



AUS-SPEC

Infrastructure Specifications

1144 Asphalt (Roadways)



1144 ASPHALT (ROADWAYS)

IMPORTANT: This document has been adapted from the NATSPEC suite of specification templates for use in the MidCoast Council area by both Council and industry. NATSPEC regularly updates the base templates (currently in April and October each year), and Council may incorporate changes into its version of AUS-SPEC from time to time. To assist in highlighting any changes made by Council to the NATSPEC templates, the following conventions are used.

- See ANNEXURE M at the end of this document which contains (where practical) MidCoast Council customisations (also known as 'office master' text). References to the Annexure are to also be inserted at relevant clauses in the main body of the document.
- Where content is added to the main body of the document, it is to be shown **in brown text like this**.
- Where content is deleted or excluded from the main body of the document, it is to be shown ~~struck through like this~~. Such clauses are to have no effect.

Where there is a conflict between main body text and MidCoast Council specific clauses, Council's specific clauses shall prevail.

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide asphalt for roadways and related pavement applications, as documented.

1.2 PRECEDENCE

General

Schedule of job details: If there are conflicts between the requirements of this worksection and the **ANNEXURE - SCHEDULE OF JOB DETAILS**, the requirements of the **ANNEXURE - SCHEDULE OF JOB DETAILS** apply.

1.3 CROSS REFERENCES

General

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- 0136 General requirements (Construction).
- 0152 Schedule of rates (Construction).
- 0161 Quality management (Construction).
- 1101 Traffic management.
- 1141 Flexible pavement base and subbase .
- 1143 Sprayed bituminous surfacing.

1.4 STANDARDS

General

Asphalt: To Austroads AGPT04B.

Flexible pavements: To Austroads AGPT02 clause 3.15.

Asphalt pavement surfacing: To Austroads AGPT03 Section 5.

1.5 INTERPRETATION

Abbreviations

General: For the purposes of this worksection the abbreviations given below apply:

- ~~DGA: Dense graded asphalt.~~ (Not used – see Section 3.5 Mix design - general)
- ~~FGGA: Fine gap graded asphalt.~~ (Not used)

- LTA: Light traffic asphalt. (Not used)
- OGA: Open graded asphalt. (Not used)
- PAFV: Polished aggregate friction value.
- PMB: Polymer modified binder.
- RAP: Reclaimed asphalt pavement.
- RPM: Reflectorised pavement marker.
- SMA: Stone mastic asphalt. (Not used)
- UTA: Ultra thin asphalt. (Not used)

Definitions

General: For the purpose of this worksection the definitions in Austroads AP-C87 and the following definitions apply:

- Added filler: Mineral matter, suitable for use in asphalt – at least 75% of which is finer than 75 µm and all of which is finer than 600 µm – which is added to the combined aggregate of an asphalt mix. Typical materials include hydrated lime, flyash, cement, cement works flue dust, ground limestone and rock dust other than that which occurs as a natural component of the combined aggregate.
- Bituminous emulsion: A dispersion of one liquid within another where the dispersed phase is a bituminous binder and the continuous phase is water
- Bitumen: Bituminous materials obtained by processing the material obtained from the refining of naturally occurring crude petroleum.
- Coarse aggregate: A general term for aggregates substantially retained on a sieve of specified size, commonly 4.75 mm.
- Fine aggregate: A general term for aggregate that substantially passes the 4.75 mm.
- Mineral filler: A fine material, the majority of which passes a 75 µm sieve, derived from aggregate or other similar granular material.
- Mix design: The designed portion of constituent materials comprising the type and source of components, target grading, binder content and volumetric properties of the mix.
- Polymer modified binder: A binder consisting of polymeric materials dispersed in bitumen with enhanced binder performance for particular applications.
- Production mix: Mix produced in the plant and delivered to the site in a workable condition suitable for stockpiling, spreading and compaction.
- Warm mix asphalt: Asphalt that is produced and placed at a lower temperature than hot mix asphalt by the use of additives and/or production processes that allow the temperature of the asphalt to be reduced.

1.6 TOLERANCES

Level

Each course of asphalt: ± 10 mm.

Wearing course placed against kerb and channel: ≤ 5 mm above the lip of the channel.

Thickness

Average total compacted thickness of the combined asphalt courses: Not less than the documented thickness.

Average thickness of any individual course: Not less than the documented thickness by more than 10%.

Surface shape tolerance table

Layer	Deviations below 3 m straightedge (mm)			
	Heavy and very heavy traffic roads		Medium and light traffic roads	
Wearing course	5	7	7	10
Intermediate and base	8	12	12	16

Note: Apply straightedge testing to any point in any direction on the tested layer.

1.7 SUBMISSIONS

Designer: A Professional engineer (see 0010 Quality requirements for design worksection definition) or alternatively a person who has 5 years' experience specialising in selection and specification of asphalt works. Submit proof of qualifications and experience along with the design.

Execution details

Spreading at low temperatures: If proposed, submit details of procedures.

Joints: Submit plans showing joints locations.

RAP management plan: Submit a plan with details of procedures for acceptance, processing and material testing.

Products and materials

Mix design: Submit details of the following for each asphalt mix:

- Type and source of constituent materials: Including for aggregates, fillers, binders and binders.
- Proportions of constituent materials used: Including binders, bituminous emulsion content, adhesion agents and additives.
- The combined aggregate particle size distribution as a single grading (not a range).
- Nominal size of the design mix.
- Test certificates: Submit evidence of conformity from an Accredited Testing Laboratory (for the required test method) for each constituent (aggregates/mineral fillers/binders/additives) including the following:
 - . Aggregates: Quality and grading.
 - . Blended aggregates: Proportions of the various sizes, including coarse aggregates.
- Trial mix testing results for review and approval.
- Mixes incorporating more than 30% RAP: Submit mix details including manufacturing plant, quality control procedures, and technical and performance data.
- ~~— Fine gap graded asphalt: If alternative particle size distribution is proposed, submit details for approval demonstrating conformance with the volumetric properties in **Fine gap graded asphalt mix table**.~~

Production mix test results: For each production batch or run of mix from the plant, submit evidence of conformity to the approved mix design and **MIX PROPERTIES** (for the appropriate asphalt type), including for:

- Grading.
- Binder content.
- Maximum density.
- Air voids.
- Laboratory compaction method used.

Records

Daily works record: Contractor to submit records for countersigning with the following:

- **ANNEXURE – ASPHALT WORK RECORD SCHEDULE**, completed each day of the work performed.
- Asphalt delivery dockets: Indicate the time and date of mixing, registration or delivery truck fleet number and mass of each truck load, measured batch loads, size and type of asphalt, class of binder/name of modified binder, temperature of the load and time of delivery.
- After finishing each asphalt pavement course:
 - . Provide survey certificate demonstrating compliance with surface level and thickness requirements.
 - . Provide inspection record verifying compliance with surface finish, shape, alignment and width requirements.
 - . Provide lot diagram updated to show bounds of lots.
 - . Provide lot register updated to record: Lot numbers, Delivery docket numbers, Lot volumes and Number of tests required for lot and specified test compliance criteria.
- Review of test results:
 - . Provide test certificates verifying compliance with specified compaction requirements.

- Lot package closures: Provide lot package closure certificates for the work lots covered by this ITP confirming that:
 - . All inspections have been completed.
 - . All tests have been completed and the results recorded on the lot record.
 - . All non-conformances have been notified.
 - . Non-conformances that have not been closed are recorded in the defects register.
 - . All changes to design details have been reviewed and approved in accordance with requirements, and these have been recorded and certified on a marked up copy of the relevant drawings (interim as built drawings) with a reference to the applicable design change notice or survey certificate.
 - . The complete set of construction records and as built drawings are **included within the handover documents**.
 - . The lot package has been closed.

Tests

Results: Submit results of testing to **ANNEXURE – MAXIMUM LOT SIZE AND MINIMUM TEST FREQUENCIES**.

