

Master Specification

Part RD-PV-S1

Supply of Pavement Materials

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RD-PV-S1 Supply of Pavement Materials

1 General

- a) This Master Specification Part sets out the requirements for the supply and delivery of pavement materials (including crushed quarry products, natural gravel, sand, and recycled materials) to be used in the construction of roadworks, bridgeworks, railways, and other applications associated with construction including:
- i) the documentation requirements, as set out in section 2;
 - ii) the requirements for identification, as set out in section 3;
 - iii) the requirements for dedicated stockpiling, as set out in section 4;
 - iv) the requirements for acceptance of material, as set out in section 5;
 - v) the quality of material requirements, as set out in section 6;
 - vi) the sampling and testing requirements, as set out in section 7;
 - vii) the requirements for recycled materials, as set out in section 8;
 - viii) the requirements for performance based pavement materials, as set out in section 9;
 - ix) the requirements for stabilised and Wet-Mixed Materials (plant mixed), as set out in section 10;
 - x) the requirements for rail ballast, as set out in section 11;
 - xi) the requirements for asphalt aggregates and sand, as set out in section 12;
 - xii) the Hold Point requirements, as set out in section 13;
 - xiii) the verification and testing requirements, as set out in section 14; and
 - xiv) the pavement material specifications, as set out in Appendix 1: Pavement material specifications.
- b) The supply and delivery of pavement materials must comply with the Reference Documents, including:
- i) AS 1141 Methods for sampling and testing aggregates;
 - ii) AS 1289 Methods of testing soils for engineering purposes;
 - iii) AS 1289 Methods of testing soils for engineering purposes
 - iv) AS 1672.1 Limes and limestones, Part 1: Limes for building;
 - v) AS/NZS 2350.8 Methods of testing portland, blended and masonry cements, Method 8: Fineness index by air permeability method;
 - vi) AS 2891.3.3 Methods of sampling and testing asphalt, Method 3.3: Binder content and aggregate grading - Pressure filter method;
 - vii) AS 2758 Aggregates and rock for engineering purposes;
 - viii) AS 2758.7 Aggregates and rock for engineering purposes, Part 7: Railway ballast;
 - ix) AS/NZS 2891.3.3 Methods of sampling and testing asphalt Binder content and aggregate grading - Pressure filter method;
 - x) AS/NZS 3582.1 Supplementary cementitious materials, Part 1: Fly ash;
 - xi) AS 3582.2 Supplementary cementitious materials, Part 2: Slag — Ground granulated blast-furnace;

- xii) AS 3583.3 Methods of test for supplementary cementitious materials for use with portland cement, Method 3: Determination of loss on ignition;
 - xiii) AS 3972 General purpose and blended cements;
 - xiv) AS 5101.4 Methods for preparation and testing of stabilized materials, Method 4: Unconfined compressive strength of compacted materials;
 - xv) Austroads Technical Specification ATS-3050 Supply of Recycled Crushed Glass Sand;
 - xvi) ISO 3310-1 Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth;
 - xvii) ISO 3310-2 Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate;
 - xviii) TfNSW Test Method T239 Fractured faces of coarse aggregate (available from <https://standards.transport.nsw.gov.au/>);
 - xix) RMS T276 Foreign materials content of recycled crushed concrete;
 - xx) SA EPA Waste derived fill (blast furnace slag) specification;
 - xxi) Department Test Procedure TP134 Particle Size Distribution - Standard Method of Analysis by Sieving (available from: https://dit.sa.gov.au/standards/test_procedures/);
 - xxii) Department Test Procedure TP183 Determination of Permanent Deformation and Resilient Modulus Characteristics of Unbound Granular Materials Under Drained Conditions (available from: https://dit.sa.gov.au/standards/test_procedures/);
 - xxiii) Department Test Procedure TP184 Determination of Texas Triaxial Classification of Unbound Granular Pavement Materials (available from: https://dit.sa.gov.au/standards/test_procedures/);
 - xxiv) Department Test Procedure TP226 Sampling of Soils, Aggregates and Rocks (available from: https://dit.sa.gov.au/standards/test_procedures/);
 - xxv) Department Test Procedure TP240 Elongation Index (available from: https://dit.sa.gov.au/standards/test_procedures/);
 - xxvi) Department Test Procedure TP244 Percent Flat Particles (available from: https://dit.sa.gov.au/standards/test_procedures/);
 - xxvii) Department Test Procedure TP705 Determination of Aggregate Stripping Value by the One Day Plate Stripping Test (available from: https://dit.sa.gov.au/standards/test_procedures/);
 - xxviii) VicRoads Standard Document 801 Material Sources for the Production of Crushed Rock and Aggregates (VicRoads specifications are available from: <http://webapps.vicroads.vic.gov.au/VRNE/csdspeci.nsf>);
 - xxix) Main Roads WA Specification 6706/02/1312 Materials Engineering Laterite Gravel Specification for Truck Arrester Bed; and
 - xxx) Main Roads Test Method WA 223.1 Crushing Test Value.
- c) All pavement material products must comply with the requirements specified in Appendix 1: Pavement material specifications.
 - d) If recycled materials are to be used pursuant to section 8, for any purpose other than construction of roadworks, additional environmental and physical requirements may be necessary.
 - e) This Master Specification Part does not consider the suitability of recycled materials for any other purpose than for use in roadworks.

