

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 – Aggregates for Earthwork

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C 88-05, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C 117-04, Standard Test Method for Material Finer Than 0.075 (No. 200) mm Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C 123-04, Standard Test Method for Lightweight Particles in Aggregate.
 - .4 ASTM C 127-07, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
 - .5 ASTM C 128-07a, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .6 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM D 698-07e1
, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .9 ASTM D 995-95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
 - .10 ASTM D 1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .11 ASTM D 1559-89, Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
 - .12 ASTM D 2419-09, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .13 ASTM D 3203-05, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
 - .14 ASTM D 4318-10, Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - .15 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Asphalt Institute (AI)
 - .1 AI MS-2-94, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.

- .2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit Asphalt concrete mix design.
- .3 Test and Evaluation Reports:
 - .1 Materials to be tested by accredited testing laboratory testing laboratory approved by Departmental Representative
 - .2 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect stockpiled material from damage.
 - .3 Replace defective or damaged materials with new.
- .3 Develop Construction Waste Management Plan.
- .4 Packaging Waste Management: remove for reuse, or disposal at an approved facility, of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Granular base and sub-base material: to Section 31 05 16 - [Aggregate Materials] and following requirements:
 - .1 Crushed or screened stone, gravel or sand.
 - .2 Gradations: within limits specified when tested to [ASTM C 136] and [ASTM C 117]. Sieve sizes to CAN/CGSB-8.2.
 - .3 Table:

<u>Sieve Designation</u>	<u>% Passing</u>	
	<u>Type 1</u>	<u>Type 2</u>
75 mm	-	100
50 mm	-	-

<u>Sieve Designation</u>	<u>% Passing</u>	
	<u>Type 1</u>	<u>Type 2</u>
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Asphalt concrete aggregates:
- .1 Coarse aggregate is aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C 136.
 - .2 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.
 - .3 Separate stock piles for coarse and fine aggregate are not required for sheet asphalt.
 - .4 Do not use aggregates having known polishing characteristics in mixes for surface courses.
 - .5 Aggregate: material to Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Crushed stone or gravel.
 - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.
 - .3 Table:

<u>Sieve Designation</u>	<u>% Passing</u>	
	<u>Base Course</u>	<u>Surface Course</u>
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	100	-
19 mm	-	-
12.5 mm	70-85	100
9.5 mm	-	-
4.75 mm	40-65	55-75
2.00 mm	30-50	35-55
0.425 mm	15-30	15-30
0.180 mm	5-20	5-20
0.075 mm	3-8	3-8
 - .4 Sand equivalent: to ASTM D 2419, Minimum 50.
 - .5 Magnesium Sulphate soundness: to [ASTM C 88]. Max % loss by mass:
 - .1 Coarse aggregate surface course: 12%
 - .2 Coarse aggregate base course: 12%
 - .3 Fine aggregate, surface course: 16%
 - .4 Fine aggregate, base course: 16%
 - .6 Los Angeles Degradation: Grading B, to ASTM C 131. Max % loss by mass

- .1 Coarse aggregate, surface course: 25%
 - .2 Coarse aggregate, surface course: 35%
 - .7 Absorption: to ASTM C 127. Max % by mass:
 - .1 Coarse aggregate, surface course: 1.75%
 - .2 Coarse aggregate, base course: 2.00%
 - .8 Loss by washing: to ASTM C 117. Max % passing 0.075 mm sieve:
 - .1 Coarse aggregate, surface course: 1.5%
 - .2 Coarse aggregate, base course: 2.00%
 - .9 Lightweight particles: to ASTM C123. Max % by mass less than 1.95 relative density:
 - .1 Surface course: 1.5%
 - .2 Lower course: 3.0%
 - .10 Flat and elongated particles: to ASTM D 4791, (with length to thickness ratio greater than 5): Max % by mass:
 - Coarse aggregate, surface course: 15%.
 - Coarse aggregate, base course: 15%.
 - .11 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C 136.

Passing		Retained On	
25 mm	to	12.5 mm	
12.5 mm	to	4.75 mm	
 - .12 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.
- .3 Mineral filler:
- .1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
 - .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.
 - .3 Mineral filler to be dry and free flowing when added to aggregate.

2.2 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers for parking lots and driveways:
 - .1 Minimum drum diameter: [1200] mm.
 - .2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.
- .4 Haul trucks: of sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
 - .1 Boxes with tight metal bottoms.

- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .5 Suitable hand tools.

2.3 MIX DESIGN

- .1 Mix design to be approved by Departmental Representative.
- .2 Mix design to be developed by testing laboratory approved by Departmental Representative.
- .3 Design of mix: by Marshall method to requirements below:
 - .1 Compaction blows on each face of test specimens: 75.
 - .2 Mix physical requirements:

Property	Roads
Marshall Stability at 60 degrees C, kN minimum	5.5 surface course 4.5 lower course
Flow Value, mm	2-4
Air Voids in Mixture, %	3-5 surface course 2-6 lower course
Voids in Mineral Aggregate, % min	15 surface course 13 lower course
Index of Retained Stability, % minimum	75
 - .3 Measure physical requirements as follows:
 - .1 Marshall load and flow value: to AASHTO T245.
 - .2 Compute void properties on basis of bulk specific gravity of aggregate to ASTM C 127 and ASTM C 128. Make allowance for volume of asphalt absorbed into pores of aggregate.
 - .3 Air voids: to ASTM D 3203.
 - .4 Voids in mineral aggregate: to AI MS-2, chapter 4.
 - .5 Index of Retained Stability: measure in accordance with Section 32 12 10 - Marshall Immersion Test for Bitumen.
 - .4 Do not change job-mix without prior approval of Departmental Representative. When change in material source proposed, new job-mix formula will be provided to be approved to be reviewed by Departmental Representative.
 - .5 Return plant dust collected during processing to mix in quantities acceptable to Departmental Representative.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt paving installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 SUBGRADE AND SURFACE PREPARATION AND INSPECTION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Verify grades of items set in paving area for conformity with elevations and sections before placing granular base and sub-base material.
- .3 Obtain written approval of subgrade by Departmental Representative before placing granular sub-base and base.

3.3 GRANULAR SUB-BASE AND GRANULAR BASE

- .1 Place granular base and sub-base material on clean unfrozen surface, free from snow and ice.
- .2 Place granular base and sub-base to compacted thicknesses as indicated. Do not place frozen material.
- .3 Place in layers not exceeding 150 mm compacted thickness. Compact to density not less than 98 % maximum dry density in accordance with ASTM D 1557.
- .4 Finished base surface to be within 10 mm of specified grade, but not uniformly high or low.

3.4 PLANT AND MIXING REQUIREMENTS

- .1 In accordance with ASTM D 995.

3.5 ASPHALT CONCRETE PAVING

- .1 Obtain written approval of tack coat from [Departmental Representative before placing asphalt mix.
- .2 Place asphalt mix only when base or previous course is dry and air temperature is above 5 degrees C.
- .3 Place asphalt concrete in compacted layers not exceeding 50 mm.
- .4 Minimum 135 degrees C mix temperature required when spreading.
- .5 Maximum 160 degrees C mix temperature permitted at any time.
- .6 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.
- .7 Compact asphalt concrete to density not less than 95 % of density obtained with Marshall specimens prepared in accordance with ASTM D 1559 from samples of mix being used. Roll until roller marks are eliminated.
- .8 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.
- .9 Moisten roller wheels with water to prevent pick up of material.
- .10 Compact mix with hot tampers or other equipment approved in writing by Departmental Representative, in areas inaccessible to roller.
- .11 Finish surface to be within 10 mm of design elevation and with no irregularities greater than 10 mm in 4.5 m.
- .12 Repair areas showing checking, rippling or segregation as directed by Departmental Representative.

3.6 JOINTS

- .1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
- .2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .3 For cold joints, cut back to full depth vertical face and tack face with hot asphalt.
- .4 For longitudinal joints, overlap previously laid strip with spreader by 25 to 50 mm.

3.7 PROTECTIVE COATING

- .1 Apply 2 coats of protective coating to completed paved areas and asphalt curbs in accordance with manufacturer's instructions.

3.8 TESTING

- .1 Inspection and testing of asphalt pavement will be carried out by designated testing laboratory in

accordance with Section 01 45 00 - Quality Control.

- .2 Costs of tests will be paid by Departmental Representative.

3.9 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse or disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

- .1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38 degrees C.
 - .1 Do not permit stationary loads on pavement until 24 hours after placement.
- .2 Provide access to buildings as required.
 - .1 Arrange paving schedule so as not to interfere with normal use of premises.

END OF SECTION