



4170 - SPECIFICATION FOR ASPHALT MAT ON SUBGRADE

4170 - 1 DESCRIPTION

- 1.01 The work shall consist of crushed aggregate and bituminous binder mixed and placed on a prepared surface at the locations and in conformity with the lines, grades, and dimensions shown on the plans or as designated by the Engineer.
- 1.02 For the purpose of this specification, the following definitions will apply:

Bituminous aggregate	-	The crushed aggregate
Bituminous mix aggregate	-	The mix after the addition of filler or blender sand.
Bituminous mix	-	The mix after the addition of bituminous binder.
Bituminous surface course	-	The mix in place on the road during and after spreading and rolling.

4170 - 2 MATERIALS

- 2.01 The Department will select and pay for the bituminous binder.
- 2.02 Where the contractor elects to road mix, the bituminous binder shall generally be an MC-200, MC-500, SC-200 or SC-500 type of liquid asphalt or an emulsified asphalt.
- 2.03 Where the Contractor elects to plant mix using a drier and haul the bituminous mix directly to the road the bituminous binder shall generally be an MC-500, MC-1000, SC-500 or SC-1000 type of liquid asphalt or an emulsified asphalt.
- 2.04 Where the contractor elects to plant mix and stockpile the bituminous mix prior to spreading only an MC-200 or SC-200 type of liquid asphalt or an emulsified asphalt shall be used.
- 2.05 Bituminous mix aggregate shall be composed of fragments of durable rock free from undesirable quantities of soft or flaky particles, shale, loan, organic or other deleterious materials.
- 2.06 Bituminous mix aggregate shall meet the gradation requirements listed below, except that, if necessary to develop the desired mix characteristics the Engineer may require a bituminous mix gradation which falls outside these requirements. If this action is necessary, the new gradation limits *will* be specified and the Contractor may achieve the required gradation by adjustment of the quantity of binder, filler, and/or blender sand.

Sieve Designation	Percent by Weight Passing Canadian Metrics Standard Sieves		
	TYPE		
	120	121	122
25.0 mm	100	-	-
18.0 mm	78 - 100	100	-
16.0 mm	-	-	100
12.5 mm	-	80 - 100	-
9.00 mm	55 - 84	-	75 - 100
5.00 mm	38 - 68	45 - 75	50 - 80
2.00 mm	23 - 49	28 - 55	30 - 60
900 µm	14 - 33	19 - 38	23 - 42
400 µm	10 - 24	14 - 28	15 - 30
160 µm	-	7 - 16	8 - 18
75 µm	4 - 14	5 - 10	7 - 11

4170 - 3 CONSTRUCTION

General

- 3.01 The asphalt mat on subgrade may be constructed with any machine, combination of machines or equipment that will produce results meeting the requirements for aggregate production, bituminous binder application, mixing, compaction, and finishing as controlled by the specifications.
- 3.02 Overburden shall be removed in accordance with the requirements for Removal of Overburden (Specification 2260).
- 3.03 Materials shall be handled in a manner such that segregation of the coarser and finer fractions will not occur.
- 3.04 Stockpiling filler or blender sand shall be done in accordance with the requirements for Stockpiling Binder, Filler, and Blender Sand (Specification 3400).
- 3.05 When storage tanks are used, the bituminous binder shall be stored in tanks provided with adequate heating and positive temperature control. Storage tanks shall not be partitioned to store more than one (1) type of bituminous material.
- 3.06 The bituminous mix design will be established by the Engineer to determine the exact proportions of bituminous binder, bituminous aggregate, filler and/or blender sand required.
- 3.07 During the course of the work, the bituminous mix design may be adjusted if necessary.
- 3.08 Where the Contractor elects to mix the bituminous aggregate and bituminous binder on the road or in a travelling plant, any filler and/or blender sand required will be mixed with the bituminous aggregate during the crushing operation.

3.09 If bituminous mix is stockpiled, the operation shall conform to the following requirements:

- (a) Bituminous mix shall be stockpiled from a conveyor belt and the mix in stockpile shall not be moved or compacted. The free fall distance from the conveyor belt to the stockpile shall be not more than two (2) metres. The height of the stockpile shall be not less than four (4) metres. The completed stockpile(s) shall be constructed to occupy the smallest feasible area.
- (b) If stockpiled bituminous mix must be carried over from one construction season to the next, the surface of the stockpile(s) shall be uniformly sprayed with an MC-30 type of cut-back asphalt.

3.10 The vehicles used to haul the bituminous mix from a central mixing plant shall be previously cleaned of all accumulations of bituminous mix and foreign materials. The inside surface of all vehicles used for hauling bituminous mix shall be sprayed with diesel fuel or soap solution prior to loading, but excess of lubrication will not be permitted. The use of gasoline, kerosene or similar products will not be permitted.

