
SECTION 802 - BITUMINOUS COLD AND WARM MIXES

802.01 GENERAL

This section covers the requirements for the manufacture of Sizes 7, 10, 14 and 20 dense graded and open graded bituminous cold and warm mixes. The requirements relate to quality of aggregates and bituminous materials, mix design, and properties of product.

802.02 DEFINITIONS

Bituminous Cold Mix

Bituminous cold mix is a mixture of bituminous binder with fine and coarse aggregates with or without filler. The bituminous binder may be cutback bitumen or bitumen emulsion. The material may be mixed hot or cold but is spread and compacted cold.

Bituminous Warm Mix

A bituminous warm mix is similar to a bituminous cold mix but is manufactured hot from a heavy grade of cutback bitumen and is used on the same day as it is mixed while the material is still warm and workable.

Binder

Binder is the bituminous material used to hold the mixture of aggregates together as a cohesive mass.

Residual Binder

Residual binder is bituminous material including any flux oil or polymer but not cutter.

In the case of bitumen emulsion, it is the binder that remains after the water has separated.

Assigned Los Angeles Abrasion Loss

The assigned Los Angeles Abrasion Loss is a hardness rating derived from Los Angeles Abrasion Loss test results and is assigned to each source by VicRoads on the basis of past test data obtained from testing products.

Coarse Aggregates

Coarse aggregates are aggregates retained on a 4.75 mm AS sieve.

Fine Aggregates

Fine aggregates are aggregates passing a 4.75 mm AS sieve.

802.03 AGGREGATES

(a) General

The combined aggregate mixture shall consist of crushed rock or crushed gravel, or a mixture of crushed rock and sand or crushed gravel and sand.

When aggregates are crushed rock, they shall consist of clean, hard, durable angular rock fragments of uniform quality.

When aggregates are crushed gravel, not less than 75% by mass of all particles shall have two or more faces produced by crushing.

Sand aggregates shall consist of clean, hard durable grains free from lumps, clay, mica and foreign matter.

(b) Source Rock

Source rock shall comply with the requirements of Section 801 - Source Rock for the Production of Crushed Rock and Aggregates.

(c) Crushed Aggregate Products

- (i) The Flakiness Index of each separate sized coarse aggregate shall be as specified in Table 802.031.
- (ii) Unsound rock and marginal rock in that fraction of the combined mixture retained on a 4.75 mm AS sieve shall not exceed the percentages specified in Table 802.031. If no facilities exist at the mixing plant to sample the combined mixture, the unsound rock and marginal rock in that fraction of each aggregate retained on a 4.75 mm AS sieve shall not exceed the percentages specified in Table 802.031.

Table 802.031

Test	Test Value
Flakiness Index % (max)	35
Total of Marginal and Unsound Rock % (by mass) (max)	10
Unsound Rock % (by mass) (max)	5

(d) Crusher Fines

Crusher fines shall:

- (i) consist of a uniformly graded product of separate particles from the crushing of rock which complies with the requirements of Clause 802.03(b);
- (ii) be free from lumps and aggregations;
- (iii) comply with the relevant requirements of Table 802.032.

Table 802.032

Test	Test Value
Degradation Factor - Crusher Fines (min)	60
Plasticity Index (max)	3

802.04 FILLER

Filler shall comply with Australian Standard AS 2150, Hot mix asphalt – A guide to good practice.

The added filler required by Clause 802.06 to be included with particular aggregate types shall be hydrated lime, portland cement or cement works flue dust.

802.05 BITUMINOUS MATERIALS

The binder to be used shall be one of the following:

- (a) Medium curing cutback bitumen of grade or equivalent field produced grade as shown in Table 802.051 and complying with the requirements of Australian Standard 2157, Cutback Bitumen.

Bitumen used for field produced cutback bitumen shall comply with Australian Standard 2008, Residual Bitumen for Pavements. The cutter shall comply with Australian Standard 3568 - Oils for Reducing the Viscosity of Residual Bitumen for Pavements.