Frequency of sampling: Submit proposal to vary frequency to correct non-conformance.

Variations

Approved mix design: Submit details, of proposed changes to the approved mix design, including its method of production, constituent material supply source, and alterations to RAP content, if applicable.

1.8 INSPECTIONS

Notice

General: Give notice so that inspection may be made of the following:

- Production plant and trucks: Asphalt production and delivery equipment before start of production mix and delivery to site.
- Sprayer calibration: Before start of spraying.
- Mobile equipment: Equipment condition before using.
- Surface preparation: Completed surface preparation, including repair of surface defects.
- Base gravel: Confirm that the base gravel has been prepared and approved for sealing.
- Spreading and compaction: Completed surfacing.
- Non-conforming sections: Completed replacement and rectification of non-conforming sections.

2 PRE-CONSTRUCTION PLANNING

2.1 ROAD OCCUPANCY

Road occupancy licensing

Requirement: Before commencement, obtain a **Roads Act (Section 138) permit** for:

- **local roads for the area of work: from Council as the roads authority.**
- **Classified Regional roads: Obtain a permit from Council and concurrence from TfNSW.**
- **Classified State roads: Obtain a permit from Council, and obtain concurrence and a Road Occupancy Licence from OPLINC (TfNSW Online PLanned INCIDENT system).**

2.2 PLANT AND EQUIPMENT

Plant

Operation: Conform to statutory environmental regulations.

3 MATERIALS

3.1 AGGREGATES

Properties and source

Properties and assessment: To Austroads AGPT04J.

Material source: Obtain each individual component of coarse and fine aggregates from the same sources as materials in the approved mix design.

Coarse aggregates

Properties: To AS 2758.5 and the **Other coarse aggregate properties table**.

Other coarse aggregate properties table

Test property	Test value	
	Heavy/very heavy traffic mix types	Other mix types
Shape testing: ⁽¹⁾ - Particle shape 2:1 ratio or - Flakiness Index	25 25	35 35
Weak particles (% maximum) ⁽²⁾	1	1
Water absorption (% maximum)	2.5	2.5
Polished stone value or polished aggregate friction value of wearing course asphalt	48 minimum	44 minimum
Notes: 1. Select only one type of shape test to be performed. 2. Weak particles test not required if unsound stone content is tested.		

Fine aggregates

Properties: Clean, hard, durable and free from lumps of clay and other aggregations of fine materials, organic material and other deleterious materials.

Soundness tested to AS 1141.24: ≤ 12% weighted loss.

Granulated glass aggregate

Material specification: to TfNSW specification 3154.

Composition limits: Make sure the proportion of granulated glass aggregate does not exceed the maximum proportions specified in the relevant TfNSW asphalt specification (R116 to R126).

Nominal size: Use granulated glass of granular form having a maximum nominal size of 5 mm.

Contaminants: Make sure the granulated glass aggregate is free from contaminants and any putrid odour.

Test: Test each type and source of granulated glass separately.

Appearance: Maintain material conformity and uniform appearance for the duration of the work.

Granulated glass is primarily crushed container glass. Do not include glass from ceramics; cathode ray tubes; fluorescent light fittings and laboratory glassware.

Properties: Conform to the following properties of glass:

Property	Test method
Particle size distribution	AS 1141.11.1
Material finer than 75 µm	AS 1141.12
Particle density and water absorption	AS 1141.5

Mineral fillers

Properties: Added filler consistent in mineral composition; dry; and free from lumps, clay, organic matter or other materials deleterious to asphalt to the **Added filler materials table**.

Added filler materials table

Material	Property ⁽¹⁾
Hydrated lime	To AS 1672.1
Fly ash	To AS/NZS 3582.1
Cement kiln dust	Solid material extracted from the flue gases in the manufacture of Portland cement, with maximum water soluble fraction of 20% (by mass) and conforms to the Grading limits for ground limestone and cement kiln dust filler materials table .

Material	Property ⁽¹⁾
Slag	To AS 3582.2
Ground limestone	Rock dust derived from ground limestone conforming to the Grading limits for ground limestone and cement kiln dust filler materials table .
Cement	To AS 3972
Notes:	
1. Provide test certificates verifying conformance, tested to the Combined filler materials tests table .	
2. Rock dust not derived from the other aggregate components in the mixture: May be used as added filler if they are derived from materials that conform to AGGREGATES .	
3. Where the AS 1672 indicates Loss on Ignition testing this is not required for fillers used in asphalt.	

Grading limits for ground limestone and cement kiln dust filler materials table

AS sieve size (mm)	% passing sieve size (by mass)
0.600	100
0.300	95 – 100
0.075	75 – 100

Combined filler material tests table

Filler type	Test type	Test property
All	Voids dry compacted filler	≥ 38%
All	Moisture content	Maximum 2%

3.2 BINDERS

Bitumen

Bituminous binders: To Austroads AGPT04F.

Classification and properties of bitumen: To AS 2008.

Other binders

Polymer modified binders: To [TfNSW specification 3252](#) or Austroads ATS 3110.

Crumb rubber modified binders: To [TfNSW specification 3256](#), or ATS 3110 for dense graded asphalt mixes and light traffic asphalt (~~DGA and LTA~~).

Crumb rubber particles in dry mix process: Provide Size 30, to Austroads ATS 3110 Table 8.4.

Bituminous emulsion tack coat

Bituminous emulsion: To AS 1160. Select a grade of bituminous emulsion that provides a strong bond between the existing surface and new asphalt layer.

Additives

Type and proportion: To the manufacturer's recommendations.

Liquid adhesion agents: Use liquid adhesion agents to improve the moisture sensitivity of dense graded asphalt mixes if the TSR value is < 80%.

Warm mix asphalt additives

Application: Add warm mix asphalt additive to reduce the asphalt manufacturing temperature and/or to improve workability during paving and compaction.

Rejuvenating agents

Mixes incorporating recycled asphalt: Add asphalt rejuvenating oil to dense graded asphalt and light traffic asphalt mixes containing > 30% RAP such that the binder blend complies with the specified viscosity requirements. Design a binder blend to a specified viscosity value as detailed in the AAPA RAP Management Plan.

3.3 RECLAIMED ASPHALT PAVEMENT

Properties and processing

Reclaimed asphalt pavement: Reclaimed Asphalt Pavement: RAP properties and processing requirements will comply with the Model Reclaimed Asphalt Pavement Management Plan, published by the Australian Asphalt Pavement Association (AAPA).

3.4 TESTING

Quality

Requirement: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

3.5 MIX DESIGN - GENERAL

Asphalt mixes

Mix types: For the asphalt mix type (e.g. AC20) specified on the Contract Drawings, conform to the relevant TfNSW asphalt specification (R116 to R126) and any project-specific details provided at **ANNEXURE - SCHEDULE OF JOB DETAILS**:

- Dense graded asphalt (DGA), also called asphaltic concrete (AC).
- Stone mastic asphalt (SMA).
- Open graded asphalt (OGA).
- Fine gap graded asphalt (FGGA).
- Light traffic asphalt (LTA).
- Ultra-thin asphalt (UTA).

Asphalt courses: Provide the following asphalt in the pavement structure, as Documented:

- Wearing or surface course.
- Intermediate course.
- Base course.
- Regulating, levelling or corrective course.

Dense graded asphalt mixes: Provide mix appropriate to the TfNSW pavement traffic category required in **ANNEXURE - SCHEDULE OF JOB DETAILS**.

3.6 MIX DESIGN - AGGREGATE GRADING AND BINDER CONTENT

General

Combined aggregate grading (including filler) and binder content: To the relevant TfNSW asphalt specification (R116 to R126) matching the asphalt type shown on the Contract Drawings. The following tables are not used in the MidCoast area.