3.11 Loaded or empty trucks shall not be turned around at points where damage may be caused to the surface or slopes of the road.

3.12 A mechanical spreader capable of spreading bituminous aggregate, bituminous mix aggregate or bituminous mix in uniform windrows at the specified tonnages shall be used when dumping bituminous aggregate, bituminous mix aggregate or bituminous mix on the roadway.

Mixing

3.13 Regardless of the method of mixing elected by the Contractor, the bituminous mix shall conform to the following requirements:

- (a) The bituminous aggregate, immediately prior to the addition of the bituminous binder, shall contain not more than two (2) percent moisture by weight.
- (b) The percentage of bituminous binder added shall not vary by more than five-tenths (0.5) of one percent from the design percentage.
- (c) The temperature of the bituminous binder when added to the aggregate shall conform to the following limits:

Type of Bituminous Binder	Temperature Degrees Celsius
MC - 200	60 - 100
MC - 500	80 - 120
MC - 1000	85 - 130
SC - 200	60 - 100
SC - 500	80 - 120
SC - 1000	85 - 130
Emulsified Asphalts	As specified in the Special Provisions

3.14 When the Contractor elects to mix the materials in a central plant, the bituminous mix and the operation shall conform to the following requirements:

- (a) A heat sensing device shall be installed to indicate the temperature of the dried aggregate at the discharge end of a drier, and to indicate the temperature of the bituminous mix at the discharge end of a drum mixer. The maximum temperature of the dry aggregate leaving a drier shall be 120°C, For a drum mixer the maximum temperature of the bituminous mix at the discharge end shall be 100°C.
- (b) The drier or drum mixer shall be equipped with a dust collector.
- (c) All plants shall be capable of accurately proportioning all materials.
- (d) The asphalt pump shall be the positive displacement type.
- (e) Aggregate particles shall not be coated with residue from improper fuel combustion.
- (f) Because of the degradation of the bituminous aggregate during processing, the Contractor may waste all or part of the dust collector material to meet the gradation limits.
- (g) If a drum type mixer is used the aggregate shall enter the drum at the burner end and travel parallel to the flame and exhaust gas stream. The asphalt shall enter the drum by way of a nozzle which may be moved along the length of the drum. Heating shall be controlled to prevent excessive oxydization of the asphalt.
- (h) Regardless of the method of mixing a uniform mixture shall be produced in which all particles are thoroughly coated. The mixing time will be increased if the bituminous mix aggregate is not completely coated with the bituminous binder.
- (i) The prepared surface shall be primed prior to the dumping of the bituminous mix.

3.15 When the Contractor elects to use blade graders, pulvi-mixers and similar equipment to mix the materials on the road, the bituminous mix and the operation shall conform to the following requirements:

- (a) The prepared surface shall be primed prior to the dumping of the bituminous aggregate. The mixing operation shall be carried out in a manner which will prevent damage to the prime coat.
- (b) The bituminous aggregate shall be bladed into an even windrow prior to adding the bituminous binder.
- (c) The bituminous binder shall be applied with a distributor equipped with the appliances and devices and meeting the adjustments and requirements contained in the Specification for Prime, Tack and Flush Coat (Specification 4000).
- (d) Mixing shall be carried out only when the surface being mixed on is dry. Mixing shall be carried out in a manner which will prevent damage to the prime coat.

- (e) The asphalt binder shall be added to such portions of the windrow of aggregate as will permit satisfactory and uniform application of the bituminous binder and satisfactory mixing of the bituminous binder and aggregate. Each portion of the windrow shall be thoroughly and satisfactorily mixed before commencing the mixing of the next portion. The portions so mixed shall then be combined into one windrow and the resultant windrow thoroughly mixed prior to commencing spreading.
 - (g) If a partially mixed windrow or portion of a windrow becomes water soaked due to rain, such a mixture shall be allowed to stand until all surface moisture has evaporated. Surface moisture shall not be trapped or emulsified by undue mixing. When surface moisture has evaporated, the mixture shall be spread and allowed to dry until it contains not more than two (2) percent moisture by weight. More bituminous binder may then be added.
 - (g) Water trapped in pools alongside a windrow of mix shall be drained immediately by making trenches across the windrow.
 - (h) Mixing shall not be carried on when the atmospheric temperature is less than two (2) degrees Celsius.
- 3.16 When the Contractor elects to mix the materials on the road using a travelling mixing plant, the bituminous mix and the operation shall conform to the following requirements:
- (a) If the operation requires the dumping of the aggregate on the prepared surface, the surface shall be primed prior to the dumping of the bituminous aggregate. The travelling plant shall be operated in a manner which will prevent damage to the prime coat. The bituminous aggregate shall be bladed into an even windrow prior to being picked up by the travelling plant.
 - (b) The bituminous mix from the travelling plant shall be deposited on a dry surface.
 - (c) The plant shall be capable of accurately proportioning all materials.
 - (d) An uniform mixture shall be produced in which all particles are thoroughly coated. The mixing time will be increased if the bituminous mix aggregate is not completely coated with the bituminous binder.

