CESSNOCK
CITY COUNCIL

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 Cessnock City 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) Cessnock City 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 Cessnock City 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 AS 2150 (2020) and Austroads AGPT04B (2014).

Flexible pavements: To Austroads AGPT02 (2017) clause 3.15.

Asphalt pavement surfacing: To Austroads AGPT03 (2009) Section 5.

1.5 INTERPRETATION

Abbreviations

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

- DGA: Dense graded asphalt.
- FGGA: Fine gap graded asphalt.
- LTA: Light traffic asphalt.

- OGA: Open graded asphalt.
- PAFV: Polished aggregate friction value.
- PMB: Polymer modified binder.
- RAP: Reclaimed asphalt pavement.
- SMA: Stone mastic asphalt.
- UTA: Ultra-thin asphalt.

Definitions

General: For the purpose of this worksection the definitions in Austroads AP-C87 (2015) 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 that 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.
- Nominal maximums size: Size designation of an aggregate or Asphalt mix size which gives an indication of the largest particle size present.
- 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: As documented.

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**	
	Parallel to centre line	**Transverse to centre line**	**Parallel to centre line**	**Transverse to centre line**
Wearing course	5	7	7	10
Intermediate and base	6	10	8	12
Notes: 1. Apply straightedge testing to any point in any direction on the tested layer.				

Layer	Deviations below 3 m straightedge (mm)			
	Heavy and very heavy traffic roads		Medium and light traffic roads	
	Parallel to centre line	Transverse to centre line	Parallel to centre line	Transverse to centre line
2. Surface Shape (if applicable) may not be appropriate in all overlay applications (Refer to Annexure for special requirements on shape).				

1.7 SUBMISSIONS

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: Where required submit details of the following for each asphalt mix:

- Type and source of constituent materials: Including for aggregates, fillers 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 mixes table**.

Production mix test results: For each production lot 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.

Additional requirement: Add any additional project specific testing requirements to the **ANNEXURES - SCHEDULE OF JOB DETAILS, Special job requirements**.

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: Include approved registered mix design code. 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:
  - If required, 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 confirming 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 accessible on-line.
  - . 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 paving equipment: Equipment condition before using. Inspect the screed of the paver, the wearing of the tamper and overall maintenance status of the rollers (especially for pneumatic rollers).
- 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 road occupancy license for local roads for the area of work from the appropriate road/local government authority.

- Roads shared by the state road authority: Obtain occupancy from the state road authority.

2.2 PLANT AND EQUIPMENT

Plant

Operation: Conform to statutory environmental regulations.

3 MATERIALS

3.1 ASPHALT APPLICATION AND SELECTION

General

Asphalt mixes: To AS 2150 (2020) Appendix B and Austroads AGPT04B (2014) based on the site conditions and intended use like layer thickness, nominal size designation and performance characteristics.

Asphalt application: To the **Asphalt applications table.**

Asphalt applications table

Nominal aggregate size	Typical applications
5 mm	Thin wearing course, footpaths, bikeways, recreational courts, sheet patching.
7 mm	Thin wearing course, footpaths, bikeways, recreational courts, sheet patching, and overlays in local residential streets.
10 mm	Surfacing course for roads subject to traffic loading where a minimum of 30 mm (nominal) thick asphalt surface is specified and for overlays in local residential streets.
14 mm	Surfacing course for roads subject to traffic loading where 50 mm (nominal) thick asphalt surface is specified. May be used for structural layers.
20 mm	Not suitable for surfacing layers. Generally used as structural layers for deep lift asphaltic concrete pavements.

Asphalt selection: To the **Asphalt selection table**.

Asphalt selection table

Type	Nominal size (mm)	Mix designation	Recommended use	Typical thickness (mm)
Dense-graded	5	LTA5	Wearing courses on lightly trafficked roads where high-speed skid resistance is not required and other uses such as parking areas, footpaths, private driveways, and tennis courts.	20 to 25
Dense-graded	7	LTA7	As for LTA5	25 to 35
Dense-graded	10	LTA10 or DGA10	Wearing courses for wide range of situations, e.g. roads and parking areas based on traffic category.	35 to 50
Dense-graded	14	DGA14	Wearing courses for most medium to heavy duty applications. Selection of a Polymer modified binder typically used in heavy to very heavy duty applications	45 to 70
			Intermediate courses	45 to 70
Dense-graded	20	DGA20	Not to be used as a wearing course	60 to 100
			Intermediate course - suitable mix where structural stiffness and support is needed in pavement structure for heavy duty applications	60 to 100
			Base courses. Structural stiffness can be improved with increased viscosity of binder selection e.g. container terminals and warehouse.	60 to 100
Open-graded	10	OGA10	Wearing courses where tyre splash is required to be minimal, e.g. locations involving wide pavement with slow surface water run-off, heavy rainfall and high traffic speeds. Pavements where tyre noise is required to be minimal. Polymer modified binders recommended in this application	30 to 40

