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| AUSTROADS TECHNICAL SPECIFICATION ATS 3120  Supply of Aggregate for Sprayed Seals | A close up of a flag  Description automatically generated |
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# Scope

This Austroads Technical Specification ATS 3120 sets out the requirements for the supply of aggregates used for sprayed bituminous surfacing work.

# Referenced Documents

The following documents are referenced in this Specification:

|  |
| --- |
| **Australian / New Zealand Standards**  AS 1141 Methods for Sampling and Testing Aggregates.  3.1 Sampling - Aggregates  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  20.1 Average least dimension – Direct measurement (nominal size 10 mm and larger)  20.2 Average least dimension – Direct measurement (nominal sizes 5 mm and 7 mm)  20.3 Average least dimension -Calculation (nomograph)  22 Wet/dry strength variation  23 Los Angeles value  24 Aggregate soundness – Evaluation by exposure to sodium sulfate solution  25.1 Degradation factor – Source rock  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  AGPT 04J-08 Guide to Pavement Technology Part 4J: Aggregate and Source Rock  AGPT-T055 Polished Stone Value |
| **ASTM International**  ASTM C295 Petrographic analysis |

# Definitions

In addition to the definitions set out in AP-C87-15 and AGPT04J-08, the definitions listed below apply to this Specification:

|  |  |
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| **Aggregate Performance Classification:** | The classification of aggregate into Class A, B or C, based on the mineralogical composition / texture, strength, hardness, toughness, soundness and shape of the aggregate. |
| **Aggregate Size:** | The nominal size of the aggregate, as determined in accordance with Clause 7.2. |
| **Secondary Mineral:** | A mineral which has formed as a consequence of the alteration or reconstruction of primary minerals by weathering, metamorphism, or exsolution. |

# Quality System Requirements

Subject to Clause 4.5, the Contractor must prepare and implement a Quality Plan that at a minimum includes the documents, procedures and/or instructions listed in this clause:

1. handling, storage and inspection of the products, including procedures for avoiding intermixing or contamination;
2. sampling and testing of processes and products (including Inspection and Test Plans);
3. calibration and maintenance of plant, including weighing equipment, screens, crushers and flow meters / proportioning systems (where installed);
4. application of precoat (where applicable);

In addition, for quarried rock:

1. use and handling of explosives;
2. assessment of quarry face and shot rock;
3. moisture control of shot rock;
4. handling processes for shot rock; and
5. for basic igneous source rock - control of secondary mineralization.

Aggregate must be produced under a Quality Management System which is third party certified to AS/NZS ISO 9001.

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

If requested, the Contractor must submit to the Principal for each nominal aggregate size:

1. test results which demonstrate that the aggregate will comply with this Specification; and
2. the nominated target value of each specified property.

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:

1. details of the prequalification / registration applicable to the material source; and
2. 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 4.5 must be provided to the Principal at least 15 working days prior to the commencement the supply of the aggregate. |

If, during the course of supply:

1. the Contractor proposes to make changes to the source of supply, plant or method of winning the aggregate, or
2. there is a change to the rock type or quality, even if sourced from the same quarry face,

the information listed in Clause 4.1 must be resubmitted to the Principal and Hold Point 1 will reapply.

# Aggregate Strength and Durability

## General

Subject to Clause 5.2, aggregate must be manufactured from rock which is hard, durable and produced from a single source.

The Contractor may submit a proposal to the Principal for the use of scoria, river gravel and synthetic materials or blended aggregates from different sources. Any such proposal must include evidence, including test results, that the aggregate will perform satisfactorily when used in a sprayed seal.

Unless the Contract documents specify that the Principal will undertake the assessment of the source rock properties under a quarry prequalification / registration scheme, the Contractor must undertake the sampling and testing necessary to demonstrate compliance with this Clause 5.

This Specification sets out 4 testing regimes for aggregate strength and durability. 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. If nothing is specified, Option 1 applies.

Where a rock type is specified, the rock type must be determined from a petrographic analysis in accordance with ASTM C295.