~~Dense graded asphalt (DGA) – Medium, heavy and very heavy traffic wearing course and base course mix table (Not used)~~

AS sieve size (mm)	Mix designation		
	DGA10 ^(†)	DGA14 ^(†)	DGA20 ^(†)
-	Percentage passing by mass		
53.0	–	–	–
37.5	–	–	100
26.5	–	100	90–100
19.0	100	90–100	73–88
13.2	90–100	71–86	58–76
9.5	72–83	58–83	47–67
6.7	54–71	46–64	37–58
4.75	43–61	37–55	30–50
2.36	28–45	24–42	20–37
1.18	19–35	15–32	13–28
0.600	13–27	10–24	9–22
0.300	9–20	7–17	6–16

AS sieve size (mm)	Mix designation		
	DGA10 ⁽¹⁾	DGA14 ⁽¹⁾	DGA20 ⁽¹⁾
0.150	6—13	4—12	4—10
0.075	4—7	3—6	3—6
Binder content (% by mass)	4.8—6.0	4.5—5.8	4.3—5.5
Notes:			
1. Mix designation: Nominal mix size.			

Light Traffic Asphalt (LTA) – Light traffic wearing course mix table (Not used)

AS sieve size (mm)	Mix designation			
	LTA5 ⁽¹⁾	LTA7 ⁽¹⁾	LTA10 ⁽¹⁾	LTA14 ⁽¹⁾
Percentage passing by mass				
19.0	–	–	–	100
13.2	–	–	100	90—100
9.5	100	100	90—100	72—89
6.7	98—100	85—100	68—87	54—79
4.75	85—100	70—87	50—76	43—69
2.36	55—75	44—65	32—57	28—53
1.18	38—57	29—48	22—42	19—40
0.600	26—43	19—35	15—31	13—30
0.300	15—28	12—25	10—23	9—22
0.150	8—18	8—16	6—14	6—15
0.075	4—11	5—8	4—7	4—7
Binder content (% by mass)	6.0—7.0	5.5—7.0	5.0—6.5	4.0—6.3
1. Mix designation: Nominal mix size.				

Open graded asphalt (OGA) mix table (Not used)

AS sieve size (mm)	Mix designation	
	OGA10 ⁽¹⁾	OGA14 ⁽¹⁾
Percentage passing by mass		
19.0	–	100
13.2	100	85—100
9.5	85—100	45—70
6.7	35—65	25—45
4.75	20—45	10—25
2.36	10—20	7—15
1.18	6—14	6—12
0.075	2—5	2—5
Binder content (% by mass) ⁽²⁾	5.0—6.5	4.5—6.0
Notes:		
1. Mix designation: Nominal mix size.		
2. Bitumen content: Expressed as a percentage of the total mix by mass.		

Stone mastic asphalt (SMA) mix table (Not used)

AS sieve size (mm)	Mix designation		
	SMA7 ⁽¹⁾	SMA10 ⁽¹⁾	SMA14 ⁽¹⁾
	Percentage passing by mass		
19.0	–	–	100
13.2	–	100	90–100
9.5	100	90–100	30–55
6.7	85–100	30–55	20–35
4.75	35–55	20–40	18–30
2.36	17–35	15–28	15–28
1.18	16–28	13–24	13–24
0.600	12–24	12–21	12–21
0.300	10–20	10–18	10–18
0.150	8–16	9–14	9–14
0.075	8–13	8–12	8–12
Binder content (% by mass)	5–7.5	6.0–7.0	5.8–6.8

(1) Mix designation: Nominal mix size.

Fine graded asphalt (FGGA) mix table (Not used)

AS sieve size (mm)	Mix designation	
	FGG7 ⁽¹⁾	FGG10 ⁽¹⁾
	Percentage passing by mass	
13.2	–	100
9.5	100	85–100
6.7	85–100	60–86
4.75	65–85	55–74
2.36	55–72	50–70
1.18	45–65	45–65
0.600	30–60	30–60
0.300	18–40	18–40
0.150	8–18	8–18
0.075	6–12	5–11
Binder content (% by mass)	6.3–7.3	6.0–7.0

Notes:
 1. Mix designation: Nominal mix size.
 Alternative particle size distribution: Do not use without approval.

3.7 MIX PROPERTIES - GENERAL**Design criteria**

Asphalt mix sampling and compaction: To the relevant TfNSW specification for the type of asphalt being used (R116 to R126).

3.8 MIX PROPERTIES – DENSE GRADED ASPHALT**Mix design criteria**

Volumetric design criteria: To either of the following:

- ~~Dense graded asphalt (DGA) mixes prepared using gyratory compaction table.~~
- ~~Dense graded asphalt (DGA) mixes compacted by the Marshall Method (50 blow compaction) table.~~

Voids mineral aggregate (VMA): To the **Voids mineral aggregate (VMA) table**.

Minimum effective binder film index:

— High fatigue base mix: 0.01 mm.

— All other mixes: 0.0075 mm.

Dense graded asphalt (DGA) mixes prepared using gyratory compaction table

Mix type		Laboratory compaction level (cycles)	Air voids (%)	Minimum air voids at 250 cycles (%)
Traffic classification	Application			
Light	Wearing and base	50	3.0—7.0	—
Medium	Wearing and base	80	3.0—7.0	—
	High fatigue base	80	2.0—4.0	—
Heavy	Wearing and base	120	3.0—7.0	—
	High fatigue base	80	2.0—4.0	—
Very heavy	Wearing and base	120	3.0—7.0	2.0

Dense graded asphalt (DGA) mixes compacted by the Marshall Method (50 blow compaction⁽¹⁾) table

Mix type		Air voids (%)	Minimum stability (kN)	Flow (mm)
Traffic classification	Application			
Light	Wearing and base	3.0—7.0	5.5	2—4
Medium	Wearing and base	4.0—7.0	6.5	2—4
	High fatigue base	2.0—4.0	6.5	2—4
Heavy	Wearing and base	3.0—7.0	6.5	2—4
	High fatigue base	2.0—4.0	6.5	2—4
Very heavy	Wearing and base	3.0—7.0	7.0	2—4

Notes:

- Where 75 blow Marshall compaction is used, reduce the air voids range by 1%.
- Where 35 blow Marshall compaction is used, increase the air voids range by 1%.

Voids mineral aggregate (VMA) table

Mix nominal size (mm)	VMA (% minimum)		
	Gyratory compaction	Marshall compaction (50 blow ⁽¹⁾)	
		Heavy/very heavy traffic wearing course mixes	Other mix types
7	16	—	16
10	16	16	16
14	15	15	15
20	14	14	14

Note:

- Where 75 blow Marshall compaction is used, reduce the VMA by 1%.

3.9 — MIX PROPERTIES - OPEN GRADED ASPHALT

Mix design criteria

Volumetric design criteria: To the **Level 1 open graded asphalt mix table**.

Asphalt particle loss: To the **Asphalt particle loss table**.

OGA maximum binder drain-off test value at 160°C: 0.3% by mass. A lower test temperature may be applied if the temperature is unlikely to be exceeded during manufacture and transportation.

Level 1 Open graded asphalt (OGA) mix table

Mix type/Traffic classification	Laboratory compaction		Air voids (%)
	Gyratory (cycles)	Marshall (blows)	
OGA	80	50	20–25

Asphalt particle loss table

Mix type/Traffic classification	Maximum asphalt particle loss (%) to AGPT/T236	
	Unconditioned	Moisture conditioned
OGA	20	35

3.10 MIX PROPERTIES – STONE MASTIC ASPHALT

Mix design criteria

Volumetric design criteria: To the **Level 1 stone mastic asphalt mix table**.

Minimum cellulose fibre content (by mass): 0.3% of cellulose fibre or not less than 0.5% of mineral fibre.

Binder drain-off test value at 170°C: Not more than 0.3% by mass.

Polymer modified binder: Use A15E to eliminate the risk of flushing/bleeding in wheel paths.