Table 802.051 - Grades of Cutback Bitumen

Mix Type	Standard Grade		Field Produced Equivalent		Viscosity Range (Pa.s)
	Grade (AS 2157)	% Residual Binder	Class 170 Bitumen Parts by Volume @ 15°C	Cutter Parts by Volume @ 15°C	
Type 2	AMC 2	73	100	37	0.22 - 0.44
Type 3	AMC 3	79	100	27	0.55 - 1.10
Type 4	AMC 4	84	100	19	2.00 - 4.00
Type 5	AMC 5	89	100	12	5.50 - 11.00
Type 6	AMC 6	93	100	7	13.00 - 26.00

- (b) Bitumen emulsion of Grade CAM manufactured from Class 170 bitumen and complying with the requirements of Australian Standard 1160, Bitumen Emulsions for Construction and Maintenance of Pavement.

802.06 MIX REQUIREMENTS

Unless otherwise directed, the grading of the combined aggregates and the proportion of residual binder shall lie within the limits specified in Tables 802.061 and 802.062 for each size of mix specified in Clause 802.11 Schedule of Details.

Aggregates of coarse or medium grained acidic rocks (e.g. granite, adamellite, granodiorite, quartz porphyry) shall contain not less than 1% filler as specified in Clause 802.04.

The residual binder content shall be expressed as a percentage by mass of the total mix.

The target grading and residual binder content for each size of mix shall be approved by the Superintendent.

Table 802.061 - Grading of Combined Aggregates (including any filler)

Sieve Size AS (mm)	Percentage Passing (by mass)								
	Dense Graded				Open Graded				
	Size 7	Size 10	Size 14	Size 20	Size 5	Size 7	Size 10	Size 14	Size 20
26.5				100					100
19.0			100	95-100				100	90-100
13.2		100	85-100	77-90			100	90-100	50-90
9.5	100	90-100	70-85	58-74	100	100	90-100	40-75	30-65
6.70	90-100	70-85	57-74	45-60		85-100	30-75	10-35	10-35
4.75	70-90	54-70	45-65	37-50	85-100	30-70	20-55	5-25	5-25
2.36	45-60	35-50	28-45	22-36	10-40	10-40	5-30	0-10	0-10
1.18	26-45	22-38	15-30	12-26	0-10	0-20	0-10		
0.600	15-30	12-27	10-23	6-20		0-10			
0.300	10-20	6-16	5-17	4-15					
0.150	4-14	4-11	3-11	2-10					
0.075	3-8	2-6	2-5	1-5	0-2	0-4	0-4	0-4	0-4

Table 802.062 - Proportion of Combined Aggregates and Residual Binder

Sieve Size AS (mm)	Percentage Passing (by mass)								
	Dense Graded				Open Graded				
	Size 7	Size 10	Size 14	Size 20	Size 5	Size 7	Size 10	Size 14	Size 20
Aggregates	95.2-94.2	95.8-94.8	96.0-95.0	96.3-95.3	96.0-95.0	96.0-95.0	96.5-95.5	96.5-95.5	97.0-96.0
Residual Binder	4.8-5.8	4.2-5.2	4.0-5.0	3.7-4.7	4.0-5.0	4.0-5.0	3.5-4.5	3.5-4.5	3.0-4.0
Total Mix	100	100	100	100	100	100	100	100	100

Unless otherwise specified or directed the type of cutback bitumen mix shall be supplied to meet the requirements of Table 802.063.

Table 802.063

Mix Type	Description and Season for Use	Ambient Temperature for Use °C	Minimum Overnight Temperature (°C) for Stockpiling
Type 2	Cold Mix (Winter)	5 - 10	0
Type 3	Cold Mix (Spring/Autumn)	10 - 20	5
Type 4	Cold Mix (Summer) Warm Mix (Winter)	20 - 30 (Cold Mix) 5 - 10 (Warm Mix)	15
Type 5	Cold Mix (Hot weather only) Warm Mix (Spring/Autumn)	>30 (Cold Mix) 10 - 20 (Warm Mix)	Not suitable
Type 6	Warm Mix (Summer)	>20 (Warm Mix)	Not suitable

The Superintendent may approve the addition of up to 5 parts of Flux Oil for cutback bitumen mixes required for extended stockpiling periods for up to 4 weeks and for very cold weather conditions.