Subject to Clause 8.5, the minimum frequency of testing of the strength and durability properties is one test per 1000 tonnes, but the frequency of testing must not be less than one test for each 6 months of production. Test certificates must not be more than 6 months old when submitted to the Principal.

## Option 1: Wet strength and wet/dry strength variation

Where Option 1 is specified for strength and durability assessment, the source rock properties must comply with Table 5.7.

Table ‎5.7: Strength properties

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Property | Rock Type | Test Method | Aggregate Performance Classification | | |
| **Class A** | **Class B** | **Class C** |
| Minimum Wet Strength (kN) | All, except for Metamorphosed Basalt (Greenstone) | AS 1141.22 | 175 | 150 | 100 |
| Maximum Wet / Dry Strength Variation (%) | All | AS 1141.22 | 35 | 35 | 40 |
| Maximum Water Absorption (%) | All rock except for Glassy Basalt | AS 1141.6.1 | 2.5 | 2.5 | 2.5 |
| Silica Undersaturated Glassy Basalt (1) | AS 1141.6.1 | 3 | 3 | 3 |
| Silica Oversaturated Glassy Basalt (2) | AS 1141.6.1 | 4 | 4 | 4 |

1. Non-Silica Glass Content > 5%, Saturated Silica Glass Content < 1%
2. Non-Silica Glass Content > 5%, Saturated Silica Glass Content >1%

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.

The Contractor may submit a proposal to the Principal for the use of aggregate with water absorption values higher than that specified in Table 5.7, 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 a sprayed seal, as well as any adjustments to the precoating rate and precoating procedures.

## Option 2: Los Angeles value

Where Alternative 2 is specified for strength and durability assessment, Maximum Los Angeles Value of the source rock (when assessed by AS1141.23) must comply with the properties specified in Table ‎5.10.

Table ‎5.10: Maximum Los Angeles Value

|  |  |  |  |
| --- | --- | --- | --- |
| Rock Type (as determined by ASTM C295) | Aggregate Performance Classification | | |
| **Class A** | **Class B** | **Class C** |
| **ACID IGNEOUS** |  |  |  |
| Granitic Rocks | 25 | 35 | 40 |
| Other Acid Igneous | 20 | 25 | 30 |
| **INTERMEDIATE IGNEOUS** | 20 | 25 | 30 |
| **BASIC IGNEOUS** | 20 | 25 | 30 |
| **METAMORPHIC** | 20 | 25 | 30 |
| **SEDIMENTARY** |  |  |  |
| Dolomite | 25 | 25 | 30 |
| Argillaceous Sediments | NP | 25 | 30 |
| Arenaceous Sediments | NP | 25 | 30 |
| River Gravel Pebble | NP | 30 | 35 |
| Calcrete | NP | 30 | 30 |
| **PYROCLASTIC** - Scoria | C | C | 35 |
| **DURICRUST** | C | C | 30 |

*NP Not permitted for use in this application.*

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

## Option 3: Sodium sulphate soundness

Where Option 3 is specified for strength and durability assessment, the Maximum Sodium Sulphate Soundness of the aggregate (Assessed by AS 1141.24) must comply with the properties specified in Table 5.11. for all rock types.

Table 5.11: Maximum Sodium Sulphate Soundness

|  |  |  |  |
| --- | --- | --- | --- |
|  | Aggregate Performance Classification | | |
| **Class A** | **Class B** | **Class C** |
| **Maximum Sodium Sulphate Soundness**  (Assessed by AS 1141.24) | 10% | 12% | 12% |

## Option 4: Degradation

Where Option 4 is specified for strength and durability assessment, aggregate properties must comply with the properties specified in Table ‎5.12 .

