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AUSTROADS TECHNICAL SPECIFICATION ATS 3130
Supply of Aggregate for Asphalt

Austroads

Contents

1. Scope

1.1 Austroads Technical Specification ATS 3130 sets out the requirements for the supply of coarse aggregate and fine aggregate for use in the production of asphalt.

1.2 Refer to ATS 3050 for the requirements for recycled crushed glass used in asphalt.

2. Referenced Documents

2.1 The following documents are referenced in this Specification:

Australian / New Zealand Standards	
AS 1141	Methods for Sampling and Testing Aggregates.
	3.1 Sampling - Aggregates
	5 Particle density and water absorption of fine aggregate
	6.1 Particle density and water absorption of course aggregate
	11.1 Particle size distribution – Sieving method
	12 Materials finer than 75 µm in aggregates (by washing)
	14 Particle shape, by proportional caliper
	15 Flakiness Index
	18 Crushed particles in coarse aggregate derived from gravel
	22 Wet/dry strength variation
	23 Los Angeles value
	24 Aggregate soundness – Evaluation by exposure to sodium sulfate solution
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	26 Secondary minerals content in igneous rocks
	28 Ball mill value
	29 Accelerated Soundness Index
	30.1 Coarse aggregate quality by visual comparison
	32 Weak particles (including clay lumps, soft and friable particles) in coarse aggregates
	40 Polished aggregate friction value – Vertical road-wheel machine
	41 Polished aggregate friction value – Horizontal bed machine
	42 Pendulum friction test
	50 Resistance to stripping of cover aggregates from binders
AS 1726	Geotechnical site investigations.
AS/NZS/ISO 9001	Quality management systems – Requirements
Austroads	
AP-C87-15	Austroads Glossary of Terms
ATM 055	Polished Stone Value
ATM 058	Aggregate Shape by the Ratio of Greatest to Least Dimension
ATS 3050	Recycled Crushed Glass
ATS 3410	Asphalt Pavements
ASTM International	
ASTM C295	Petrographic analysis

3. Definitions

3.1 In addition to the definitions set out in AP-C87-15, the definitions and abbreviations listed below apply to this Specification:

Aggregate Component	Aggregate manufactured to a nominated grading from a specific rock source with properties that comply with this Specification.
Secondary Mineral	A mineral which has formed as a consequence of the alteration or reconstruction of primary minerals by weathering, metamorphism, or exsolution.
BOS	Basic Oxygen Steelmaking
EAF	Electric Arc Furnace
PAFV	Polished Aggregate Friction Value
PSV	Polished Stone Value
SMA	Stone Mastic Asphalt

4. Quality System Requirements

4.1 Subject to Clause 4.3, the Contractor must prepare and implement a Quality Plan that at a minimum, includes the documents, procedures and/or instructions listed in this clause:

a) handling, storage and inspection of the products, including procedures for avoiding intermixing or contamination;

b) sampling and testing of processes and products (including Inspection and Test Plans);

c) calibration and maintenance of plant, including weighing equipment, screens, crushers and flow meters / proportioning systems (where installed);

In addition, for quarried rock:

d) use and handling of explosives;

e) assessment of quarry face and shot rock;

f) moisture control of shot rock;

g) handling processes for shot rock; and

h) for basic igneous source rock - control of secondary mineralization in the manufacturing process.

In addition, if steel furnace slag aggregate is proposed:

i) stockpile management and the method of record keeping for the purpose of verifying that the minimum time for weathering is achieved.

4.2 Aggregate must be produced under a Quality Management System which is certified to AS/NZS ISO 9001 by an organisation accredited by Joint Accreditation System of Australia and New Zealand (JAS-ANZ).

4.3 If the documents listed in Clause 4.1 have been provided to the Principal and assessed under a prequalification / registration scheme applicable to the jurisdiction where the work is carried out, Clause 4.1 does not apply and the Contractor must instead provide the following to the Principal:

a) details of the prequalification / registration applicable to the material source; and

b) where a quarry is used, details of the area of the quarry (for example, face number, bench number and reduced level) that will be used to source the material.

HOLD POINT 1.	
Process Held	Commencement of aggregate supply
Submission Details	The documents listed in Clause 4.1 or 4.3 must be provided to the Principal at least 15 working days prior to the commencement the supply of the aggregate.