Level 1 stone mastic asphalt mix table

Mix type		Laboratory compaction		Air voids to AS/NZS 2891.9.2 (%)	Minimum VMA
Size (mm)	Traffic classification	Gyratory (cycles)	Marshall (blows)		
7	Light/Medium	120	50	3.0–5.0	19
10	Light/Medium	120	50	3.0–5.0	18
10	Heavy/Very heavy	120	50	3.0–5.0	18
14	Heavy/Very heavy	120	50	3.0–5.0	17

3.11 MIX PROPERTIES – FINE GAP GRADED ASPHALT

Mix design criteria

Volumetric design criteria: To the **Fine gap graded asphalt mix table**.

Fine gap graded asphalt mix table

Traffic classification	Laboratory compaction		Air voids (%)
		Gyratory (cycles)	
Light	80	50	3.0–5.0

3.12 MIX PROPERTIES – LIGHT TRAFFIC ASPHALT

Mix design criteria

Volumetric design criteria: To the **Light traffic asphalt mix table**.

Light traffic asphalt mix table

Traffic classification	Laboratory compaction		Air voids (%)
	Gyratory (cycles)	Marshall (blows)	
Light	80	50	3.0–5.0

3.13 MIX PROPERTIES – ASPHALT MIXES INCORPORATING RAP

Mix design criteria

Asphalt mixes: Incorporate RAP designed to meet the same performance criteria as asphalt mixes without RAP. **Only use RAP in conformance with TfNSW specification 3153 Reclaimed Asphalt**

Pavement Material and the relevant TfNSW asphalt specification (R116 to R126). Design mixes in conformance with the following:

- Prepare separate mix designs for mixes containing RAP.
- All the binder in the RAP contributes to the binder content of the final asphalt mix.
- ~~— Use up to 20% RAP in wearing courses.~~
- ~~— Use up to 30% RAP in base layers, unless precluded in the **ANNEXURE – SCHEDULE OF JOB DETAILS**.~~
- ~~— For DGA/LTA mixes containing up to 20% RAP by mass of total mix no intervention is required to correct for the stiffening influence of the RAP binder.~~
- ~~— For DGA/LTA mixes containing greater than 20% to 30% RAP content, allow for the use of bitumen one class lower than the normal viscosity grade, e.g. substitute C320 with C170.~~
- ~~— For RAP content greater than 30%, add binder rejuvenating agents to modify binder characteristics.~~
- ~~— Use up to 15% RAP containing polymer modified binder.~~
- ~~— Verify the viscosity of the resultant RAP/virgin binder blend to the procedures in the Model Reclaimed Asphalt Pavement Management Plan, published by the Australian Asphalt Pavement Association (AAPA).~~

4 EXECUTION

4.1 MIX DESIGN

Mix design requirements

Design limits: Design a mix that conforms to **MATERIALS** for approval.

Identification: Identify each mix design by a unique numbering system acceptable to the Principal.

Non-conforming mixes: Revise and retest mixes that do not conform to **MATERIALS**.

Previously designed mixes: Acceptable if it conforms to all the following requirements:

- **MATERIALS**.
- The work is undertaken within a two year period of the date of testing in the mix design report.
- The type, quality and source of all constituent materials remain unchanged.
- The proportions of aggregates and filler do not vary by more than 20% of the proportion of that constituent material in the original mix design.

Mix design approval

Trial mix testing: Prepare minimum 6 samples for testing at the coarse and fine limits of the particle size distribution (PSD) in a laboratory.

Approval procedure: Provide mix design details to **SUBMISSION, Products and materials** and trial mix testing results demonstrating that the design mix conforms to the requirements of this worksection over the range of PSD and binder content limits.

Testing: By an accredited laboratory and test results presented in an endorsed test report.

Non-conforming mix design: Revise and retest.

Mix design currency

Period of mix currency: Mix designs may be current for a period of up to two years where no substantial change has occurred for the source and quality of the constituent materials.

4.2 PRODUCTION MIX

Sampling and testing of asphalt production

Production mix testing: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Sampling: Prepare samples from fresh production asphalt at the asphalt plant to AS/NZS 2891.1.1. Do not mix samples. Visually inspect each loaded truck on a random basis for segregation, uncoated particles, excess bitumen or overheating, before dispatch from the plant.

Sampling and testing frequency

Frequency of production asphalt testing: To the **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**

Process control

Process control measures: Develop, document and implement suitable measures for controlling the asphalt production process. Process control measures may include the following:

- The use of statistical process control charts for some or all of the tests required.
- Rules for determining the process is under statistical control and subject to reduced testing frequency.

Production tolerances for aggregate grading and binder content table

AS sieve size (mm)/property	Maximum permitted variations from the approved mix design (% by mass)
Grading: Sieve size one size larger than nominal size	Nil
26.5 mm sieve or larger	± 7
4.75 to 19.0 mm sieve inclusive	± 7
1.18 to 2.36 mm sieve inclusive	± 5
0.300 to 0.600 mm sieve inclusive	± 4
0.150 mm sieve	± 2.5
0.075 mm sieve	± 1.5
Binder content: Percent by mass of total mix	± 0.3
Notes:	
1. Source: AS 2150 Table 13 (and TfNSW specification R116 Table 8).	

4.3 CONSTRUCTION PLANT AND EQUIPMENT**General**

Requirement: Provide all plant and equipment and labour necessary for carrying out the work in conformance to this worksection to ensure smooth, continuous asphalt placing.

Plant operating condition: Make sure all plant and equipment used on the work is suitable, conforms to the contractor's submitted quality documentation and kept in good operating condition.

Operation: Conform to statutory environmental regulations.

Faulty plant or equipment: Do not use faulty plant or equipment that may affect the product quality or operational safety.

4.4 MANUFACTURE AND STORAGE**Asphalt manufacturing plant**

Plant condition: Sound design and construction, capable of consistently producing the required asphalt mixes at a rate suitable for smooth, continuous asphalt placing.

Storage of raw materials

Storage: Store raw materials at the mixing site in sufficient quantities to allow continuous production, and effective sampling and testing before use.

Facilities for handling materials: Handle and store as follows:

- **Aggregates:** Prevent contamination and segregation. Allow for separate stockpiles of aggregates from different sources or of different sizes.
- **Fillers:** Keep dry and free flowing at all times. Separate fillers of different types.
- **Additives, including cellulose or mineral fibres:** Protect from moisture or contamination. Do not use wet materials.
- **Binders:** In thermostatically controlled binder tanks, each fitted with a thermometer that is located where it can be read conveniently and to allow for sampling of binders.

Heating binders: Do not heat bitumen binder to more than 185°C. Conform to the manufacturer's recommendations for temperature and time combinations for heating and storing multigrade and polymer modified binders.

Mixing temperature

Temperature of bitumen and aggregates: Not more than the temperature limits in the **Mixing temperatures table** at the mixing plant and when discharged from the plant.

Mixing temperatures table

Material	Maximum temperature (°C)
Class 170, Class 320, Class 450 Bitumen delivered into mixer – wearing course	165
Class 320, Class 450, Class 600 Bitumen delivered into mixer – base course	160
Polymer modified binder asphalt DGA/SMA/OGA ⁽¹⁾	175
Crumb Rubber modified asphalt DGA/OGA/GGA ⁽²⁾	165
Note: 1. Maximum temperature of open graded asphalt: Not more than that determined from the asphalt binder drain-off test. 2. Preference is to move to lower mixing temperature using warm mix technologies where appropriate to distance, ambient temperature, layer thickness and hand work.	

Moisture content

Maximum moisture content: 0.5% after completion of mixing.

Storage of mixed asphalt

Asphalt storage before delivery: If required, conform to the following:

- Store the mix in insulated bins to minimise segregation and prevent localised cooling and overheating if heating is required to maintain a uniform temperature throughout the body of mix.
- Discharging: Use a method that minimises segregation. Discard any caked or segregated portions of mix.
- Asphalt with polymer modified binders: Do not store in plant silos for more than 8 hours and to the manufacturer's recommendations.
- Open graded asphalt and stone mastic asphalt: Do not store in plant silos for more than four hours.
- Total time of storage: Not more than 24 hours without approval.

