

SECTION 12 ROADWORKS (ASPHALTIC CONCRETE)

1 ASPHALTIC CONCRETE

1.1 ASPHALTIC CONCRETE GENERALLY

Standard

To AS 2734.

Nominal size

The nominal mix size is shown on the Drawings.

1.2 ASPHALT MATERIALS

Definitions

To AS 2150, Clause 2 except as follows:

- Coarse aggregate - all that aggregate retained on a 2.36 mm sieve.
- Fine aggregate - all that aggregate passing a 2.36 mm sieve.

Coarse aggregate

Use coarse aggregate consisting of crushed rock or crushed gravel particles of 2.36 mm size or larger which are clean, hard, durable and free from laminated particles, clay and other aggregations of fine material, soil, organic material and any other deleterious material. Use only aggregate having the properties, when tested by appropriate test methods as stipulated by the Queensland Department of Transport, Transport Technology Division, given in the following table:

Property	Limit	Test Method
Flakiness index	Max. 35	Q201
Wet aggregate crushing value	Max. 20%	Q204B
Percentage of sample with crushed faces	Min. 80%	Q215
Polished aggregate friction value	Min. 45	Q203

Fine aggregate

Use fine aggregate consisting of natural sand particles and/or crushed rock or crushed stone particles smaller than 2.36 mm size, which are clean, hard, durable and which are free from clay and other aggregations of fine material, soil, organic material and any other deleterious material.

Reference Samples Certificates: Submit test certificates for each aggregate fraction to be used to obtain the combined aggregate grading. The aggregates supplied under the Contract shall be of a quality similar to that represented by the certificate.

Mineral filler

Use mineral filler of an approved material such as hydrated lime or fly ash. The filler shall be dry, free of lumps, free from clay, organic material and any other deleterious materials, and shall comply in all other respects with the requirements of AS 2357. Approved materials should exhibit voids in the dry compacted filler (Test No. AS 1141.17) of not less than 40%.

Binder

Unless stated otherwise in the Contract documents, use only bitumen to AS 2008, Class 320, as binder in the mix.

Combined aggregate particle size distribution

The grading of the combined aggregates and mineral filler shall be such that it complies with the grading limits of the following table, and in addition the shape of the lower part of the combined grading plot (material passing the 2.36 mm sieve) shall be such that nowhere shall the percentage passing consecutive sieves vary from at or near one limit to at or near the other limit. In addition not less than 50% of the material passing the .075 mm sieve shall be mineral filler.

A.S. Sieve Size (mm)	Percentage (by Mass) Passing Sieve Nominal Mix Size	
	10 mm	5 mm
13.2	100	---
9.5	90 - 100	100 mm
4.75	58 - 76	85 - 100
2.36	40 - 58	55 - 76
0.60	17 - 35	26 - 43
0.30	11 - 24	15 - 28
0.15	7 - 16	8 - 18
0.075	4 - 7	4 - 11

Sampling

To AS 1141, AS 2008 and AS 2357, as appropriate. The frequency of sampling and size of samples shall be determined by the Superintendent.

1.3 ASPHALT MIX DESIGN

Requirements

Design the asphalt mix by the Marshall method to meet the requirements specified for manufacture, placing and compaction and so that the mix, when tested by the appropriate method of AS 2150, has properties within the limits specified below:

Mix properties

Marshall stability:	4.5 kN minimum
Marshall flow:	2 minimum 4.5 mm maximum
Stiffness of mix (Stability Flow)	2 kN/mm minimum
Voids in total mix: (Maximum theoretical density based on apparent specific gravity of aggregates):	3% minimum 6% minimum
Voids in aggregate filled with bitumen:	60% minimum 80% maximum

Sampling for test specimens

To AS 2891.1.

Compaction of test specimens

By dual-head mechanical compactor, giving the equivalent of 50 blows by the method described in AS 2150.

Proposed job mix

If requested the Contractor shall submit the following details to the Superintendent:

- combined aggregate particle size distribution;
- binder content expressed as a percentage of the total mix;
- the filler content expressed as a percentage by mass of the combined aggregates;
- the asphalt mix properties;
- the proposed mixing temperature.

1.4 PLANT SITE LABORATORY

Requirement

Provide at the asphalt plant site a laboratory equipped to carry out relevant tests on the mix and the mix constituents.