5. Aggregate - General

General

5.1 Aggregate used in the production of an asphalt mix must be the same Aggregate Component as that used in the registered asphalt mix design.

5.2 Aggregate must:

a) be produced from material which is hard and durable;

b) exhibit a uniform appearance for the duration of the work at each site;

c) not exhibit any expansive reactions resulting from the presence of free calcium oxide, magnesium oxide or other expansive materials; and

d) be free from dust, clay, dirt or any other deleterious matter.

5.3 Steel furnace slag, if approved by the Principal, must be:

a) processed to be free from discrete metallic coarse particles; and

b) weathered for a minimum of 28 days from the time of stockpiling.

5.4 Unless specified otherwise in the Contract documents, the Contractor must undertake the sampling and testing necessary to demonstrate compliance with this Specification.

5.5 Where a rock type is specified, the Contractor must ensure that a petrographic analysis in accordance with ASTM C295 is carried out on the source rock to determine the rock type. The frequency of the analysis must be such any variation in the petrography that may affect the aggregate quality is identified as required by this Specification.

5.6 If specified in the Contract documents that an assessment of the degree of weathering of the source rock is required, the proportions of weathered rock material in the source rock (classified in accordance with Table 20 of AS 1726), must not exceed the following limits by mass:

Slightly weathered rock: 10%

Distinctly weathered rock: 0.1%

Extremely weathered rock: 0.1%

Residual soil: 0%.

6. Coarse Aggregate

General

6.1 Coarse aggregate is aggregate with a nominal size not less than 5 mm. It must be sufficiently strong to not break or disintegrate under compaction equipment and must be tested to demonstrate compliance with Table 6.1.

Table 6.1: Aggregate properties

Property	Acceptance Criteria	Test Method	Test Frequency (1)
Petrographic analysis	Interpretative report	ASTM C295	1 per 6 months
Particle size distribution	Refer Clause 6.2	AS 1141.11	1 per 1,000 tonnes
Material finer than 75 µm by washing	Report	AS 1141.12	1 per 1,000 tonnes
Strength and durability	Refer Clause 8	Refer Clause 8	1 per 5,000 tonnes
Friction Rating	Refer Clause 6.3	Refer Clause 6.3	1 per 12 months
Particle density (dry basis and SSD)	Report	AS 1141.6.1	1 per 6 months
Flakiness index for use in the following asphalt types: (2)			
Dense graded asphalt	≤ 30%	AS 1141.15	1 per 1,000 tonnes
Open graded asphalt	≤ 25%		
Stone mastic asphalt -SMA 7 and SMA10	≤ 25%		
Stone mastic asphalt –SMA 14	≤ 20%		
High Modulus Asphalt (EME2)	≤ 25%		
Particle shape (for fraction retained on 9.5 mm AS sieve for each constituent aggregate nominal size): (2)			
Using 2:1 calliper ratio	≤ 25%	AS 1141.14	1 per 1,000 tonnes
Using 3:1 calliper ratio	≤ 10%	AS 1141.14	
Ratio of greatest to least dimension of aggregate fractions < 10 mm nominal size for aggregates used in SMA (3)	≤ 2.1	ATM 058	1 per 1,000 tonnes
Fractured face(s) for aggregates derived from gravels and meta-sediments: (2)			
At least two fractured faces	≥ 85%	AS 1141.18	1 per 1,000 tonnes
At least one fractured face.	100%		
Free lime content (BOS and EAF aggregates only): (4)			
BOS steel furnace slag aggregates	≤ 6%	ASTM C114-10 (5)	2 in the first 500 tonnes and 1 per 500 tonnes thereafter
EAF steel furnace slag aggregates	≤ 3%		

Notes:

(1) New testing must be undertaken whenever there is a change of quarry face, source rock type or change of source.

(2) Particle Shape testing is only required if specified in the Contract documents. If Particle Shape testing is specified, testing for the Flakiness Index is not required.

(3) Not required for material from a blasted quarry face.

(4) BOS and EAF steel furnace slag aggregates must be tested from certified stockpile Lots at the supplier's premises. Sampling must be carried out using a sampling tube as described in AS 1141.3.1 with all samples taken from at least 300 mm away from the face of the stockpile. Use the sampling technique detailed in Annexure A5 in AS 1141.3.1. Alternative sampling may be carried out using AS 1141.3.1 Section 9.3 "Backblading method" but the samples must not be mixed to form an average from the Lot.