Type	Nominal size (mm)	Mix designation	Recommended use	Typical thickness (mm)
Open-graded	14	OGA14	As for OGA10.	35 to 45
Stone mastic	5	SMA5	Wearing course for medium traffic providing ultra-thin flexible and durable layer with good textured surface. Polymer modified binders only in this application SMA 5 can also be used as a bottom layer SAMI and in this case C320 may be adequate	17 to 25
Stone mastic	7	SMA7	Wearing course for medium traffic providing ultra-thin flexible and durable layer with good textured surface. Polymer modified binders only in this application SMA 7 can also be used as a bottom layer SAMI and in this case C320 may be adequate	25 to 35
Stone mastic	10	SMA10	Wearing course where a durable, rut-resistant mix is required in a well textured surface in high traffic speeds. Polymer modified binders only in this application	35 to 45
Stone mastic	14	SMA14	As for SMA10 with increased texture benefit	50 to 60
Fine gap-graded	7	FGGA7	As for DGA5. Increased workability assists in achieving dense, durable surfacing.	20 to 25
Fine gap-graded	10	FGGA10	As for FGGA7.	25 to 35

This table is a guide for typical asphalt applications and may vary based on site conditions and project specific requirements.

For most wearing courses and structural asphalt applications, dense graded asphalt (DGA - LTA) mix types are used. Other mix types are used as a wearing course to provide particular surface characteristics for particular applications as follows:

Open graded asphalt (OGA): Used as a porous wearing course to reduce water spray and road-tyre noise levels on freeways and other high speed roads.

Ultra-thin asphalt (UTA): A specialty asphalt mix for placing in thin layers (12 to 20 mm compacted thickness). It uses a modified grading to improve resistance to surface shearing forces, which reduces porosity but still provides coarse textured surface. UTA must be placed in conjunction with a heavy tack coat, sprayed seal or strain alleviating membrane interlayer (SAMI) to provide strong bonding to the underlying surface.

Stone mastic asphalt (SMA): Used to provide good surface texture and good deformation resistance on heavily trafficked roads. Smaller nominal sizes can also be used as a durable, well-textured surface in lightly trafficked applications.

Fine gap graded asphalt (FGGA) provides a very fine textured surface in a mix that can be readily compacted to low air voids thereby providing good durability in lightly trafficked pavements. The grading envelope for FGGA provides for a wide choice of grading target but there is a design intent to produce a gap grading with limited intermediate sized aggregate fractions. While the grading and binder content produces a more workable mix, it can be more susceptible to deformation and is not appropriate for heavily trafficked or highly stressed areas.

See Austroads AGPT03 (2009) for a detailed guide on the selection of different wearing course asphalt mixes for particular surface characteristics. The nominal size may be determined as a function of the layer thickness or the layer thickness selected on the basis of the nominal size required for a particular application. See Dense graded mixes table for layer thickness and nominal size requirements for different uses.

3.2 AGGREGATES

Properties and source

Properties and assessment: To Austroads AGPT04J (2008).

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 (2020) 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 to AS 1141.14 (2007) or AS 1141.15 (1999): [a] Particle shape ≤ 25% at 2:1 ratio (maximum) or Flakiness Index (maximum)	 25 25	 35 35
Weak particles (% maximum) [b]	1	1
Water absorption (% maximum) [c]	2.5	2.5
Polished stone value (PSV) or polished aggregate friction value (PAFV) of wearing course asphalt	48 minimum	44 minimum
Notes: a. Select only one type of shape test to be performed. b. Weak particles test not required if unsound stone content is tested. c. Constituent materials with water absorptions exceeding the maximum may be proposed for approval with supporting data.		

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 (2018): ≤ 12% weighted loss.

Water absorption: To AS 1141.5 ≤ 3%.

Granulated glass aggregate

Dense Graded Asphalt (DGA) and Light Traffic Asphalt (LTA): Make sure the proportion of granulated glass aggregate does not exceed 10% of the total mix for mixes used in bases and no more than 2.5% for asphalt used in wearing courses.

Manufacture and supply of recycled crushed glass: To Austroads ATS 3050 (2022).

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 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 (2020)
Material finer than 75 µm	AS 1141.12 (2015)
Particle density and water absorption	AS 1141.5 (2000)

Mineral fillers

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

Added filler materials table

Material	Property
Hydrated lime	To AS 1672.1 (1997)
Fly ash	To AS/NZS 3582.1 (2016)
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**.
Slag	To AS 3582.2 (2016)
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 (2010)
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 series indicates Loss on Ignition testing this is not required for fillers used in asphalt. 4. Caution should be exercised in the selection of fillers for different asphalt mixes.	

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%

3.3 BINDERS

Bitumen

Bituminous binders: To Austroads AGPT04F (2017) and the **Binder selection table**.

Binder selection table

Binder type	Class or grade	Recommended use
Bitumen	Class 170	Light Traffic Category application such as footpaths or some residential streets
Bitumen	Class 320	General purpose, base, intermediate and wearing courses dependent on traffic loading and / or increase in pavement temperatures
Bitumen	Class 450	General purpose, base, intermediate and wearing courses.
Bitumen	Class 600	Increased stiffness in structural base layers.