1.5 ASPHALT MANUFACTURE

Standard

To AS 2150 clause 6, modified as follows:

Mixing plant

Manufacture Asphaltic Concrete in a plant holding current approval of the Queensland Department of Transport, Transport Technology Division.

Certificate: If required, furnish a certificate stating that the plant has been inspected by Queensland Department of Transport, Transport Technology Division and is currently approved for use by Queensland Department of Transport, Transport Technology Division.

1.6 ASPHALT MANUFACTURING TOLERANCES

Requirement

Asphaltic concrete used on the job shall have properties within the following limits of the approved design mix:

Mix property:		Tolerance:
Aggregate passing	4.75 mm sieve or larger	± 6%
Aggregate passing	2.36 sieves	± 5%
Aggregate passing	0.6 mm sieve	± 4%
Aggregate passing	0.3 mm sieve	± 3%
Aggregate passing	0.15 mm sieve	± 2%
Aggregate passing	0.075 mm sieve	± 1.5%
Bitumen content		± 0.3%
Added filler content		± 0.5%
Mixing temperature		± 10°C

Sampling

To AS 2891.1. Two samples shall be taken from the mixed material supplied and placed each day.

Testing

Carry out testing of the samples required to prove the mix is within the tolerances stated above and supply relevant test certificates to the Superintendent.

Rejection

Material which does not comply with the design mix, within the limits stated above shall be removed from the site and the cost of all restoration and replacement works shall be borne by the Contractor.

1.7 ASPHALT SURFACING CONSTRUCTION PLANT

Sprayers

Provide sprayers capable of spraying the tack coat uniformly through jets in a spray bar at the desired rate of application. Fit spray bars with end shields. Fit each sprayer with a hand lance.

Spreaders

Spreaders shall be self-propelled and equipped with hoppers and distributing screws of the counter-rotating type to place the asphalt evenly in front of the screed and capable of spreading the asphaltic concrete without segregation, in thicknesses between 12 mm and 50 mm and to widths between 1.8 m and 4.3 m. Provide means to heat the screed uniformly over its full width. Fit a mechanical tamper adjusted to ensure that asphaltic concrete as placed by the spreader will not deform excessively during initial compaction.

Level control devices

Equip spreaders to enable automatic control of levels and thicknesses using a fixed stringline or a mobile level averaging beam on one side of the machine concurrently with, on the other side, as required by the project:

- a fixed stringline, or
- a mobile level averaging beam, or
- a joint-matching shoe, or
- crossfall devices.

String or wire lines: Maximum sag in unsupported line length: 2 mm.

Levelling beam: Provide an average profile from a minimum of 8 separate contact points evenly spaced over a length of not less than 9 m.

General roller requirements

Rollers shall be self-propelled, capable of reversing without backlash and fitted with brushes or similar devices to enable the contact surface of each roll or tyre to be kept uniformly damp with a minimum amount of water and free from foreign material. Taps controlling the rate of flow of water shall be readily accessible to the driver. Do not allow water to run directly from taps to the asphalt being compacted. Incorporate a wetting agent into the water applied to pneumatic-tyred rollers, and in the water applied to steel-wheeled rollers when directed.

Steel wheeled rollers

Steel-wheeled non vibrating rollers: Shall have a mass of not less than 6 t, and a static load intensity of not less than 35 kN per metre width of drive roll.

Steel-wheeled vibrating rollers: Shall have a total mass of not less than 6 t, and a static load intensity of not less than 20 kN per metre width of vibrating roll, and a device which will automatically stop vibration when rolling stops.

Frequency of vibration: Within the range 33 to 50 Hz.

Amplitude of vibration: Within the range 0.4 mm to 0.8 mm.

Pneumatic tyred rollers

Pneumatic-tyred multi-wheeled rollers shall have smooth tyres of equal size, an all up mass of not less than 11 t and wheel loads of not less than 10 kN. Offset rear wheels relative to the front wheels to give overlapping tyre paths and complete coverage for the effective width of the roller. Tyre pressures shall be adjustable up to

at least 700 kPa. Rollers used for initial rolling on layers of compacted thickness 100 mm or more shall have tyres of width not less than 220 mm on rims of diameter not less than 500 mm.

1.8 PRIMING

Requirement

If shown on the Drawings or if site conditions dictate, apply a primer to the prepared pavement in accordance with Subsection SPRAYED BITUMINOUS SURFACING.