(5) Use Test Method B as detailed in Section 29 of ASTM C114-10. The testing must be carried out at the steel furnace slag aggregates supplier's premises before transport to the asphalt plant.

6.2 Where testing for Wet Strength and Wet/Dry Strength Variation is used, if all tests have met specification requirements for both properties for the six previous Lots actually tested, the Principal may approve the testing frequency in Table 6.2.

Table 6.2: Reduced Frequency of Testing

Wet/Dry Strength Variation	Frequency of Testing
< 25%	1 per 20,000 tonnes
< 30%	1 per 10,000 tonnes
< 35%	1 per 5,000 tonnes

6.3 Unless specified otherwise in the Contract documents, the friction rating of the coarse aggregate must comply with either the Polished Aggregate Friction Value (PAFV) or the Polished Stone Value (PSV) as specified in Table 6.3. The minimum test frequency is 1 test per 6 months of production.

Table 6.3: Friction Rating

Application	Acceptance Criteria PAFV or PSV (1)
Heavy duty dense graded asphalt wearing course other than wearing course	 ≥ 48 ≥ 44
Stone Mastic Asphalt	≥ 48
Open Graded Asphalt	≥ 48
Light duty dense graded asphalt	≥ 44

Notes:

(1) The test method for PAFV is:

a) AS 1141.40; or

b) AS1141.41 and AS1141.42.

(2) The test method for PSV is ATM-055.

7. Fine Aggregate

7.1 Fine aggregate is aggregate that substantially passes a 4.75 mm sieve. It must consist of one (or a combination of) the following:

a) source rock aggregate, including crusher dust generated from tertiary crushers (such crusher dusts may be washed and/or classified prior to use), resulting from the manufacture of the coarse aggregate.

b) natural quartz sands,

c) recycled glass aggregate that complies with ATS 3050; and / or

d) EAF or BOS steel furnace slag (if approved by the Principal).

7.2 Fine aggregate, and the source material used for the production of fine aggregate, must conform to the requirements of Table 7.2. Where a prequalification / registration applies, the Principal may approve an alternative rate of testing.

Table 7.2: Fine Aggregate Properties and Requirements

Property	Source Material that the Testing is Required on	Acceptance Criteria	Test Method	Test Frequency (1)
Petrographic analysis	Source rock and natural quartz sands.	Interpretative report	ASTM C295	1 per 12 months
Particle size distribution	All	Refer Clause 6.2	AS 1141.11	1 per 1,000 tonnes
Material finer than 75 µm by washing	All	Report	AS 1141.12	1 per 1,000 tonnes
Strength and durability	Source rock	Refer Clause 8	Refer Clause 8	1 per 5,000 tonnes (3)
Aggregate soundness (total weighted loss)	Source rock and natural quartz sands.	≤ 12%	AS 1141.24	1 per 5,000 tonnes
Particle density (dry basis and SSD) (2):	Source rock, natural quartz sands and recycled glass aggregate.	Report	AS 1141.5	1 per 5,000 tonnes
Proportion of bonded quartz grains	Processed sandstone	≤ 2.5%	Determined by point count	1 per 1,000 tonnes
Water absorption(3):	BOS steel furnace slag aggregates	≤ 4.0%	AS 1141.5	1 per 5,000 tonnes
	Source rock, natural quartz sands and recycled glass aggregate	≤ 3.0%		
Angularity	Natural sand used in SMA (4)	≥ 43%	AASHTO T304-96 Method A	2 in the first 1000 tonnes and 1 per 1000 tonnes thereafter
Free lime content:	BOS steel furnace slag aggregates	≤ 6%	ASTM C114-10 (5)	2 in the first 500 tonnes and 1 per 500 tonnes thereafter

Notes:

(1) New testing must be undertaken whenever there is a change of quarry face, source rock type or change of source.

(2) Testing must be completed on material passing the 4.75 mm test sieve and retained on the 0.075 mm test sieve.

(3) Not required for natural sands or fine aggregates produced from the same source material as the coarse aggregate.