Binder type	Class or grade	Recommended use
Multigrade bitumen	M1000	As for M500 but providing further increased stiffness and deformation resistance at higher temperatures.
Polymer-modified binder	Various	Improved resistance to fatigue cracking and/or improved resistance to permanent deformation.
Notes: 1. Bitumen binders are those that conform to AS 2008 (2013). 2. Multigrade bitumen are those that conform to AS 2008 (2013). 3. Polymer-modified binders are those that conform to the Austroads ATS 3110 (2023). 4. Further advice on the selection of modified binders for specific application to the Austroads AGPT04B (2014). 5. Availability of binders may vary in different parts of Australia.		

This table is a guide for typical asphalt applications and may vary based on site conditions and project specific requirements.

Binder types selection for dense graded wearing and base course applications are shown in **Binder selection table.** Not all binder types are available in all locations and Class 450 is used extensively in NSW. Where Class 320 bitumen is available it is recommended to be used for mixes containing 25% or more of RAP. Some polymer modified binders require delivery in minimum quantities and special handling and storage requirements. The specification of modified binders may, therefore, not be practical for small projects or remote locations. Before specifying a particular binder, the designer should ascertain the availability in the project location.

It should be noted that:

The air void range for gyratory compaction of dense graded mixes are different to those for Marshall compaction.

The limits for gyratory compaction are based on different compactive effort (cycles) for different traffic applications.

The air void range for Marshall compaction provides the option of varying compactive effort for different traffic levels, or choosing a different air void range based on a single 50-blow compactive effort. The use of 50-blow compaction allows mixes of different applications and air voids to be selected from the one set of laboratory test data.

If mixes are to be designed for different Marshall compactive effort, the air void range and VMA should be reduced by up to 1% for 75-blow compaction and increased by up to 1% for 35-blow compaction. Where different air voids criteria are required, document a special clause in the **ANNEXURE - SCHEDULE OF JOB DETAILS** in the worksection.

Classification and properties of bitumen: To AS 2008 (2013).

Other binders

Polymer modified binders: To Austroads ATS 3110 (2023).

Crumb rubber modified binders: To Austroads ATS 3110 (2023) 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 (2023) Table 8.4.

Bituminous emulsion tack coat

Bituminous emulsion: To AS 1160 (1996). 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 or combination of fillers and liquid adhesion agents to improve the moisture sensitivity of dense graded asphalt mixes or light traffic asphalt if the tensile stripping ratio (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 to the **Maximum proportion of additive in warm mix asphalt table**.

Maximum proportion of additive in warm mix asphalt table

Additive	Maximum Proportion
Wax	2.0% by mass of binder
Surfactants	Limit to be nominated by the Contractor
Water (either directly, or in the form of water containing crystals)	3% by mass of the binder

Rejuvenating agents
Mixes incorporating recycled asphalt: Where required add an asphalt rejuvenating additive to 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 AfPA Reclaimed Asphalt Pavement (RAP) Management Plan (2018) - Appendix A.

3.4 RECLAIMED ASPHALT PAVEMENT

Properties and processing
Reclaimed asphalt pavement: RAP properties and processing requirements to the AfPA Model Reclaimed Asphalt Pavement Management Plan.

3.5 TESTING

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

3.6 MIX DESIGN - GENERAL

Asphalt mixes
Mix types: Select from the following mixes based on particle size distribution to **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:

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

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

3.7 MIX DESIGN - AGGREGATE GRADING AND BINDER CONTENT

General
Combined aggregate grading (including filler) and binder content: To the limits appropriate for the wearing course and asphalt mix type.

Dense graded asphalt (DGA) - Medium, heavy and very heavy traffic wearing course and base course mix table

AS sieve size (mm)	**Mix designation**		
	Percentage passing by mass		
	DGA10[a]	**DGA14[a]**	**DGA20[a]**
53.0	–	–	–
37.5	–	–	–
26.5	–	–	100
19.0	–	100	90 - 100
13.2	100	90 - 100	71 - 86
9.5	90 - 100	72 - 83	58 - 83
6.7	68 - 82	54 - 71	46 - 64
4.75	50 - 70	43 - 61	37 - 55
2.36	32 - 51	28 - 45	24 - 42
1.18	22 - 40	19 - 35	15 - 32
0.600	15 - 30	13 - 27	10 - 24
0.300	10 - 22	9 - 20	7 - 17
0.150	6 - 14	6 - 13	4 - 12
0.075	4 - 7	4 - 7	3 - 6
Binder content (% by mass)[b]	5.2 - 6.5	4.8 - 6.0	4.5 - 5.8
a. Mix designation: Nominal mix size. b. Bitumen content: Expressed as a percentage of the total mix by mass.			