Manufacture of stone mastic asphalt

~~Fillers systems: Design or modify to provide for the appropriate quantity of added filler. In drum mix plants, minimise loss of filler by feeding direct into the mixer alongside addition of binder.~~

~~Fibres: Add in a way that allows good dispersion and prevent loss through dust collection systems and damage from overheating.~~

~~Increase mixing times: Allow if required for adequate dispersal and mixing of fibres.~~

Asphalt mixes incorporating reclaimed asphalt pavement (RAP)

RAP materials: Use RAP from stockpiles that have been tested for grading, moisture content and binder content and is consistent with the materials used in the approved mix design.

Batch mixing plants: Incorporate the RAP by one of the following methods:

- Meter into the asphalt plant after heating and drying of aggregates.
- Add directly to the weigh hopper with the other aggregate materials, for each batch.
- Weigh separately and add directly to the pugmill.

Batch mixing time: If necessary, increase mixing time to allow adequate heat transfer and dispersion of RAP.

Drum mix plants: Protect RAP from excessive temperatures at drum entry point and shield from direct flame contact.

4.5 DELIVERY**Transportation**

Requirement: Transport asphalt as follows:

- Vehicle body: Keep the inside of vehicle bodies clean and coat with a thin film of an appropriate release agent to prevent asphalt sticking to the body. Remove surplus release agent before loading asphalt into the vehicle.
- Protection: After loading with asphalt, cover the vehicle body to prevent contamination and reduce the mix cooling rate.

- Vehicle insulation: Insulate vehicles if the haul length or weather condition may cause the asphalt temperature to drop below the required placing temperature, or where excessive local cooling of the mix may occur.
- Transportation operation: Program so that operations allow for continuous placing of asphalt.

Asphalt work records

Requirement: Record the details of the work performed each day. Include delivery dockets stating the mass of each truck load.

4.6 PLACING

Surface preparation

Requirement: Clear surface of deleterious material before tack coating and placing asphalt.

Protection of services and fixtures adjacent to surfacing area

Protection: Prevent tack coat, binder, aggregate, asphalt or other material used on the work from entering, adhering or obstructing gratings, hydrants, valve boxes, inspection pit covers, access chamber covers, bridges, or culvert decks, kerbs and other road fixtures.

Cleaning: Immediately after spreading the asphalt, clean off and remove any residual materials from services and road fixtures.

Initial seal

Requirement: As documented, before asphaltting, perform an initial seal for granular pavements to 1143 Sprayed bituminous surfacing.

Tack coating

Application: Apply tack coat to the cleaned surfacing area before placing asphalt as follows:

- Tack coat material: Use a bitumen emulsion that conforms to AS 1160, at a breaking rate suitable for the climatic and surface conditions so that the coating surface is fully broken, free of surface water and intact before spreading asphalt.
- Application rate of residual binder: Apply at a uniform rate 0.20 to 0.30 L/m².
- Application method: Apply tack coat by spray bar fitted to a mechanical sprayer. Use hand spraying only in areas where it is impracticable to use a spray bar.
- Protection of adjacent works: Protect finished surfaces of kerbs, channels, adjoining structures, traffic and parked vehicles from tack coat spray. However, ensure that joints, cut-ins and other surfaces (on pits, kerb or the like) that will contact the final asphalt layers are tack coated.

Tack coat omission: Coating may be omitted if spreading asphalt over clean, freshly placed asphalt, or cleaned, fresh initial sealed surfaces (preferably do not tack coat fresh initial seals). Old seals are to be tack coated.

Ultra-thin surfacing materials application rate: Nominate application rate of tack coat and modify the tack coating procedure to suit.

Application rates more than 0.5 L/m²: Apply through a spray bar mounted directly on the asphalt paver, immediately ahead of the spreading of asphalt.

Asphalt spreading temperatures (for densely graded asphalt) table

Road surface temperature (°C) ⁽¹⁾	Minimum mix temperature (°C) ⁽²⁾			Range of mix temperature (°C) ⁽³⁾
	< 30 mm ⁽⁴⁾	30 – 40 mm ⁽⁴⁾	41 – 100 mm ⁽⁴⁾	> 100 mm ⁽⁴⁾
5 – 10	See note 5	See note 5	145	135 – 150
10 – 15	150	145	140	130 – 145
15 – 25	150	145	135	125 – 140
> 25	150	145	130	120 – 135

Notes:

1. Generally applicable to the coolest area of the pavements, e.g. shade areas.
2. Applicable to Classes 170, 320 and 450 bitumen binders. If using Class 600, multigrade, or PMBs, allow for temperatures 5 to 10°C higher than those shown.
3. Maximum temperatures apply when placing thick layers, to avoid excessive displacement under rolling.
4. Layer thickness.

Road surface temperature (°C) ⁽¹⁾	Minimum mix temperature (°C) ⁽²⁾			Range of mix temperature (°C) ⁽³⁾
	< 30 mm ⁽⁴⁾	30 – 40 mm ⁽⁴⁾	41 – 100 mm ⁽⁴⁾	> 100 mm ⁽⁴⁾
5. If placing asphalt in thin layers under cool conditions is required, consider mix workability, asphalt temperature, compaction techniques and any other factor that may cause cooling from wind or moisture as this may adversely affect the ability to achieve proper compaction, joints and surface finish quality. 6. If placing of asphalt over a previous layer that has not cooled below about 65°C, adjust mix temperatures. 7. If warm mix asphalt (WMA) is used, the temperatures required can be reduced by 25°C to 30°C up to layer thicknesses of 100 mm. The minimum temperature of WMA for layer thicknesses of over 100 mm may be reduced by up to 15°C.				

Spreading

Placing: Place asphalt with a self-propelling paving machine except where the use of a paver is impracticable.

Ambient conditions for placing: Place asphalt in the following conditions:

- Surfacing area: Dry and free from standing water.
- Surface temperature: Minimum 5°C.
- Pavement surface temperature for placing wearing course asphalt: Minimum 10°C. If placing at lower temperatures is required, obtain approval of procedures for compensating rapid cooling of asphalt materials.

Layer thickness: To the **Asphalt mix requirements table**.

Level control: To the **ANNEXURE - SCHEDULE OF JOB DETAILS**. If no method is documented, apply suitable automatic or manual screed level controls using an averaging beam or electronic device.

Spreading: Spread asphalt without tearing or segregation, in conformance with the following:

- Paving speed: Match the paving machine speed to the supply rate so that the number of paving stops is minimised.
- Paving stops: Do not leave the paving machine stationary for prolonged periods where the screed box is in contact with the previously placed asphalt or if there is loose asphalt in front of the screed.

Adjoining existing work

New work adjoining to existing work or structure: Align the horizontal location of any point on the pavement with the existing pavement structure.

Compaction

Timing: Uniformly compact asphalt as soon as the asphalt has cooled sufficiently to support the rollers without displacement.

Rollers: Use suitable sized steel wheeled or vibratory rollers and pneumatic tyred rollers to achieve compaction.

Open graded, stone mastic asphalt and crumb rubber asphalt: Compact asphalt as follows:

- Do not use pneumatic tyred rollers.
- Use a method that does not damage the aggregates or draw binder to the surface of stone mastic asphalt.
- Apply sufficient vibratory steel drum roller passes using high frequency and low amplitude to achieve compaction.

Joints

Joint location: Plan the joint locations before work commences and provide joints as follows:

- Longitudinal joints: Provide if the width of the pavement requires more than one paving run.
- Transverse joints:
 - At the completion of each day's paving operations.
 - Where a delay in paving operation may cause the asphalt to cool and adversely affect placing.
 - If a break in a longitudinal run is required.
- Minimise the number of joints.

- Shape requirements: To the **Surface shape tolerance table**.

Longitudinal joints: Locate joints as follows:

- Align joints in the wearing course with traffic lane line markings.
- Offset joints from layer to layer by minimum 150 mm, provided that no joint is placed directly below a trafficked wheel path.

Transverse joints: Offset joints by minimum 2 m in adjoining paving runs and from layer to layer.