(4) Natural sand may only be used in SMA if approved by the Principal.

(5) Use Test Method B as detailed in Section 29 of ASTM C114-10. The testing must be carried out at the steel furnace slag aggregates supplier's premises before transport to the asphalt plant.

8. Aggregate Strength and Durability

8.1 This Specification sets out 4 testing regimes for determining the strength and durability of coarse aggregate and fine aggregate. The aggregate must conform with the testing regime(s) nominated by the Principal in the Contact documents. More than one option may be specified by the Principal.

8.2 Unless specified otherwise in the Contract documents or a reduced rate of testing applies under a Principal's registration / prequalification scheme, the aggregate must be tested for each property listed under the specified option at the rate of one test per 1,000 tonnes of each type of asphalt.

Option 1: Wet strength and wet/dry strength variation

8.3 Where Option 1 is specified for durability assessment, the source rock properties must comply with Table 8.3.

Table 8.3: Aggregate Strength

Property	Material Type	Test Method	Acceptance Criteria
Minimum Wet Strength (kN)	All, except for Metamorphosed Basalt (1)	AS 1141.22	150
Maximum Wet / Dry Strength Variation (%)	All	AS 1141.22	35
Maximum Water Absorption (%)	BOS and EAF steel furnace slag aggregate	AS 1141.6.1	2.5
	All rock except for Glassy Basalt (2) and Rhyolite	AS 1141.6.1	2.5
	Rhyolite	AS 1141.6.1	Report only

Notes:

(1) May be referred to as Greenstone; Refer Clause 8.5.

(2) Non-Silica Glass Content > 5%.

8.4 The Wet Strength and the Wet / Dry Strength Variation tests must be carried out on the 13.2 mm to 9.5 mm fraction for samples from the source rock of the aggregate.

8.5 The Contractor may submit a proposal to the Principal for the use of aggregate with Wet / Dry Strength Variation values higher than that specified in Table 8.3, provided its Wet Strength is at least 60 kN greater than the specified maximum value for the relevant aggregate quality category. Any such proposal must include evidence, including test results, that the aggregate will perform satisfactorily when used in asphalt, as well as any adjustments to the mix design.

Option 2: Los Angeles value

8.6 Where Alternative 2 is specified for durability assessment, Maximum Los Angeles Value of the source rock (when assessed by AS1141.23) must comply with the properties specified in Table 8.6.

Table 8.6: Maximum Los Angeles Value

Rock Type (as determined by ASTM C295)	Acceptance Criteria (max)
ACID IGNEOUS	
Granitic Rocks	30
Other Acid Igneous	25
INTERMEDIATE IGNEOUS	25
BASIC IGNEOUS	25
METAMORPHIC	25
SEDIMENTARY	
Dolomite	25
Argillaceous Sediments	25
Arenaceous Sediments	25
River Gravel Pebble	30
Calcrete	30
PYROCLASTIC - Scoria	C
DURICRUST	C

Note:

C Conditional – only permitted if the Contractor has provided evidence of its suitability in the approved Quality Plan.

Option 3: Sodium Sulphate Soundness

8.7 Where Option 3 is specified for durability assessment, the Maximum Sodium Sulphate Soundness of the aggregate (Assessed by AS 1141.24) must not exceed 10 % for all rock types.

Option 4: Degradation

8.8 Where Option 4 is specified for durability assessment, aggregate properties must comply with the properties specified in Table 8.8.

Table 8.8: Degradation

Rock Type	Property	Test Method	Acceptance Criteria
Granitic	Degradation Factor (min)	AS 1141.25.1	50
Acid Igneous, excluding granitic	Degradation Factor (min)	AS 1141.25.1	45
Trachyte	Degradation Factor (min)	AS 1141.25.1	50
Intermediate Igneous, excluding Trachyte	Degradation Factor (min)	AS 1141.25.1	45
Hornfels	Degradation Factor (min)	AS 1141.25.1	40
Metamorphic, excluding Hornfels	Degradation Factor (min)	AS 1141.25.1	45
Basic Igneous (1)	Secondary Mineral Content (max)	AS 1141.26	25
Basic Igneous	Accelerated Soundness Index (min)	AS 1141.29	94
Basic Igneous	Degradation Factor (min)	AS 1141.25.1	45
Argillaceous Sediments	Ball Mill Value (max)	AS 1141.28	30
Arenaceous Sediments	Ball Mill Value (max)	AS 1141.28	40
Duricrust	Degradation Factor (min)	AS 1141.25.1	45

Notes:

(1) As specified in the Contract documents, either Secondary Mineral Content, Accelerated Soundness Index or Degradation Factor may be used for the testing of Basic Igneous Rock.