Light traffic asphalt dense graded asphalt (DGA) - Light Traffic (LTA) - Light traffic wearing course mix table

AS Sieve size (mm)	**Mix designation**			
	LTA5[a]	**LTA7[a]**	**LTA10[a]**	**LTA14[a]**
	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	20 - 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)[b]	6.5 - 7.5	6.0 - 7.5	5.5 - 6.5	5.0 - 6.0
a. Mix designation: Nominal mix size. b. Bitumen content: Expressed as a percentage of the total mix by mass.				

Open graded asphalt (OGA) mix table

AS sieve size (mm)	**Mix designation**	
	OGA10[a]	**OGA14[a]**
	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)[b]	5.0 – 6.5	4.5 – 6.0
a. Mix designation: Nominal mix size. b. Bitumen content: Expressed as a percentage of the total mix by mass.		

Stone mastic asphalt (SMA) mix table

AS sieve size (mm)	**Mix designation**			
	SMA5[a]	**SMA7[a]**	**SMA10[a]**	**SMA14[a]**
	Percentage passing by mass			
19.0	100	–	–	100
13.2	100	–	100	90 – 100
9.5	100	100	90 – 100	30 – 55
6.7	100	85 – 100	30 – 55	20 – 35
4.75	85 - 100	30 – 62	20 – 40	18 – 30
2.36	55 - 75	20 – 35	15 – 28	15 – 28
1.18	38 - 57	16 – 28	13 – 24	13 – 24
0.600	26 - 43	14 – 24	12 – 21	12 – 21
0.300	15 - 28	12 – 20	10 – 18	10 – 18
0.150	8 - 18	10 – 16	9 – 14	9 – 14
0.075	4 - 11	8 – 12	8 – 12	8 – 12
Binder content (% by mass)[b c]	6.5 - 8.5	6.0 – 7.3	6.0 – 7.0	5.8 – 6.8
a. Mix designation: Nominal mix size. b. Bitumen content: Expressed as a percentage of the total mix by mass. c. SMA with low in situ voids as SAMI binder content may be greater.				

Fine gap graded asphalt (FGGA) mix table

AS sieve size (mm)	**Mix designation**	
	FGG7[a]	**FGG10[a]**
	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

AS sieve size (mm)	**Mix designation**	
	FGG7[a]	**FGG10[a]**
	Percentage passing by mass	
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)[b]	6.3 – 7.3	6.0 – 7.0
a. Mix designation: Nominal mix size. Alternative particle size distribution: Do not use without approval. b. Bitumen content: Expressed as a percentage of the total mix by mass.		

3.8 MIX PROPERTIES - GENERAL

Design criteria

Asphalt mix sampling and compaction: Use the gyratory compaction to Austroads AGPT/T212 (2021) or the Marshall Method.

Additional requirements: Add any additional project specific testing requirements to the **ANNEXURES – SCHEDULE OF JOB DETAILS, Special job requirements**.

3.9 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(1)) table**.

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

Minimum effective binder film index:

- High fatigue base mix: 10 micron.
- All other mixes: 7.5 micron.

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**			
Medium	Wearing and base	80	3.0 – 6.0	–
	High fatigue base	80	2.0 – 4.0	–
Heavy	Wearing and base	120	3.0 – 6.0	2.0
	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) table

Mix type		**Air voids (%)**	**Minimum stability (KN)**	**Flow (mm)**
Traffic classification	**Application**			
Medium	Wearing and base	3.0 – 6.0	6.5	2 – 4
	High fatigue base	2.0 – 4.0	6.5	2 – 4
Heavy	Wearing and base	3.0 – 6.0	6.5	2 – 4
	High fatigue base	2.0 – 4.0	6.5	2 – 4
Very heavy	Wearing and base	3.0 – 6.0	7.0	2 – 4
Note:				

Mix type		Air voids (%)	Minimum stability (KN)	Flow (mm)
Traffic classification	**Application**			
1. Where 75 blow Marshall compaction is used, an alternative air voids range may be proposed by the contractor for consideration by the Principal.				

Voids mineral aggregate (VMA) table

Mix nominal size (mm)	VMA (% minimum)		
	Gyratory compaction	Marshall compaction (50 blow)	
		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%.			

3.10 MIX PROPERTIES - OPEN GRADED ASPHALT

Mix design criteria

Volumetric design criteria: To the **Level 1 Open graded asphalt (OGA) 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 Austroads AG:PT/T236 (2005)	
	Unconditioned	Moisture conditioned
OGA	20	35
Notes: 1. Moisture conditioned testing required only if Quarry resource is susceptible to aggregate stripping. 2. Use the asphalt particle loss requirements where applicable.		

3.11 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 or A20E or A15E or A10E 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 (2014) (%)	Minimum VMA
Size (mm)	Traffic classification	Gyratory (cycles)	Marshall (blows)		
5	Light/Medium	120	50	3.0 – 5.0	20
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
Note: Bottom layer SMA as SAMI, air voids to be in the range 1.5 - 4.0.					