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 "Construction Management", the Construction Documentation must include:

- a) a quality plan which complies with the requirements set out in Table RD-PV-S1 2-1;
- b) the test results as required by section 6.3a);
- c) a procedure for determining the stripping performance of the sealing aggregates in both wet and dry states, as required by section 6.3b);
- d) the secondary mineralisation information required by section 6.4c);
- e) the sampling procedures required by section 7.1b);
- f) the RCG quality records as required by section 8.3c);
- g) blast furnace slag written statement of compliance as required in section 8.4d);
- h) the pavement material mix design, as required by section 9c);
- i) the recycled material product information, as required in section 10.2b);
- j) the strength based stabilised material information, as required in section 10.3a);
- k) evidence of suitability of proposed proprietary chemical binders, including procedures for the use, dosage and handling of the binder, as required by Table RD-PV-S1 10-1;
- l) a methodology for control, measurement, and quality assurance of the specified power form binder content, as required by section 10.5.2b);
- m) a methodology for control and quality assurance of the liquid binder content, as required by section 10.5.3b);
- n) a methodology for control and quality assurance of the respective combination binder contents, as required by section 10.5.4b);
- o) procedures for verifying the additive content for each 150 t of treated material, as required by section 10.5.6;
- p) where the Contractor proposes to develop procedures for sampling of stabilised materials, details of procedures for verifying the additive content for each 150 t of treated material, as required by section 10.6.2b);
- q) details of the proposed retarder and usage rate to be used with blended cement binders, as required by section 10.7a);
- r) nominated time periods for delivery of binders to the site, as required by section 10.10e);
- s) where basic igneous source rock is used for the production of ballast, details of the maximum acceptable level of secondary mineralisation of the source rock and procedures for monitoring the product during quarrying and production, as required by section 11c);
- t) where asphalt aggregates are to be produced, details of the process control system required by section 12b); and
- u) evidence that micaceous materials aggregate particles will maintain long term strength and not exfoliate when subject to processing, as required by section 15.19.1 of Appendix 1: Pavement material specifications.

Table RD-PV-S1 2-1 Quality plan procedure requirements

Material	Quality plan details required and procedures to be documented
All materials	Random selection of sample increments (in accordance with the requirements of section 7).
	Representative splitting of bulk samples (in accordance with the requirements of section 7).
	Handling and storage of the pavement material product, including the avoidance of intermixing, contamination, or deterioration which may affect the product properties.
	Inspection of bins, stockpile pads, and trucks for contamination and operational efficiency
	Requirements for inspection and testing of processes and products (including the Inspection and Test Plan).
Material sourced from quarries	Plant calibration and maintenance, including weighing equipment, flow meters, and proportioning systems (where installed).
	Primary, secondary, and tertiary crusher inspection, wear adjustment, and maintenance.
	Screen deck inspection, wear adjustment, and maintenance.
	Use and handling of explosives.
	Assessment of quarry face and shot rock.
	Moisture control of shot rock.
Sealing aggregate	Stripping performance (in accordance with the requirements of section 6.3).
Asphalt aggregates	Additional process control elements (in accordance with the requirements of section 2.1b) and section 12).
Basic igneous source rock	Control of secondary mineralisation (in accordance with the requirements of section 6.4 and section 11c)).
Recycled Crushed Concrete	Control of constituent materials, including supplementary materials (in accordance with the requirements of section 8.2).
RCG	Quality control and compliance testing (in accordance with the requirements of section 8.3)
Stabilised materials	Chemical binder properties (in accordance with the requirements of section 10.4).
	Contractor developed test procedures (where applicable) (in accordance with the requirements of section 10.6.2).
	Control of binder content (in accordance with the requirements of section 10.5).
	Use of retarder (in accordance with the requirements of section 10.7).
	Working time for other binders (in accordance with the requirements of section 10.10).