1.9 PREPARATION FOR ASPHALT SURFACING

Cleaning

Clean loose or foreign material off the primed or sealed base surface with suitable power blowers or power brooms (or by hand brooms where inaccessible to power equipment). Keep traffic off the cleaned surface.

Potholes

Trim to a regular shape and a uniform depth of at least 75 mm, tack coat the edges and patch with asphaltic concrete.

1.10 TACK COAT

Material

Bitumen emulsion to AS 1160, designations ARS/170.

Application

Apply tack coat not less than 30 minutes nor more than 2 hours before asphaltic concrete is placed. Cover the surface uniformly at an application rate of between 0.17 and 0.33 L/m² of bitumen emulsion, as directed.

Spraying operations

Keep the interior of tanks, pipework, spray bars and jets of tack coat sprayers clear of foreign materials. Pipework, spray bars and jets shall be empty of tack coat materials before spraying commences. Use a lance or squeegee only in those areas inaccessible to a sprayer or where a varying application rate is required and only with the approval of the Superintendent. Brush out any pools of tack coat which may form in small depressions or surface irregularities over the adjacent area with brooms or rubber squeegees before the emulsion breaks.

Protection

Use adequate means to protect adjacent surfaces during spraying. Prevent freshly coated surfaces from being contaminated by dust or other foreign material.

1.11 DELIVERY OF ASPHALT MIX

Standard

To AS 2150, clause 8.

Rejection

Loads which are outside the allowable range of temperature or which become wet shall be rejected.

1.12 SPREADING ASPHALT SURFACING

Preconditions

Place asphalt surfacing in dry weather on a dry pavement surface at a pavement temperature not less than 10°C.

Method

Unless otherwise permitted, place asphalt surfacing by mechanical spreader, operated at the lowest uniform rate consistent with the continuous operation of the mixing plant. Place the mix with a minimum of delay after delivery. Keep the temperature of the mix in the hopper of the spreader at not less than 120°C. Do not reheat.

Hand spreading: The Superintendent may approve hand spreading in areas where machine spreading is impracticable. In such cases deposit the mix outside the area on which it is to be spread, distribute it into place and spread and level it without segregation, using suitable lutes.

Operations

Spread the mix in layers covering the full width of the carriageway, or, if approved, in lanes of width normally not less than 3 m, to a surface parallel with the finished pavement surface, and to a depth as required by the specified compacted thickness. Layers placed in adjoining lanes shall have the same compacted thickness.

1.13 COMPACTING ASPHALT SURFACING

Generally

Before commencing compaction, correct any irregularities in line or level. Trim lane edges to a straight line. Compact asphalt surfacing uniformly as soon as it will support rollers without undue displacement, and complete rolling while the mix temperature is above 80°C. Operate rollers with the driving roll or wheels nearer the spreader, and at a speed slow enough to avoid displacement of the mix and not greater than 5 km/h. Disengage vibratory mechanisms before stopping or reversing direction. Operate steel-wheeled rollers with minimum wetting of rolls. Operate pneumatic-tyred rollers without wetting the tyres except during the initial stages of rolling, when only sufficient water is to be applied to the tyres to prevent adhesion of the mix until the tyres have gained heat. Make adjacent roller passes of different lengths.

Initial rolling

Use a non-vibratory steel-wheeled roller or a vibratory steel-wheeled roller with the vibrator disengaged. Roll transverse and/or longitudinal joints first. Continue rolling longitudinally, commencing on the lower side and proceeding to the higher side of the spreader run. The roller shall overhang the unsupported edges of the run by about 0.1 m. Overlap each longitudinal pass on the previous pass by about 0.1 m.

Secondary rolling

Perform secondary rolling as soon as possible after initial rolling with a self-propelled pneumatic-tyred roller. Roll longitudinally commencing on the lower side and proceed to the higher side of the spreader run. Each roller pass shall overlap the previous pass.

Final rolling

Perform final rolling using a vibratory or non-vibratory steel-wheeled roller to eliminate all roller marks.

Echelon paving

When paving in echelon, leave the edge of the run common to adjacent spreaders unrolled for a width of 0.2 m until the longitudinal joint has been constructed. Roll this strip together with the edge of the adjacent spreader run. Commence rolling before the temperature of the material along the edge of the first spreader run has fallen below 95°C.