3.12 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)	Marshall (blows)	
Light	80	50	3.0 – 5.0

3.13 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	2.0 – 5.0

3.14 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 DGA and LTA mixes unless supporting data is provided to propose the inclusion of RAP in other mix types. 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.
- For 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 mixes containing 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 mixes containing greater than 30% RAP the need for binder rejuvenating agents is to be assessed.
- Use up to 15% RAP in asphalt containing polymer modified binder unless the RAP is from a dedicated source of PMB asphalt, and the resultant binder meets Austroads ATS 3110 (2023) requirements for the specified binder or the mix design with the RAP has comparable performance test results to the virgin PMB mix design.
- Verify the viscosity of the resultant RAP/virgin binder blend to the procedures in the AfPA Model Reclaimed Asphalt Pavement Management Plan.

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 will be necessary to change during production to ensure the original mix design is achieved.

Mix design approval

Trial mix testing: Testing will be based on evidence of production trial evaluated against the approved mix design submission limits established for each mix design. Laboratory trials will be used as an initial starting formulation and confirmed against project specific volumetric and or performance properties of this specification. If the project requires to meet specific asphalt performance characteristics (i.e. rutting, fatigue) these criteria will be listed in the **ANNEXURE – SCHEDULE OF JOB DETAILS** and listed as a separately pay item as per **ANNEXURE – PAY ITEMS.**

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 (2013). Do not mix samples. Visually inspect 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 to the AfPA IG-3 (2000) - Implementation Guide and AfPA Work Tip No.15 (2019). Process control measures will 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 on 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

AS sieve size (mm)/property	Maximum permitted variations from the approved mix design (% by mass)
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
Source: AS 2150 (2020) Table 13.	

4.3 CONSTRUCTION PLANT AND EQUIPMENT

General

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 binders LTA/DGA/SMA/OGA[a]	175
Crumb Rubber modified LTA/DGA/OGA/GGA[b]	165
a. Maximum temperature of open graded asphalt: Not more than that determined from the asphalt binder drain-off test. b. 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 (unless evidence is provided to substantiate that a longer storage time is not detrimental to the asphalt):

- 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
Filler 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.

Preheating of RAP: Undertake the preheating of RAP to reduce the need to superheat the other raw materials and reduce the time for heat transfer to occur.

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
General: Conform to *1141 Flexible pavement base and subbase*.

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

Road surface: Make sure the road surface is clean to achieve good bonding between new asphalt and the existing surface.

Primer Coat

- A 7mm primer seal is required under all sealing on flexible pavements and all asphalt other than cul-de-sac turning circles and major intersections where the asphalt will be applied over the two-coat flush seal.
- A minimum of 14 days in the case of a primer seal and two days in the case of a two-coat flush seal will be required to elapse before application of the asphalt surface.

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.

Priming

Requirement: If required, prime crushed rock and gravel 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 (1996), at a breaking rate suitable to 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 0.40 L/m^2.
- 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 kerbs, channels, adjoining structures, traffic and parked vehicles from tack coat spray.

Tack coat omission: Coating may be omitted if spreading asphalt over clean, freshly placed asphalt, or over a clean primed surface.

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/m^2: Apply through a spray bar mounted directly on the asphalt paver, immediately ahead of the spreading of asphalt.

Asphalt spreading temperatures (for DGA) table

Road surface temperature (°C)[a]	**Minimum mix temperature (°C)[b]**			**Range of mix temperature (°C)[c]**
	< 30 mm[d]	**30 – 40 mm[d]**	**41 – 100 mm[d]**	**> 100 mm[d]**
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

a. This table is a guide for typical asphalt spreading temperatures and may vary based on site conditions, project specific requirements or if a workability additive or warm mix additive isused (and supporting evidence is provided).
b. Generally applicable to the coolest area of the pavements, e.g. shade areas.
c. 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.
d. Maximum temperatures apply when placing thick layers, to avoid excessive displacement under rolling.
Notes:
1. 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.

Road surface temperature (°C)[a]	**Minimum mix temperature (°C)[b]**			**Range of mix temperature (°C)[c]**
	< 30 mm[d]	**30 – 40 mm[d]**	**41 – 100 mm[d]**	**> 100 mm[d]**
2. If placing of asphalt over a previous layer that has not cooled below about 65°C, adjust mix temperatures. 3. 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:

- Potential risk of binder pick up when using pneumatic tyred rollers.
- Use a method that does not damage the aggregates or draws 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 - Nominal layers

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

Density assessment - Nominal layers

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/NZS 2891.7.1 (2015) or AS/NZS 2891.7.3 (2014).

BD = bulk density of the lot to AS/NZS 2891.9.2 (2014) for cores or AS/NZS 2891.14.2 (2013) and AS/NZS 2891.14.3 (2013) for nuclear density gauge.

Characteristic value (CV) of in situ air voids for nominal layers with consistent support stiffness table

Asphalt type and thickness (mm)	Upper CV limit (Vu) %	Lower limit (V_L) %
All heavy and very heavy traffic asphalt wearing courses	8	3
Medium traffic wearing course	8	3
Light traffic wearing course in FGGA	7	2
Notes: 1. Refer Density testing requirements as listed in **DENSITY ASSESSMENT**. 2. Fatigue mixes – reduce value for Vu & VL by 1% from those state above.		

