 801).*

Asphalt content will be determined as per *ASTM D 2172- Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.*

5.3.2 Physical (Source and Consensus) Properties

Each individual aggregate component of the mix will be blended to combine aggregate as per the submitted and approved Job Mix Formula (JMF) for physical (source and consensus) property testing. **Aggregate components will be combined in accordance with *MEB Standard P054 Preparation of Bituminous Aggregates for the Determination of Physical Properties***.

The physical properties will be tested following the standards as specified in Table 5.2.

Table 5.2 Testing for Physical Properties

Test	Standard
Lightweight Particles Content (Note 1)	**MEB P056**
Specific Gravity and Absorption (Note 2)	**MEB P055**
Ironstone Content	MEB C221
Clay Lumps and Friable Particles Content	ASTM C142
Los Angeles Abrasion Loss	ASTM C131
Fractured Faces	ASTM D5821
Sand Equivalent (Superpave Only)	ASTM D2419
Uncompact Void Content of Fine Aggregate (Superpave Only)	AASHTO T304
Flat and Elongated Particles (Superpave Only)	ASTM D4791

Note 1: The heavy liquid used in the test method shall consist of a solution of zinc chloride in water

Note 2: Specific gravity will be used to calculate Bituminous Mix volumetric properties.

921. 6 APPEALS

Appeals will be considered by the Contract Administrator if the Contractor can demonstrate that Quality Assurance test results are different from the Quality Control test results.

Quality Control test results for a Lot which are provided to the Contract Administrator subsequent to the Contractor`s receipt of the Quality Assurance test results for that Lot will not be considered for an Appeal.

The Contractor shall serve notice of Appeal to the Contract Administrator, in writing, within five (5) days of receipt of the applicable Quality Assurance test results. Samples collected and retained for Appeal testing will be discarded if notice of Appeal is not requested within the allotted time period.

The Contractor shall bear all costs of Appeal testing unless the new test results indicate an improvement to the unit price adjustment. The cost for Appeal testing will be based on the price that Manitoba pays its Service Provider for the Appeal test in question (including tax) plus 10% for administration. The Appeal testing Service Provider will be selected on the basis of competitively tendered lowest qualified price that is not in a conflict of interest with the Contractor or Manitoba.
Appeal testing will be done by a 3rd party laboratory retained by the Contract Administrator.

The Appeal test results shall replace the Appeals Quality Assurance test results and used to calculate the pay adjustment.

The Contract Administrator will not be responsible for any delays including but not limited to Contractor's downtime, or other costs as a results of the Appeal.

921. 7 ACCEPTANCE CRITERIA

The acceptance of the material will be based on the material characteristics from the Quality Assurance test results. Pay adjustment will apply if the physical properties (as applicable) of aggregate from the representative Lot do not meet all the requirements.

The deviation (absolute value) in each property from the specification limit will be calculated using the following formula:

$$Deviation\ from\ the\ Specification\ Limit\ , Dpp = |PPsl - PPlm|$$

Where:

PPsl = Specification Limit for each Physical Property, %

PPlm = Lot Mean value for each Physical Property which falls outside the specification limit, %

The Contract Administrator will accept the material into the Work at a reduced payment to the Unit Price for Bituminous Mix following Table 7.1. If the total pay adjustment due to deficiency in physical properties (excluding the gradation) exceeds 30%, the representative Lot of the Bituminous Mix will be rejected.

Where pay adjustments are made, deductions will be made as a lump sum separately from the Unit Price.

If the acceptance test results on a Lot fall in rejection, corrective actions apply.

Table 7.1 Pay Adjustment for Physical Properties

Unit Price Adjustment, $ per Tonne of Bituminous Mix including Asphalt Cement	= - 2 x (PRTBmix/100)	= - 5 x (PRTBmix/100)	= - 10 x (PRTBmix/100)	= - 25 x (PRTBmix/100)
Physical Properties	Deviation from the Specified Limit, Dpp (Absolute Value)			
Fractured Faces	≤ 3	4 to 6	7 to 10	> 10
Lightweight Particles Content	≤ 2	3 to 5	6 to 8	> 8
Clay Lumps and Friable Particles Content	≤1.0	1.1 to 2.0	2.1 to 3.0	> 3.0
Ironstone Content	≤ 3	4 to 6	7 to 9	> 9
Los Angeles Abrasion Loss	≤ 3	4 to 6	7 to 10	> 10
Sand Equivalent	≤ 1.4	1.5 to 3.4	3.5 to 5.0	> 5.0
Uncompact Void Content of Fine Aggregate	≤ 3	4 to 6	7 to 10	> 10
Flat and Elongated Particles	≤ 3	4 to 6	7 to 10	> 10

Where:

Dpp = Lot mean deviation in each physical property (absolute value)

PRTBmix = Price per tonne of Bituminous Mix including the actual percentage of asphalt cement added to the Bituminous Mix by the contractor, $

921. 8 CORRECTIVE ACTIONS

8.1 Unacceptable Aggregate and Repair Requirements

Each Lot of unacceptable (rejected) aggregate will be subjected to corrective actions.

All corrective actions shall be performed at the Contractor’s expense.

The following corrective actions are generally accepted:

- Remove material from the rejected Lot to its full depth of the rejected lift and replace with new material meeting the Specification requirements.

The Contractor shall not undertake any correction on any defective work prior to notifying the Contract Administrator.

All corrected areas shall meet the requirements in the *Construction Specification for Bituminous Pavement (801).*

921. 9 COST OF QUALITY ASSURANCE RE-TEST OR RE-INSPECTION

The Contract Administrator shall charge the Contractor the cost of re-test or re-inspection for each unacceptable Lot subjected to corrective measures identified through Quality Assurance.

The cost of re-testing will be based on:

1. In the event that the re-test was conducted by a laboratory service provider during the contract, the price that Manitoba pays its laboratory service provider (including tax) plus 10% for administration.
2. In the event that the testing is conducted by Manitoba, the cost to Manitoba to conduct the re-test.

Manitoba will charge the Contractor for additional staff costs during construction of remove and replace corrective measures at the rate of the daily liquidated damages.