802.07 BINDER QUALITY

Cutback bitumen that has been stored at elevated temperatures for more than 1 week shall be tested for compliance with Clause 802.05 and if necessary adjusted by the addition of cutter and subsequent circulation to produce a homogeneous mixture.

802.08 MIXING AND MIXING TEMPERATURES

The temperature of the aggregates and cutback bitumen at the time of mixing shall be sufficiently high to permit mixing as specified.

At no time shall temperatures of materials exceed the following:

Class 170 Bitumen	185°C
Cutback Bitumen	See Table 802.081
Aggregates Delivered into Mixer	Shall not exceed the maximum temperatures of the relevant cutback bitumen used or 100°C for bitumen emulsion binder.

At the time of mixing the temperature of the cutback bitumen shall be within the range specified in Table 802.081.

Table 802.081

Grade of Cutback Bitumen	Binder Temperature	
	Mixing Range °C	Maximum Storage Temperature °C
AMC 2	60 - 80	100
AMC 3	75 - 95	115
AMC 4	90 - 115	135
AMC 5	100 - 125	150
AMC 6	120 - 145	160

The combined aggregates, including filler, and binder shall be thoroughly mixed in the correct proportions until at least 90% of the coarse aggregate particles are fully coated.

Except for bitumen emulsion mixes the moisture content of the mix shall not exceed 1.5%.

A maximum moisture content of 2.5% may be permitted by the Superintendent provided that an approved adhesion agent is added to the binder at the rate of 0.5% by mass of binder.

802.09 BITUMINOUS COLD OR WARM MIX RECYCLED FROM RECLAIMED ASPHALT PAVEMENT

Unless otherwise specified, Reclaimed Asphalt Pavement may be re-cycled by adding it to new mix during the mixing process subject to the requirements of this clause being met.

All cold and warm mixes Reclaimed Asphalt Pavement shall comply with all aspects of Section 802 for the size and type of mix specified for use.

Reclaimed Asphalt Pavement shall consist of milled or excavated asphalt pavement free of foreign material such as unbound granular base, broken concrete or other contaminants and shall be crushed and screened to a maximum size not exceeding the size of mix produced.

The manufacturing process shall provide for addition of Reclaimed Asphalt Pavement to a batch plant pugmill or drum mixer separately from other mix components by a method that avoids damage to the mix by overheating.

802.10 FREQUENCY OF INSPECTION AND TESTING AT THE MIXING PLANT

The Contractor shall test production at a frequency which is sufficient to ensure that all material supplied under the Contract complies with specified requirements. The frequency shall not be less than that shown in Table 802.101, except that the Superintendent may agree to a lower frequency where the Contractor has implemented a system of statistical process control and can demonstrate that such lower frequency is adequate to assure the quality of the product.

Table 802.101

Checks Required	Minimum Frequency
Scrutiny for segregation, uncoated particles, separated bitumen, excess bitumen or overheating before despatch from the plant	Each loaded truck
Temperature of asphalt before despatch from the plant	Each loaded truck or at intervals of 15 minutes if more than one truck is despatched in 15 minutes
Unsound Rock Content	One test on each component of coarse aggregate per day
Degradation Factor - Crusher Fines	At monthly intervals
Plasticity Index of crusher fines	At monthly intervals
Flakiness Index of coarse aggregate 10 mm and larger	At monthly intervals
Bitumen Content and full Sieve Analysis of asphalt (full extraction test)	One test per day

The Contractor shall make available for inspection at the plant all work sheets and results of checks carried out.

802.11 — SCHEDULE OF DETAILS — REFER TO TENDER DRAWINGS.

Mix Type	Nominal Size (mm)	Dense Graded (tonne)	Open Graded (tonne)
Cutback Bitumen — Cold/Warm Mixes			
Type 2	##:		
Type 3			
Type 4			
Type 5			
Type 6			
Bitumen Emulsion — Cold Mixes			
CAM			
Other			