Acceptance constant table

Number of tests or measurements	Acceptance constant (k)
3	0.535
4	0.617

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

4.8 DENSITY ASSESSMENT

Corrector layers and or variable support stiffness

Bearing capacity of base and subgrade layers: Use alternative test methods available and capable of rapid and direct measurement of the bearing capacity of base and subgrade layers. Use the appropriate equipment from the following:

- Light Falling Weight Deflectometer (LWD).
- Clegg Hammer.
- Dynamic Cone Penetrometer (DCP).
- Borehole Shear Tester (BST).
- Variable Energy Dynamic Cone Penetrometer (PANDA Probe).
- Geogauge.
- Plate Load Test or Intelligent Compaction rollers.

Support stiffness: Where deficiencies in support stiffness is identified, improve the support layer to ensure minimum and uniform bearing capacity is achieved prior to asphalt overlay.

Correction layer: Where asphalt is constructed as a correction layer (variable asphalt thickness) or over variable or poor support stiffness conditions the acceptance criteria based on a characteristic value (CV) is not statistically suitable in assessing Lot compliance. Use the **Lot Averaging for assessing Lot compliance table.**

Lot Average Range – Arithmetic mean of the in situ air voids expressed as percentage for the lot.

In situ Air Void Requirements for Correction Layers and or variable support stiffness (1) use the **Lot Averaging for assessing Lot compliance table.**

Lot Averaging for assessing Lot compliance table

Asphalt type and thickness (mm)	Lot Average Range Air Void (%)
All heavy and very heavy traffic asphalt wearing courses	3 – 8
Medium traffic wearing course	3 – 8
Light traffic wearing course	3 – 7
Low in situ voids SMA as SAMI	1.5 - 6
Notes: 1. Refer Density testing requirements as listed in **Field testing for placing and finished pavement.** 2. Fatigue mixes – reduce value for V_u & V_L by 1% from those stated above.	

4.9 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: If required, 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 (2023). 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 (2014).
- Nuclear density measurement: To AS/NZS 2891.14.2 (2013) using the calibrated procedure described in AS/NZS 2891.14.3 (2013).

Maximum density: To AS/NZS 2891.7.1 (2015) or AS/NZS 2891.7.3 (2014).

Reference density: To AS/NZS 2891.14.5 (2014) 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 ANNEXURE A

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

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

Remarks: _____

Penciller: _____ Sampling by: _____

Superintendent's_____ Contractor's_____
Representative: (Signature) Representative: (Signature)

Affiliation: _____ Affiliation: _____

5.3 ANNEXURE - SUMMARY OF HOLD AND WITNESS POINTS

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	Primer spraying
INSPECTIONS, Notice Mobile equipment	W	Equipment condition.	1 day before using equipment	Asphalt production and primer 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	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
INSPECTIONS, Notice Surface preparation	H	Completed surface preparation, including repair of surface defects. Confirm base gravel is approved for surfacing to commence.	7 days before placing	Placing/ spreading

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
INSPECTIONS, Notice Spreading and compaction	H	Completed surfacing.	3 days after compaction	The next lot or application of pavement marking
INSPECTIONS, Notice Non-conforming sections	W	Completed replacement and rectification of non-conforming sections.	1 day before the inspection	Linemarking application and opening to traffic
Note: H = Hold Point (Superintendent and Principal Certifier), 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**	As per Contractor ITP	As per Contractor ITP	AS 1141.11.1 (2020)
Coarse aggregates	Los Angeles Abrasion (where applicable)	1 per source	1 per source and 6 monthly thereafter	AS 1141.23 (2021)
	Unsound and marginal stone content (where applicable)	1 per source	1 per source and 6 monthly thereafter	AS 1141.30.1 (2022)
	Wet strength (Where applicable)	1 per source	1 per source and 6 monthly thereafter	AS 1141.22 (2019)
	Wet/dry variation (Where applicable)	1 per source	1 per source and 6 monthly thereafter	AS 1141.22 (2019)
	Weak particles	1 per source	1 per source and 6 monthly thereafter	AS 1141.32 (2019)
	PAFV	1 per source	1 per source and 6 monthly thereafter	AS 1141.40 (2017), AS 1141.41 (2017) or AS 1141.42 (2017)
	Water absorption and density	1 per constituent material	1 per constituent material and 6 monthly thereafter	AS 1141.6.1 (2000) or AS 1141.6.2 (1996)
	Shape testing of coarse aggregate Particle shape 2:1 ratio Flakiness Index	1 per source	or 6 monthly or change in materials	AS 1141.14 (2007) or AS 1141.15 (1999)
Fine aggregates	Soundness	1 per source	1 per source and 6 monthly thereafter	AS 1141.24 (2018)