Hot joints: If placing asphalt against the edge of a preceding lane that has not cooled below 100°C, construct hot joints by leaving a 150 mm strip of asphalt unrolled along the free edge until the adjoining lane is placed. Compact the unrolled strip simultaneously with the material in the adjoining lane.

Warm joints: If placing asphalt against the edge of a preceding lane that has not cooled below 60°C, construct warm joints by rolling the full width of the first lane being placed, before placing the adjoining lane.

Cold joints: If placing asphalt against the edge of a preceding lane that has cooled below 60°C, construct cold joints by:

- Overlapping the previous edge by 25 to 50 mm.
- Pushing back the overlap using lutes, immediately after spreading, forming a slight ridge that is compacted with the steel wheel roller.

4.7 FINISHED PAVEMENT PROPERTIES

Dimensions and levels

Requirement: Provide finished pavement to level, alignment, thickness and shape to **TOLERANCES**.

Density assessment

Lot conformance: Assess the lot characteristic value of in situ air voids.

Characteristic value of in situ air voids: Calculate the lower (V_L) and upper (V_u) characteristic values of in situ air voids of the lot as follows:

$$V_L = \bar{a} - ks$$

$$V_u = \bar{a} + ks$$

where:

\bar{a} = arithmetic mean of the in situ air voids expressed as percentage for the lot.

s = standard deviation of the air voids expressed as percentage for the lot.

k = factor that depends on the number of tests as documented in **Acceptance constant table**.

$$a = \left(\frac{MD - BD}{MD} \right) \times 100\%$$

and

MD = mean maximum density of the production lot to AS 2891.7.1 or AS/NZS 2891.7.3.

BD = bulk density of the lot to AS/NZS 2891.9.2 for cores or AS/NZS 2891.14.2 and AS/NZS 2891.14.3 for nuclear density gauge.

Characteristic value of in situ air voids for dense graded wearing course and base course asphalt table

Asphalt type and thickness (mm)	Upper limit characteristic value (%)	Lower limit characteristic value (%)
All heavy and very heavy traffic asphalt wearing courses	8	3
Medium traffic wearing course	8	3
Light traffic wearing course	7	3

Acceptance constant table

Number of tests or measurements	Acceptance constant (k)
3	0.535
4	0.617
5	0.675
6	0.719
7	0.755
8	0.783
9	0.808
10	0.828
15	0.901
20	0.947

Ride quality

Requirement: Test and report on the surface wearing course longitudinal profile to Clause M4. Maximum acceptable values for asphalt are 40 to 50 NAASRA roughness counts or 1.6 to 2.0 International Roughness Index (IRI_s).

4.8 FIELD TESTING FOR PLACING AND FINISHED PAVEMENT**Quality**

Requirement: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Frequency of in situ asphalt testing: To **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Dimensions and levels

Course position: **Determine** using the following method:

- Levels: Survey.
- Alignment: Survey.

Thickness: If confirmation of asphalt thickness is required, determine it by coring to a recognised random sampling plan.

- Coring of asphalt: To AS 2891.1.2. Determine layer thickness before trimming of cores. Do not trim cores by more than 5 mm.

Density testing

Timing: Perform testing as soon as practicable after completion of work.

Location: Choose the location of each in situ density test by a method of random stratified sampling.

Layer thickness: Allow as follows:

- For core sample tests: The layer thickness is the mean thickness of the core samples.
- For nuclear and impedance density gauge tests: The layer thickness is the nominal thickness.

Core holes: Repair all holes using a method compatible with the pavement from which cores have been taken.

Restrictions: Do not perform density testing on the following:

- Lots less than 30 t.
- Layers with a nominal thickness equal to or less than 30 mm.
- Layers with a nominal thickness less than 2.5 times the nominal mix size, or open graded asphalt.

Bulk density: Determine from either of the following methods:

- Pre-saturation method: To AS/NZS 2891.9.2.
- Nuclear density measurement: To AS/NZS 2891.14.2 using the calibrated procedure described in AS/NZS 2891.14.3.

Maximum density: To AS 2891.7.1 or AS/NZS 2891.7.3.

Reference density: To AS/NZS 2891.14.5 calculate as the mean maximum density of the lot, for the purpose of in situ air voids calculations.

Completion tests

Surface shape: Deviation from 3 m straightedge test.

5 ANNEXURES**5.1 ANNEXURE - SCHEDULE OF JOB DETAILS****Asphalt mix requirements table**

Item	Layer/course	Asphalt mix type	Traffic classification	Binder class/type	Nominal mix size	Layer thickness

Notes to schedule:

- Asphalt mix requirements: See BINDERS and MIX DESIGN - AGGREGATE GRADING AND BINDER CONTENT and the MIX PROPERTIES clauses.
- Asphalt mix type: e.g. AC7, AC20 .
- Traffic classification: e.g. Light, Medium, Heavy, Very heavy duty.
- Binder type: e.g. Bitumen, PMB, Crumb rubber modified.
- Binder class: e.g. 170, 320, 600. Nominal mix size: e.g. 7, 10, 14, 20 or 28. Layer thickness: May vary with site conditions, traffic classification, size and pavement layer.

Special job requirements

The Works are to be completed in accordance with environmental (e.g. DA or REF) and road authority permit conditions, along with any additional requirements as Documented or set out by the Superintendent below:

- Special design criteria
- Coarse aggregate
- Approval of job mix
- Submission of samples
- Method of level control
- Measurement of ride quality
- Density testing
- Use of Reclaimed Asphalt Pavement (RAP)
- Non-conforming materials
- Removal of thermoplastic or other line marking
- Additional pavement preparation
- Other

5.2 ANNEXURE - ASPHALT WORK RECORD SCHEDULE

CLIENT:

Date: _____ Contract No: _____ Work location: _____ km to: _____ km

Road name: _____ Supplier: _____ From: _____ Towards: _____
 (Crossroad or landmark)

Road no.: _____ Job no.: _____ PMS/MMS segment numbers: _____

Plan no.: _____ Mix type: _____ New surfacing Resurfacing Existing surface type: _____

Delivery								Paving								Remarks		
Load no.	Time			Truck registration No.	Docket no.	Net mass (t)	Mix temp ex paver °C	Chainage		Paved width (m)	Direction with or against	Dist. from left edge to centre of run (m)	Thickness (mm)	Layer			Sample no. & lot size (tonnes) if sampled	Weather work stoppages, start & finish etc.
	Depot plant	Arrive job	Depart job					From	To					1st	2nd	3rd		

Remarks: _____

Penciller: _____ Sampling by: _____ Superintendent's _____ Contractor's _____
 Representative: (Signature) Representative: (Signature)

Affiliation: _____ Affiliation: _____

5.3 ANNEXURE - SUMMARY OF HOLD AND WITNESS POINTS

For private developments, certain Hold and Witness Points where specifically noted below require representatives of both the Superintendent and the Principal Certifier (e.g. Council) to authorise release.