Avoidance of surface defects

Do not leave rollers stationary on asphalt surfacing which is still warm. Keep roller wheels free from any build-up. Immediately correct surface defects resulting from rolling.

Inaccessible areas

Compact asphalt surfacing in areas inaccessible to the specified rollers using small vibrating rollers or hand-operated mechanical compactors of types approved by the Superintendent.

1.14 ASPHALT COMPACTION TESTING

Density tests

Perform density tests in accordance with AS 2150 on core samples taken from the compacted asphalt layer.

Number of Tests: In accordance with AS 2734, Section 9.

Compaction standard

Compaction of the mix shall be such that compaction test results of 90% of the core samples indicate a density not less than 97% of the density achieved by the Marshall test specimens for the mix and no result indicates a density less than 95% of that density.

1.15 JOINTS IN ASPHALT SURFACING

Generally

Plan the placing of the asphalt surfacing to minimize the number of joints. Make the joints so that they are well bonded and sealed and provide a smooth riding surface across the joint.

Joint locations

Transverse joints: Offset in adjoining spreader runs by not less than 2 m. Offset from layer to layer by not less than 2 m and by up to 7 m if so directed.

Longitudinal joints: Offset from layer to layer by not less than 150 mm. Make longitudinal joints parallel to the carriageway centreline, and, where directed, plan the offsets so that the joints in the wearing course coincide with the lane line positions.

Method of construction

Longitudinal joints: Form exposed edges of each spreader run while hot to a straight line with a dense face inclined between vertical and 45° to the vertical for the full depth of the layer. Tamp the unsupported longitudinal edges of spread material to raise the level of the asphalt surfacing slightly to secure maximum edge compaction from subsequent rolling. Do not damage the unsupported longitudinal edge by rolling, except that, on 10 mm courses, the Superintendent may permit such an edge to be rolled over. Make good longitudinal edges which contain segregated or open textured material or which have been damaged by traffic or rolling by cutting back to expose a new straight dense inclined face. Do not cut with a diamond saw. Overlap the screed of the spreader on the adjacent run by 25 mm to 50 mm. At joints constructed against cold edges, the overlapping asphaltic concrete shall be removed to waste or crowded back at the joint but not thrown on to the layer being spread. Treat joints as 'cold' when the temperature of the first run has fallen below 60°C. Where directed, tack coat cold contact surfaces uniformly and thinly.

Transverse joints: Construct transverse joints at right angles to the direction of spreading and cut to a straight vertical face for the full depth of the layer. Unless otherwise approved, construct transverse joints if the spreading operation is stopped for 20 minutes, or if the pavement temperature falls below 90°C, whichever occurs sooner. Before placing asphalt surfacing to construct transverse joints, tack coat cold contact surfaces uniformly and thinly.

Abutting structures

Place asphalt surfacing against abutting structures such as kerb, gutter, manhole or adjoining pavement in the same manner as for longitudinal and transverse joints. Fill spaces left unfilled between the spreader run and abutting edges with sufficient material to the proper height prior to compaction.

Matched junctions

Where asphalt surfacing is required to match an existing pavement, bridge deck, rail or other fixture, place the material to provide a smooth riding surface across the junction. Where necessary, remove sufficient of the existing pavement for this purpose. Where it is necessary to taper the thickness of a layer to provide a smooth riding junction, terminate the layer at a chase cut into the existing pavement about 20 mm deep and 400 mm wide unless otherwise directed. Where necessary, removal of coarse particles from a layer of tapering thickness will be permitted using hand raking. Where the thickness of the layer tapers to less than twice the nominal size of the mix, tack coat the area upon which material of such thickness is to be placed uniformly at an application rate between 0.50 and 0.75 L/m².

1.16 ASPHALT SURFACING TOLERANCES

Levels (Finished surface course)

Absolute level tolerance: +/- 10 mm.

(Maximum deviation from design level).

Relative level tolerance:

- Longitudinal direction: 5 mm.
- Transverse direction: 10 mm.

(Maximum deviation from a 3 m straightedge laid on each plane surface.)

Levels at junctions with gutters: Within + 5 mm, - 0 mm of the level of the gutter edge.

Layer thickness

Any one sample: + 10 mm, - 5 mm.

Average thickness: The mean thickness of the core samples in a lot shall be not less than the specified thickness.

Surface finish

Provide a surface uniform in appearance and free from depressions in which water can lie.