Activity	Material properties	Maximum lot size	Minimum test frequency	Test method/Conformance assessment
	Water absorption	1 per constituent material	1 per constituent material and 6 monthly thereafter	AS 1141.5 (2000)
Combined filler	Voids in dry compacted filler	1 per mix design	1 per mix design	AS/NZS 1141.17 (2014)
Added mineral filler	Grading	1 per source	1 per source	AS 1141.11.1 (2020)
	Voids in dry compacted filler			AS/NZS 1141.17 (2014)
	Moisture content			AS 4489.8.1 (1997)
Binder	Bitumen	Each production batch	1 per production batch	AS 2008 (2013)
	PMB		1 per production batch	Austroads ATS 3110 (2023)
	Emulsion		1 per production batch	AS 1160 (1996) Table A1
RAP	Minimum: As per RAP Management Plan or Contractor's RAP Management Plan			
Mix design	Approval of mix and NATA endorsed certification – supplier's documentary evidence and certification	1 per mix design	1 per mix design	**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 (2013)
	Binder content	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.3.1 (2013) or AS/NZS 2891.3.2 (2013) or AS/NZS 2891.3.3 (2013) or AGP/PT/T234
	Temperature	Each loaded truck or as indicated on the plant control system	
Laboratory compacted dense graded asphalt	Marshall stability and flow (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.5 (2015)

Activity	Key quality verification requirements	Normal minimum frequency	Test method
(DGA) - Voids and VMA			
	Air Voids in mix (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.5 (2015) AS/NZS 2891.8 (2014) AS/NZS 2891.9.2 (2014)
	Gyropac (80 cycles)	One test per 300 Tonne of asphalt plant production	Austroads AGPT/T212 (2021) AS/NZS 2891.2.2 (2014) AS/NZS 2891.9.2 (2014) AS/NZS 2891.8 (2014)
	Gyropac (80 or 120 cycles)	One test per 300 Tonne of asphalt plant production	Austroads AGPT/T212 (2021) AS/NZS 2891.2.2 (2014) AS/NZS 2891.9.2 (2014) AS/NZS 2891.8 (2014)
	Gyropac (250 cycles) (Only for Heavy and Very Heavy Category)	One test per 300 Tonne of asphalt plant production	Austroads AGPT/T212 (2021) AS/NZS 2891.2.2 (2014) or AS/NZS 2891.9.2 (2014) AS/NZS 2891.8 (2014)
Laboratory compacted open graded asphalt (OGA)	Voids: Gyropac (80 cycles) or Marshall (50 blows)	One test per 300 Tonne of asphalt plant production	Austroads AGPT/T212 (2021) AS/NZS 2891.2.2 (2014) or AS/NZS 2891.5 (2015) AS/NZS 2891.9.3 (2014) AS/NZS 2891.8 (2014)
	Asphalt particle loss	(Mix submission only)	Austroads AG:PT/T236 (2005)
Laboratory compacted stone mastic asphalt (SMA)	Voids: Gyropac (120 cycles) or Marshall (50 blows)	One test per 300 Tonne of asphalt plant production	Austroads AGPT/T212 (2021) AS/NZS 2891.2.2 (2014) or AS/NZS 2891.8 (2014)
Laboratory compacted fine gap graded asphalt (FGGA)	Voids in mix (50 blows)	One test per 300 Tonne of asphalt plant production	AS/NZS 2891.5 (2015) AS/NZS 2891.8 (2014) AS/NZS 2891.9.2 (2014)
	Voids: Gyropac (80 cycles)	One test per 300 Tonne of asphalt plant production	Austroads AGPT/T212 (2021) AS/NZS 2891.2.2 (2014) AS/NZS 2891.8 (2014) AS/NZS 2891.9.2 (2014)

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 layer thickness	1 day's laying	Average thickness of asphalt layer determined by core thickness	Average thickness of coring to AS 2891.1.2 (2023)
	In situ air voids for DGA, FGG, SMA (not required for OGA)	1 day's laying	No cores below 100 m^2 or Min of 3 Cores or 1 per 500m^2	AS/NZS 2891.9.2 (2014) or AS/NZS 2891.14.2 (2013)
	Density ratio and percentage of air voids of in situ	1 day's laying	No cores below 100 m^2 or	AS/NZS 2891.14.5 (2014)

Activity	Characteristics	Maximum lot size	Minimum test frequency	Test method/Conformance assessment
	compacted asphalt < 40 mm		Min of 3 Cores or 1 per 500m^2	
	Surface shape	1 day's laying	1 per 20 m linear lane length (where applicable)	3 m straightedge
Note: Where Nuclear Gauge Density testing is utilized layer thickness shall be calculated by Layer Thickness (mm) = (Total Tonnes (t) / Avg Compacted Density of Lot / Total Area paved (m^2).				

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.

Measurement and payment

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

Pre-determined non-conformance: The acceptance criteria in the form of payment deduction(s), will be applied to non-conformances for the following properties:

- Asphalt mix properties:
  - . Particle size distribution and binder content in asphalt.
  - . In situ air voids.

Deductions that apply for asphalt mix properties will be the greater % of the pre-determined non-conformances.