Clause and description	Type*	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS, Products and materials Mix design – Type and source of constituent materials; Test certificates	H	Documentation on material type, source and test certificates as evidence of conformance for each constituent.	10 days before starting production mix	Production of mix
SUBMISSIONS, Products and materials Mix design	H	Samples, documentation and test certificates verifying the mix design meets the project requirements.	10 days before starting production mix	Production of mix
SUBMISSIONS, Tests Production mix	H	Test certificates.	7 days before ordering materials	Ordering and delivery of material
INSPECTIONS, Notice Production plant and trucks	W	Asphalt production and delivery equipment condition.	1 day before starting production mix	Asphalt production
INSPECTIONS, Notice Sprayer calibration	W	Spraying equipment condition.	1 day before spreading	Initial seal spraying
INSPECTIONS, Notice Mobile equipment	W	Equipment condition.	1 day before using equipment	Asphalt production and initial seal spraying
SUBMISSIONS, Records Daily work records	W	Completed ANNEXURE – ASPHALT WORK RECORD . Delivery dockets.	On the day of delivery	Asphalt supply
INSPECTIONS Asphalt delivery. Asphalt finishing. Asphalt tests	W	QA documentation of delivery, finishing, and testing.	7 days before finishing processes such as linemarking and RPM's	ASPHALT WORK RECORDS SCHEDULE
SUBMISSIONS, Execution details Spreading at low temperatures	H – Superintendent and Principal Certifier	If required, details of proposed procedures.	1 day before spreading	Placing/spreading
SUBMISSIONS, Execution details Joints	H	Plan of joint locations.	7 day before placing	Placing/spreading

Clause and description	Type*	Submission/Inspection details	Submission/Notice times	Process held
INSPECTIONS, Notice Surface preparation	H – Superintendent and Principal Certifier	Completed surface preparation, including repair of surface defects. Confirm base gravel is approved for surfacing to commence.	7 days before placing	Placing/spreading
INSPECTIONS, Notice Spreading and compaction	H – Superintendent and Principal Certifier	Completed surfacing.	2 days after compaction	The next lot or application of pavement marking
INSPECTIONS, Notice Non-conforming sections	W – Superintendent and Principal Certifier	Completed replacement and rectification of non-conforming sections.	1 day before the inspection	Linemarking application and opening to traffic

*H = Hold Point, W = Witness Point

5.4 ANNEXURE – MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES TABLE

Frequency of sampling and testing of constituent materials

Activity	Material properties	Maximum lot size	Minimum test frequency	Test method/Conformance assessment
Material supply	Coarse and fine aggregates Grading	1 week's production	1 per week	AS 1141.11.1
	Coarse aggregates			
	Los Angeles Abrasion (where applicable)	1 contract	1 per contract or change in materials or 6 monthly	AS 1141.23
	Unsound and marginal stone content (where applicable)		or 6 monthly	AS 1141.30.1
	Wet strength (Where applicable)		or 6 monthly	
	Wet/dry variation (Where applicable)		or 6 monthly	
	Weak particles		or 6 monthly	AS 1141.32
	PAFV		or 12 monthly	AS 1141.40, AS 1141.41 or AS 1141.42
	Water absorption and density		or 6 monthly or change in materials	AS 1141.6.1 or AS 1141.6.2
Shape testing of coarse aggregate		or 6 monthly or change in materials	AS 1141.14 or	

Activity	Material properties	Maximum lot size	Minimum test frequency	Test method/Conformance assessment
	- Particle shape 2:1 ratio - Flakiness Index			AS 1141.15
	Fine aggregates			
	Soundness	1 contract	1 per contract or change in materials	AS 1141.24
	Combined filler			
	Voids in dry compacted filler	1 contract or 1 month's production	1 per contract or 1 per month	AS/NZS 1141.17
	Added mineral filler			
	Grading	Each production batch	1 per batch or 12 monthly	AS 1141.11.1
	Voids in dry compacted filler			AS/NZS 1141.17
	Moisture content			AS 4489.8.1
	Binder			
	Bitumen	Each production batch	1 per production batch	AS 2008
	PMB		1 per production batch	Austrroads ATS 3110
	Emulsion	Each production batch	1 per production batch	AS 1160 Table A1
	RAP	As per RAP Management Plan		
	Grading	1 stockpile	1 per stockpile	AS/NZS 2891.3.1, AS/NZS 2891.3.2 or AS/NZS 2891.3.3
	Binder content	1 contract	1 per contract or change in materials	
	Mix properties			
Mix design	Approval of mix and NATA endorsed certification – supplier's documentary evidence and certification	1 contract	1 per mix	MATERIALS

Frequency of sampling and testing of production of asphalt table

Activity	Key quality verification requirements	Normal minimum frequency	Test method
Asphalt production	Grading	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.3.1
	Binder content	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.3.1 or AS/NSZ 2891.3.2 AS/NSZ 2891.3.3 or AGP/PT/T234

Activity	Key quality verification requirements	Normal minimum frequency	Test method
	Temperature	Each loaded truck or as indicated on the plant control system	
Laboratory compacted dense graded asphalt (DGA) - Voids and VMA (Not used in MidCoast area)	Marshall stability and flow (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.5
	Voids in mix (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.8
	Gyropac (80 cycles)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.2.2 AS 2891.7.1 AS/NZS 2891.9.2 AS/NZS 2891.8
	Gyropac (80 or 120 cycles)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.2.2 AS 2891.7.1 AS/NZS 2891.9.2 AS/NZS 2891.8
	Gyropac (250 cycles)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.2.2 AS 2891.7.1 AS/NZS 2891.9.2 AS/NZS 2891.8
Laboratory compacted open graded asphalt (OGA) (Not used in MidCoast area)	Voids: Gyropac (80 cycles) or Marshall (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.2.2 AS/NZS 2891.9.3 AS/NZS 2891.8
	Asphalt particle loss	One test per 300 Tonne of asphalt plant production	Austrroads AG:PT/T236
Laboratory compacted stone mastic asphalt (SMA) (Not used in MidCoast area)	Voids: Gyropac (120 cycles) or Marshall (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.2.2 AS 2891.7.1 AS/NZS 2891.9.2 AS/NZS 2891.8
Laboratory compacted fine gap graded asphalt (FGGA) (Not used in MidCoast area)	Voids in mix (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.8
	Voids: Gyropac (80 cycles)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.2.2 AS/NZS 2891.8 AS/NZS 2891.9.3

Frequency of sampling and testing of finished asphalt properties table

Activity	Characteristics	Maximum lot size	Minimum test frequency	Test method/Conformance assessment
Placing and compaction	Course position	1 day's laying	One survey point per 25 m ²	Survey (Where applicable)
	Compacted course thickness	1 day's laying	No cores below 100 m ² 3 – 6 cores above 100 m ²	Average thickness of coring to AS 2891.1.2
	In situ air voids for DGA, FGG, SMA	1 day's laying	No cores below 100 m ² 3 – 6 cores above 100 m ²	AS/NZS 2891.9.2 or AS/NZS 2891.14.2

Activity	Characteristics	Maximum lot size	Minimum test frequency	Test method/Conformance assessment
	Density ratio and percentage of air voids of in situ compacted asphalt < 40 mm	1 day's laying	No cores below 100 m ² 3 – 6 cores above 100 m ²	AS/NZS 2891.14.5
	Surface shape	1 day's laying	10 per 200 m lane length or part thereof	3 m straightedge
	Ride quality	1 day's laying	To relevant RMS test method (see Clause M4).	To Clause M4.

5.5 ANNEXURE - PAY ITEMS

This Annexure applies to Council projects. For private development works use of this schedule is optional, at the Superintendent's discretion.

Separate pay items

Requirement: Separate pay items in the **Schedule of rates** for each nominal course thickness and each nominal size and type of asphalt required.

Method

Pay items: Determine by **Measurement by mass** or **Measurement by area** and thickness, as provided in the **Schedule of rates**.

List any special job requirement as an additional separate payment items.

Standard method

Pay items	Unit of measurement	Schedule rate scope
1144.1 Mix design	Lump sum	All costs associated with mix design and control.

Measurement by mass

Pay items	Unit of measurement	Schedule rate scope
1144.2 Supply and install asphalt measured by mass unless otherwise specified in the ANNEXURE - SCHEDULE OF JOB DETAILS	Tonnes Determine the mass in tonnes from dockets supplied by the Contractor and issued at a certified weighing system by batch weights using certified scales approved by the Superintendent.	All costs associated with supply, install and finishing of asphalt.

Measurement by area and thickness

Pay items	Unit of measurement	Schedule rate scope
1144.3 Supply and install asphalt determined from measurement of area and thickness where specified in the ANNEXURE - SCHEDULE OF JOB DETAILS	Tonnes. Determine the mass in tonnes by multiplying the area and thickness determined from the dimensions on the plans or as specified for the work being measured by the density of asphalt in a lot taken as the arithmetic mean of the in situ densities of the lot.	All costs associated with supply, install and finishing of asphalt.