Table ‎5.12: Degradation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rock Type (1) | Property | Test Method | Aggregate Performance Classification | | |
| **Class A** | **Class B** | **Class C** |
| Granitic | Degradation Factor (min) | AS 1141.25.1 | 50 | 45 | 35 |
| Acid Igneous, excluding granitic | Degradation Factor (min) | AS 1141.25.1 | 45 | 40 | 35 |
| Trachyte | Degradation Factor (min) | AS 1141.25.1 | 50 | 40 | 30 |
| Intermediate Igneous, excluding Trachyte | Degradation Factor (min) | AS 1141.25.1 | 45 | 40 | 35 |
| Hornfels | Degradation Factor (min) | AS 1141.25.1 | 40 | 35 | 20 |
| Metamorphic, excluding Hornfels | Degradation Factor (min) | AS 1141.25.1 | 45 | 40 | 35 |
| Basic Igneous (2) | Secondary Mineral Content (max) | AS 1141.26 | 25 | 30 | 30 |
| Basic Igneous (2) | Accelerated Soundness Index (min) | AS 1141.29 | 94 | 90 | 90 |
| Basic Igneous (2) | Degradation Factor (min) | AS 1141.25.1 | 45 | 40 | 40 |
| Argillaceous Sediments | Ball Mill Value (max) | AS 1141.28 | 30 | 35 | 35 |
| Arenaceous Sediments | Ball Mill Value (max) | AS 1141.28 | 40 | 45 | 45 |
| Duricrust | Degradation Factor (min) | AS 1141.25.1 | 45 | 40 | 40 |

1. Rock type is determined by ASTM C295.
2. 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.

# Friction Rating

Unless specified otherwise in the Contract documents, the friction rating of Class A Aggregate must comply with either the Polished Aggregate Friction Value (PAFV) or the Polished Stone Value (PSV) specified in Table 6.1.

Table 6.1: Friction Rating

|  |  |  |  |
| --- | --- | --- | --- |
| Property | Acceptance Criteria | Minimum Test Frequency (1) | Test Method |
| PAFV | ≥ 45 | 1 per 6 months of production | Either:  AS 1141.40; or  AS1141.41 and AS1141.42 |
| PSV | ≥ 48 | 1 per 6 months of production | AGPT-T055 |

1. Subject to Clause 8.5.

Test certificates must not be more than 6 months old when submitted to the Principal.

# Production Properties

## General

Aggregate must be clean and free of impurities, such as clay, organic matter or foreign materials.

## Particle dimensions

Unless specified otherwise in the Contract documents, the aggregate must comply with the particle size distributions given in Table 7.2 for each respective nominal size.

Table 7.2: Particle size distribution

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| As Sieve Size (mm) | Percentage Passing by Mass for each Nominal Size | | | | | |
| **20 mm** | **16 mm** | **14 mm** | **10 mm** | **7 mm** | **5 mm** |
| 26.5 | 100 |  |  |  |  |  |
| 19.0 | 80 - 100 | 100 | 100 |  |  |  |
| 16.0 |  | 80 - 100 |  |  |  |  |
| 13.2 | 0 - 20 | 0 - 50 | 80 - 100 | 100 |  |  |
| 9.5 | 0 - 2 | 0 - 10 | 0 - 20 | 80 - 100 | 100 |  |
| 6.7 |  | 0 - 2 | 0 - 2 | 0 - 20 | 80 - 100 | 100 |
| 4.75 |  |  |  | 0 - 2 | 0 - 25 | 80 - 100 |
| 2.36 |  |  |  |  | 0 - 2 | 0 - 30 |
| 1.18 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 – 1.0 |
| Minimum Average Least Dimension (1) (mm) | 10.0 | 8.0 | 7.0 | 5.0 | 3.5 | 2.5 |

1. Determined in accordance with AS 1141.20.1. For aggregates with a nominal size of 10 mm or greater, the slotted gauge method is the preferred method.

Subject to Clause 8.5, the minimum frequency of testing for the properties listed in Table 7.2 is one test per 500 tonnes. Test certificates must not be more than 3 months old when submitted to the Principal.

## Other production properties

Aggregate must comply with Table 7.4.