Pre-determined non-conformance for in situ air voids: The acceptance criteria have not been provided for in situ air voids below the minimum V_L, however in situ Air Voids recorded below 2% for (V_L) will be assessed based on the impact to its engineering suitability.

Deduction for a lot: The payment deduction applied for the Lot will be sent to the asset owner with all final correspondence regarding close out of the non-conforming Lot.

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 (%)	**Light Traffic Category Deduction (% of lot value)**	**Medium/Heavy/Very Heavy Traffic Deduction (% of lot value)**
≤ 1.0	7.5	7.5
1.0 - 1.5	15	15
1.6 - 2.0	30	30
≥ 2.0	Engineering assessment	Engineering assessment
Notes: 1. Engineering Assessment - alternate surface treatment options should be considered to mitigate the reduction in pavement life (i.e. Sealcoat, emulsion fog seal or Surface Enrichments). 2. Insufficient compaction in base layers will lead to potential water ingress and or early life rutting.		

Deductions for particle size distribution and binder content non-conformances table

Combined Particle Size Distribution Element	**% by which Nonconformance exceeds Production Tolerance**	**Deductions (% of Lot or Sub-lot Value)**
Passing – All sieves excluding 0.075 mm	Each 1% or part thereof	1
Passing 0.075 mm	Each 0.5 or part thereof	2
Binder Content	**(% by mass of total asphalt mix)**	
All asphalt mixes	Each 0.1 or part thereof below the design Binder Content lower limit	3

Light traffic asphalt: Performance characteristics of a Light Traffic Asphalt is placed on ensuring excessive in situ air voids is avoided due to the increased likelihood of further pavement damage caused by ingress of water. Consider an alternate engineering approach for rectification using available surface treatment processes at no additional cost to the client which ensures pavement preservation and removal of water ingress into the pavement. Mutually agree such solutions between all parties before releasing of responsibility with respect to Non-conformance of excessive In situ Air Voids.

Statistical variability: Where it is proven that the underlying support structure is the main contributing factor for statistical variability with not being able to reach acceptable In situ Voids the asphalt Lot will be accepted and not removed. Any additional costs incurred for rectification of the non-conformance or agreed engineering solution will then be paid for in full by the client.

Assessment approach: A suitable assessment approach for high In situ voids would be to conduct permeability testing on extracted cores after surface treatment with a required permeability of ≤ 15 µm/s.

Engineering judgement: Consider engineering judgement when reviewing non-conformances. Low in situ air voids around braking zone are of a higher risk and could cause skidding. Rutting and/or flushing if likely to occur will generally be detected Inservice early in the life cycle.

5.6 ANNEXURE - REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

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	2020	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 1141.22	2019	Wet/dry strength variation
AS 1141.23	2021	Los Angeles value
AS 1141.24	2018	Aggregate soundness - Evaluation by exposure to sodium sulfate solution
AS 1141.30.1	2022	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 the 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	2020	Asphalt - A guide to good practice
AS 2758		Aggregates and rock for engineering purposes
AS 2758.5	2020	Specification for aggregates for asphalt
AS/NZS 2891		Methods of sampling and testing asphalt
AS/NZS 2891.1.1	2013	Sampling - Loose asphalt
AS 2891.1.2	2023	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	Binder 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	Binder 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/NZS 2891.7.1	2015	Determination of maximum density of asphalt - Water displacement method

AS/NZS 2891.7.3	2014	Determination of maximum density of asphalt - Methylated spirits displacement
AS/NZS 2891.8	2014	Voids and volumetric properties of 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 guage 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
AfPA IG-3	2000	Asphalt plant - Process control guide
AfPA RAP	2018	Reclaimed Asphalt Pavement (RAP) Management Plan
AfPA Work Tip No.15	2019	Asphalt production process control
Austroads AGPT		Guide to pavement technology
Austroads AGPT02	2017	Pavement structural design
Austroads AGPT03	2009	Pavement surfacings
Austroads AGPT04B	2014	Asphalt
Austroads AGPT04F	2017	Bituminous binders
Austroads AGPT04J	2008	Aggregate and source rock
Austroads AGPT/T212	2021	Gyratory compactor test method
Austroads AG:PT/T236	2005	Asphalt particle loss
Austroads AP-C87	2015	Austroads glossary of terms
Austroads ATS		Austroads technical specifications
Austroads ATS 3050	2022	Supply of recycled crushed glass sand
Austroads ATS 3110	2023	Technical specification for the supply of polymer modified binders
EN 15804	2012	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
ISO 14025	2006	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 21930	2017	Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services

6 ANNEXURE M – CESSNOCK CITY 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 *Development Engineering Handbook*. Acceptance is to be obtained in writing from: an authorised representative of Council's Director of Infrastructure and Engineering Services.	**Variation procedure**

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 Cessnock City Council *Development Engineering Handbook* for final inspection, works-as-executed and handover requirements.	**Completion**

7 AMENDMENT HISTORY

0	15/01/2024	First Published