Non-conformance

General: Any of the following may be required for non-conforming material:

- Offset the reduced service life arising from the non-conforming material by reducing payment for the non-conforming material by the method defined in the **ANNEXURE - SCHEDULE OF JOB DETAILS**.
- Remove the non-conforming material.
- Any other remedial treatment that is expected to provide the required level of service.

Deductions for non-conforming in situ air voids

In situ air voids outside of specified limits V_U by (%)	Deduction (% of lot value)
≤ 1.0	7.5
1.0 - 2.0	30
≥ 2.0	Reject

Note: the comparable table for reference in TfNSW specifications for dense graded asphalt is R116/B.2.

5.6 ANNEXURE - REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

ARRB	2020	Sealed Roads Best Practice Guide
ARRB	2020	Unsealed Roads Best Practice Guide
AS 1141		Methods for sampling and testing aggregates
AS 1141.5	2000	Particle density and water absorption of fine aggregate
AS 1141.6.1	2000	Particle density and water absorption of coarse aggregate - Weighing-in-water method
AS 1141.6.2	1996	Particle density and water absorption of coarse aggregate - Pycnometer
AS 1141.11.1	2009	Particle size distribution - Sieving method
AS 1141.12	2015	Materials finer than 75 μm in aggregates (by washing)
AS 1141.14	2007	Particle shape, by proportional caliper
AS 1141.15	1999	Flakiness index
AS/NZS 1141.17	2014	Voids in dry compacted filler
AS 1141.23	2009	Los Angeles value
AS 1141.24	2018	Aggregate soundness - Evaluation by exposure to sodium sulfate solution
AS 1141.30.1	2009	Coarse aggregate quality by visual comparison
AS 1141.32	2019	Weak particles (including clay lumps, soft and friable particles) in coarse aggregates
AS 1141.40	2017	Polished aggregate friction value - Vertical road-wheel machine
AS 1141.41	2017	Polished aggregate friction value - Horizontal bed machine
AS 1141.42	2017	Pendulum friction test
AS 1160	1996	Bitumen emulsions for construction and maintenance of pavements
AS 1672		Limes and limestones
AS 1672.1	1997	Limes for building
AS 2008	2013	Bitumen for pavements
AS 2150	2005	Asphalt - a guide to good practice
AS 2758		Aggregates and rock for engineering purposes
AS 2758.5	2009	Coarse asphalt aggregates
AS/NZS 2891		Methods of sampling and testing asphalt
AS/NZS 2891.1.1	2013	Sampling - Loose asphalt
AS 2891.1.2	2008	Sampling - Coring method
AS/NZS 2891.2.2	2014	Sample preparation - Compaction of asphalt test specimens using a gyratory compactor
AS/NZS 2891.3.1	2013	Bitumen content and aggregate grading - Reflux method
AS/NZS 2891.3.2	2013	Binder content and aggregate grading - Centrifugal extraction method
AS/NZS 2891.3.3	2013	Bitumen content and aggregate grading - Pressure filter method

AS/NZS 2891.5	2015	Compaction of asphalt by Marshall method and determination of stability and flow - Marshall procedure
AS 2891.7.1	2015	Determination of maximum density of asphalt - Water displacement method
AS/NZS 2891.8	2014	Voids and density relationships for compacted asphalt mixes
AS/NZS 2891.9.2	2014	Determination of bulk density of compacted asphalt – Presaturation method
AS/NZS 2891.9.3	2014	Determination of bulk density of compacted asphalt - Mensuration method
AS/NZS 2891.14.2	2013	Field density tests - Determination of field density of compacted asphalt using a nuclear thin-layer density gauge
AS/NZS 2891.14.3	2013	Calibration of nuclear thin-layer density gauge using standard blocks
AS/NZS 2891.14.5	2014	Field density tests - Density ratio and percentage air voids of compacted asphalt
AS/NZS 3582		Supplementary cementitious materials
AS/NZS 3582.1	2016	Fly ash
AS 3582.2	2016	Slag - Ground granulated blast-furnace
AS 3972	2010	General purpose and blended cements
AS 4489		Test methods for limes and limestones
AS 4489.8.1	1997	Free moisture - Convection oven
Austrroads AGPT		Guide to pavement technology
Austrroads AGPT02	2017	Pavement structural design
Austrroads AGPT03	2009	Pavement surfacings
Austrroads AGPT04B	2014	Asphalt
Austrroads AGPT04F	2017	Bituminous binders
Austrroads AG:PT/T234	2005	Asphalt Binder Content (Ignition Oven Method)
Austrroads AG:PT/T236	2005	Asphalt Particle Loss
Austrroads AG:PT/T237	2005	Binder Film Index
TfNSW 3153	2020	QA Specification Reclaimed Asphalt Pavement Material
TfNSW 3154	2020	Granulated Glass Aggregate
TfNSW 3252	2020	Polymer Modified Binder for Pavements
TfNSW 3256	2020	Crumb Rubber
TfNSW R71	2020	Construction of Unbound and Modified Pavement Course
TfNSW R83	2020	Concrete Pavement Base
TfNSW R116	2020	Heavy Duty Dense Graded Asphalt
TfNSW R117	2020	Light Duty Dense Graded Asphalt
TfNSW R118	2020	Crumb Rubber Asphalt
TfNSW R119	2020	Open Graded Asphalt
TfNSW R121	2020	Stone Mastic Asphalt
TfNSW R123	2020	Thin Open Graded Asphalt Surfacing
TfNSW R126	2020	High Modulus Asphalt
RMS T182	2012	Road roughness testing (NAASRA Roughness Meter)
RMS T187	2012	Measurement of ride quality of road pavements by laser profiler
RMS T188	2012	Project ride quality (Vehicular laser profilometer)
Austrroads ATS 3110	2020	Technical specification for the supply of polymer modified binders

6 ANNEXURE M – MIDCOAST COUNCIL SPECIFIC CLAUSES

M1.	Variations to or non-conformances with Council's AUS-SPEC are to be evaluated with reference to the procedure in Council's <i>Development Engineering Handbook</i> . Acceptance is to be obtained in writing from: <ul style="list-style-type: none"> a) an authorised representative of Council's Director of Infrastructure and Engineering Services, or b) an accredited certifier where they are the Principal Certifier and hold the relevant accreditation category for the type of work. 	Variation procedure
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M2.	This specification applies in addition to any development consent (DA) conditions. If there is any inconsistency, the conditions of consent shall prevail.	DA conditions
M3.	Refer to the MidCoast Council <i>Development Engineering Handbook</i> for final inspection, works-as-executed and handover requirements.	Completion
M4.	<p>Test methods for ride quality: To RMS T182 (NAASRA roughness), T187 or T188 (International Roughness Index).</p> <p>Surface courses on new roads: Provide roughness measurement test results for review after trimming and before sealing. Results are to conform to the relevant RMS specification for the surface course material:</p> <ul style="list-style-type: none"> • Unbound and Modified Base Courses (with or without Sprayed Bituminous Seal): To Table R71/B.3. • Concrete Base Courses: To Table R83/27. • Asphalt Course: To Clause 4.7 in this worksection. RMS specifications R116, R117, R118, R119, R121, R123 or R126, as applicable to the type of asphalt used, are supplementary reference material. <p>Note: Test results generally less than or equal to 1.56m/km/lane (International Roughness Index) comply, and higher values may be acceptable in accordance with the RMS specifications. However, if specified under the Contract, an incentive payment or deduction amount is to be applied in line with the RMS values given.</p> <p>Guidance on threshold levels for maintenance intervention: Refer to ARRB Sealed and Unsealed Roads Best Practice Guides.</p> <p>Amendments: This clause is used in worksections <i>1113 Stabilisation, 1133 Plain and reinforced concrete base, 1141 Flexible pavement base and subbase, and 1144 Asphalt (Roadways)</i>.</p>	Ride quality

7 AMENDMENT HISTORY

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