Table 7.4: Aggregate properties

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Property | Test Method | Test Frequency (1) | Aggregate Performance Classification | | |
| **Class A** | **Class B** | **Class C** |
| Minimum Flakiness Index (1) For aggregates used in the bottom layer of double/double seals (e.g. I-D/D, D/D, HSS2-M, HSS2-H, XSS, and GRS-D/D) | AS 1141.15 | 1 per  1,000 tonnes | 10 | 10 | 10 |
| Minimum Flakiness Index (1)  For aggregates used in all applications other than the bottom layer of double/double seals | AS 1141.15 | 1 per  1,000 tonnes | 0 | 0 | 0 |
| Maximum Flakiness Index (2) | AS 1141.15 | 1 per  1,000 tonnes | 25 | 30 | 35 (5) |
| Crushed Particles (3) (%) | AS 1141.18 | 1 per  5,000 tonnes | 100 | 80 | 80 |
| Weak Particles (4) (%) | AS 1141.32 | 1 per  1,000 tonnes | 1 | 2 | 3 |

1. Subject to Clause 8.5.
2. Not required for aggregate sizes less than 10 mm.
3. Not required for material from a blasted quarry face.
4. Only required where the sprayed seal is to be applied in Queensland.
5. If the Los Angles Value (LAV) is used to determine the durability of the rock in accordance with Table 5.10 and the LAV > 25, the maximum Flakiness Index is 30.

Test certificates for the properties listed in Table 7.4 must not be more than 3 months old when submitted to the Principal.

# Sampling and Testing

## General

Sampling must be undertaken in accordance with AS 1141.3.1.

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

1. a separate stockpile is formed for each stockpile lot of the same material type, or
2. 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.

The maximum lot size is 1000 tonnes.

If requested by the Principal, the Contractor must riffle and/or quarter the samples taken for testing, and deliver a sample in a sealed and labelled container to the Principal.

## Frequency of testing

The frequency of testing set out in this Specifies applies, unless:

1. a reduced rate of testing applies under a prequalification / registration scheme applicable to the jurisdiction where the work is carried out; or
2. 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.

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.

The sampling and testing for each property required under this Specification must also be carried out: whenever there is a change of quarry face, source rock type or change of source.

## Delivery

Aggregate must not be removed from the quarry or manufacturing site until the aggregate has been tested and NATA endorsed test certificates demonstrating compliance with the requirements of this Specification have been submitted to the Principal.

|  |  |
| --- | --- |
| HOLD POINT 2. | |
| Process Held | Acceptance of aggregate and/or commencement of aggregate delivery. |
| Submission Details | All test results demonstrating that the aggregate complies with this Specification must submitted prior to the commencement of supply of aggregate to the worksite. |

# Precoating

This Clause 9 applies where it is specified in the Contract documents that precoating is required.

Where an approval / registration scheme for precoating agent is applicable in the jurisdiction where the sprayed seal will be applied, the precoating agent must be registered / approved under that scheme.

Precoating must be carried out on surface dry aggregate.

The precoating agent must be applied to the aggregate in a manner and at a rate and time that provides a completed, light, uniform, effective cover of all aggregate particles at the time of spreading.

The quantity of precoating agent applied must be just sufficient to coat each aggregate particle uniformly.

Precoating must not be carried out when rain is imminent. If aggregate has been precoated and rain appears imminent, the aggregate must be adequately covered to prevent the precoating material being washed from the aggregates.

Precautions, such as covering stockpiles, must be taken to prevent settlement of dust, penetration of moisture or drying out of the precoating material in the stockpiled aggregate.

If testing for stripping resistance of the precoated aggregate is specified in the Contract documents, the Maximum Stripping Test Value (%) for all classes of aggregate is 10, when assessed by AS 1141.50.

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 | Commencement of aggregate supply |  | Quality Plan |
| 8.8 | Commencement of aggregate delivery |  | Test results |

Amendment Record

|  |  |  |  |
| --- | --- | --- | --- |
| Amendment no. | Clauses amended | Action | Date |
| - | New specification | New | December 2021 |
|  |  |  |  |

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