2.2 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include:

- a) NATA endorsed test results for the bulk sample as required in section 5b)ii);
- b) aggregate wet and dry test results required in section 6.3d);
- c) sampling and test results required in section 7.2; and
- d) the verification requirements set out in section 14.

3 Identification

- a) In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Contractor must

ensure that the pavement materials are produced in identifiable Work Lots not greater than the following:

- i) sealing and asphalt aggregates, arrestor bed material: 500 t; and
 - ii) other pavement materials: 1,000 t.
- b) The Contractor must ensure that a Work Lot of the pavement material is produced under uniform conditions from the same source material or the same constituent components and be essentially homogeneous with respect to composition and general appearance.
 - c) A Work Lot of the pavement material may be prepared from more than one day's production.

4 Dedicated stockpiles

The Contractor must establish dedicated stockpiles of pavement material conforming to the following requirements:

- a) the location of each Work Lot must be accurately identified until conformance of the Work Lot with this Master Specification Part has been verified;
- b) any non-conforming Work Lots placed into these stockpiles must be removed;
- c) where the stockpile contains more than one Work Lot, the stockpile must be constructed in horizontal layers with each successive layer fully contained within the area of the upper surface of the preceding layer;
- d) levelling of each layer must be carried out in a manner to minimise segregation and material breakdown; and
- e) once a dedicated stockpile has been completed, further material must not be added to the stockpile.

5 Acceptance of material

- a) Acceptance of pavement materials will be undertaken on a Work Lot basis and the total quantity of pavement material in the Work Lot will be subject to acceptance or rejection.
- b) The pavement material in a Work Lot will be accepted if:
 - i) the pavement material has been produced and stockpiled in accordance with this Master Specification Part; and
 - ii) the test results endorsed by a NATA accredited laboratory for the bulk sample confirm compliance with the requirements specified in this Master Specification Part, and results submitted as part of the Quality Management Records.

6 Quality of materials

6.1 General

The Contractor must ensure that the pavement materials satisfy the following quality requirements:

- a) all material must be clean, sound, hard, and durable;
- b) mica, shale and similar laminated materials, adherent coatings, any foreign material, or nodular rounded (spherical) particles must not be present in form or sufficient quantity to produce adverse effect upon the usage and performance of the material;
- c) products must be produced from natural rock or sand deposits, as appropriate, except where otherwise permitted in this Master Specification Part;
- d) recycled materials must conform to the requirements detailed in section 8, which are specific to use in roadworks; and

- e) all materials must be free from plant material (including seeds) from declared plants, as declared under the *Landscape South Australia Act 2019* (SA).

6.2 Properties

The Contractor must ensure that the pavement materials satisfy the following requirements:

- a) additive contents must be within the tolerances stated in section 10.5, in the case of plant mixed materials; and
- b) for all materials specifications, square aperture sieves, which conform to the requirements of ISO 3310-1 Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth and ISO 3310-2 Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate, must be used for the determination of grading for particle sizes 75 mm and finer. Coarser sizes must be determined by linear measurement.

6.3 Aggregate stripping

The Contractor must:

- a) implement a testing program to prevent the adverse stripping performance of sealing aggregates and provide the test results as part of the Construction Documentation;
- b) include a procedure for determining the stripping performance of the sealing aggregates in both wet and dry states as part of the Construction Documentation;
- c) include pre-coating agents and adhesion agents in the testing program; and
- d) report the wet and dry test results and submit as part of the Quality Management Records.

6.4 Secondary mineralisation

- a) This section 6.4 applies where basic igneous source rock (as defined in AS 2758 Aggregates and rock for engineering purposes) is used for the production of a pavement material.
- b) The Contractor must ensure that secondary mineralisation is not present in the pavement material to the extent that it adversely affects the pavement material's durability or long term performance.
- c) The Construction Documentation must:
 - i) indicate the level and nature of secondary mineralisation of the source rock, including a description of the potential of the secondary mineralisation to cause material degradation;
 - ii) include procedures for monitoring the quality of the product and component materials during quarrying and production, addressing the control and monitoring of secondary mineralisation;
 - iii) include rock type and durability classifications (i.e. sound, marginal or unsound rock) in accordance with VicRoads Standard Document 801 Material Sources for the Production of Crushed Rock and Aggregates; and
 - iv) address any other information requested by the Principal or required by the Contract Documents.