Spreading

- 3.17 When required, a tack coat shall be applied in accordance with the requirements for Bituminous Prime, Tack, and Flush Coat (Specification 4000).
- 3.18 Before the bituminous mix is spread, loose dirt or other objectionable material shall be removed from the surface to be paved by brooming and other methods.
- 3.19 Bituminous mix shall be spread on dry surfaces.
- 3.20 The bituminous mix shall not be spread when the prepared surface is frozen and/or when the atmospheric temperature is less than two (2) degrees Celsius.

- 3.21 Contact faces of curbs, gutters, manholes, and sidewalks shall be coated with bituminous binder before placing the bituminous mix.
- 3.22 Where the Contractor elects to road mix, travelling plant mix, or central plant mix with no drier, the bituminous mix shall be allowed to cure for a minimum of twenty-four (24) hours prior to commencing spreading. The bituminous mix shall be spread not later than seventy-two hours after the completion of mixing unless prevented by rain.
- 3.23 When the Contractor elects to mix the materials in a central plant, using a drier or drum mixer, the length of bituminous mix placed on the road, including the section being spread, shall be not greater than three (3) kilometres.
- 3.24 Only motor graders shall be permitted to spread the mix. Generally the edges of the surfacing shall be laid first. The surface shall be laid so the outside edge is in line with the stakes or string line placed to mark the edge of the surfacing. Sufficient blading shall be done until the surface is smooth.
- 3.25 The bituminous mix, at the time of spreading, shall contain not more than two (2) percent moisture by weight.
- 3.26 The thickness of the bituminous surface course shall be uniform.

Rolling

- 3.27 The mat shall be rolled with straight axle, pneumatic tire roller, having a rolling pressure of thirty-five (35) kilograms per centimetre width of tire.
- 3.28 Rolling shall commence at the outer edges of the mat and progress towards the centre, except that on superelevated curves rolling shall progress from the lower to the upper edge. Rolling shall continue until the surface of the mat is smooth and all loose material is tied down.
- 3.29 If the mat bleeds or raves because of improper procedures by the Contractor, the mixture shall be re-worked and aggregate added if required at no direct expense to the Department.
- 3.30 When designated by the Engineer, a flush coat shall be required in accordance with the requirements for Bituminous Prime, Tack, and Flush Coat (Specification 4000).

4170 - 4 MEASUREMENT

- 4.01 Asphalt Mat on Subgrade will be measured in tonnes of bituminous mix delivered to the road if the Contractor elects to use a plant mix method.
- 4.02 Asphalt Mat on Subgrade will be measured in tonnes of bituminous mix aggregate delivered to the road if the Contractor elects to use a road mix method.

4170 - 5 PAYMENT

- 5.01 Payment for ASPHALT MAT ON SURGRADE will be made at the unit price per tonne. The unit price will be full compensation for removal of overburden, excavating, crushing, screening, stockpiling, drying, heating, and storing the bituminous binder, mixing, loading, dumping, spreading, and rolling the bituminous surface course and placing salvaged or imported gravel on the shoulders, if applicable. The unit price will also be full compensation for the addition of the filler and/or blender sand at the crushing or mixing plant.
- 5.02 Payment for HAULING ASPHALT MAT ON SUBGRADE will be made at the unit price per tonne kilometre in accordance with the requirements for Haul (Specification 2405).
- 5.03 Payment for ASPHALT MAT ON SUBGRADE IN PLACE will be made at the unit price per tonne. The unit price will be full compensation for removal of overburden, excavating, crushing, screening, stockpiling, drying, heating and storing the bituminous binder, mixing, loading, hauling, dumping, spreading, and roiling the bituminous surface course and placing salvaged or imported gravel on the shoulders, if applicable. The unit price will also include the addition of filler and/or blender sand at the crushing or mixing plant.
- 5.04 Payment for hauling filler or blender sand to the crushing or mixing plant will be made in accordance with the requirements for Haul (Specification 2405).
- 5.05 Payment for flush coat will be made in accordance with the requirements for Bituminous Prime, Tack, and Flush Coat (Specification 4000).
- 5.06 Payment for tack coat will be made in accordance with the requirements for Bituminous Prime, Tack, and Flush Coat (Specification 4000).