9. Particle Size Distribution

9.1 The actual particle size distribution of each coarse aggregate and fine aggregate material (when tested in accordance with AS 1141.11 and AS 1141.12) may vary from the nominated target value within the tolerances shown in Table 9.1.

Table 9.1: Permissible variation to nominated particle size distribution of aggregates

Description	Tolerance (% by mass of aggregate)
Passing 26.5 mm and larger	± 10
Passing 4.75 mm to 19.0 mm	± 8
Passing 1.18 mm and 2.36 mm	± 6
Passing 0.300 mm and 0.600 mm	± 5
Passing 0.150 mm	± 3
Passing 0.075 mm	± 2

10. Sampling and Testing

General

10.1 The Quality Plan and/or Inspection and Test Plan (ITP) must include details of all sampling locations, frequencies and test methods. Samples must be representative of materials used in asphalt production.

10.2 Sampling must be undertaken in accordance with AS 1141.3.1.

10.3 Each Aggregate Component and source of aggregate must be tested separately.

10.4 Each individual stockpile lot must be clearly delineated by one of the methods below:

a) A separate stockpile is formed for each stockpile lot of the same material type, or

b) Material of the same type is added to a single stockpile incrementally such that a portion representing a discreet stockpile lot is added, tested and found to be conforming before the next portion, representing the next stockpile lot, is added. Any non-conforming stockpile lots must be removed from the stockpile prior to the addition of further portions.

10.5 The maximum lot size is 1000 tonnes.

10.6 If the aggregate is of segregated appearance, it must be divided into sub-lots such that each sub-lot contains only that quantity of aggregate which is visually homogeneous. Each sub-lot must separately comply with the requirements of this Specification.

10.7 In addition to the requirements of AS 1141.3.1 and unless otherwise specified or agreed with the Principal, defined boundaries of sub-lots represented by individual tested samples are deemed to be the midpoints in production between the samples.

10.8 All phases of any particular test must be performed at the same laboratory.

10.9 If the Principal requests samples, the Contractor must riffle and/or quarter the samples taken for testing, and deliver the samples in sealed and labelled containers identifying the following:

a) lot number;

b) sample description;

c) sampler;

d) date produced and/or supplied;

e) date sampled; and

f) any other quality system references, as appropriate.

Frequency of Testing

10.10 The frequency of testing set out in Table 6.1 and Table 7.2 apply, unless:

a) a reduced rate of testing applies under a prequalification / registration scheme applicable to the jurisdiction where the work is carried out; or

b) the Contractor has submitted a proposal (supported by statistical analysis verifying consistent process capability and product characteristics) for a reduced rate of testing and the Principal has approved that proposal.

10.11 For a reduced rate of testing to apply, the aggregate must be manufactured under uniform conditions from a single homogeneous source. The Principal may rescind approval of a reduced rate of testing at any time. Clause 10.10 does not apply to steel furnace slag aggregates.

Delivery

10.12 Aggregate must not be removed from the quarry or manufacturing site until the aggregate has been tested for compliance with the requirements of this Specification. The Contractor must ensure that the aggregate properties do not deteriorate between testing and incorporation into the asphalt mix.

10.13 Test results demonstrating compliance with this Specification must be submitted to the Principal with the Lot conformance data specified in ATS 3410.

Annexure A: Summary of Hold Points, Witness Points and Records

The following is a summary of the Witness Points / Hold Points that apply to this Specification and the Records that the Contractor must submit to the Principal to demonstrate compliance with this Specification.

Clause	Hold Point	Witness Point	Record
4.2	1. Commencement of aggregate supply		Quality Plan
10.13			Test results

Amendment Record

Amendment no.	Clauses amended	Action	Date
-	New specification	New	November 2023

Key

Format	Change in format
Substitution	Old clause removed and replaced with new clause
New	Insertion of new clause
Removed	Old clauses removed