7 Sampling and testing

7.1 Sampling

- a) The Contractor must arrange for sampling of pavement materials to be carried out by an NATA accredited laboratory in accordance with the requirements of Department Test Procedure TP226 Sampling of Soils, Aggregates and Rocks.

- b) The Contractor must include in the Construction Documentation procedures for the random selection of sample increments appropriate to the sampling method used and the process of splitting and recombining to produce 2 samples equally representative of the bulk sample.
- c) Preparation of samples for testing must be undertaken in accordance with the requirements of AS 1289.1 Methods of testing soils for engineering purposes.
- d) Unless otherwise approved in the Construction Documentation, the NATA accredited laboratory must split each bulk sample to produce an audit sample to be held by the NATA accredited laboratory for a period no less than 14 days after submission of test results.
- e) Audit samples for sealing aggregates must be held until the end of the Defects Liability Period and the sample supplied to the Principal upon request.

7.2 Testing

- a) Notwithstanding Department Test Procedure TP226 Sampling of Soils, Aggregates and Rocks, the Contractor must ensure that quality control testing for each pavement material product is undertaken on a sample representing each production Work Lot and testing records must be submitted as part of the Quality Management Records.
- b) The Contractor must ensure that the quality control tests listed for each pavement material product listed in Appendix 1: Pavement material specifications is performed on the sample representing each Work Lot in accordance with the testing frequency specified in Table RD-PV-S1 7-1.

Table RD-PV-S1 7-1 Assurance minimum testing frequencies

Test procedure	Property	Minimum test frequency
Spall⁽⁴⁾		
AS 1141.11.1	Particle size distribution	One test per 5 Work Lots
Rail ballasts⁽⁴⁾		
AS 1141.11.1	Particle size distribution	One test per 5 Work Lots
AS 1141.23	Los Angeles value	One test per 5 Work Lots
Rail ballast⁽⁴⁾		
AS 1141.4	Bulk density	2 tests for the first Work Lot, and one test per Work Lot thereafter
AS 1141.6.1	Particle density	2 tests for the first Work Lot, and one test per Work Lot thereafter
a) AS 1141.11.1; and b) AS 1141.12.	Particle size distribution	2 tests for the first Work Lot, and one test per Work Lot thereafter
AS 1141.22	Wet / dry strength	2 tests for the first Work Lot, and one test per Work Lot thereafter
AS 1141.23	Los Angeles value	2 tests for the first Work Lot, and one test per Work Lot thereafter
AS 1141.14	Misshapen particles	2 tests for the first Work Lot, and one test per Work Lot thereafter
Quarried pavement materials⁽⁴⁾		
TP134	Particle size distribution	One test per Work Lot
a) AS 1289.3.1.2; b) AS 1289.3.2.1; c) AS 1289.3.3.1; and d) AS 1289.3.4.1.	Atterberg limits	One test per Work Lot
AS 1141.23	Los Angeles value	One test per Work Lot ⁽³⁾
TP183	Resilient modulus / deformation	One test per 100 Work Lots (performance based only)
TP184	Triaxial compression	One test per 100 Work Lots (performance based only)
Recycled pavement materials⁽⁴⁾		
TP134	Particle size distribution	One test per Work Lot

Test procedure	Property	Minimum test frequency
a) AS 1289.3.1.2; b) AS 1289.3.2.1; c) AS 1289.3.3.1; and d) AS 1289.3.4.1.	Atterberg limits	One test per Work Lot
RMS T276	Foreign materials content	One test per Work Lot
AS 2891.3.3	Bitumen content	One test per Work Lot ⁽³⁾
AS 1141.23	Los Angeles value	One test per Work Lot ⁽³⁾
TP183	Resilient modulus / deformation	One test per 100 Work Lots (performance based only)
TP184	Triaxial compression	One test per 100 Work Lots (performance based only)
Stabilised pavement material⁽⁴⁾		
TP134 Particle Size Distribution - Standard Method of Analysis by Sieving	Particle size distribution	One test per Work Lot
a) AS 1289.3.1.2; b) AS 1289.3.2.1; c) AS 1289.3.3.1; and d) AS 1289.3.4.1.	Atterberg limits	One test per Work Lot
AS 1141.23	Los Angeles value	One test per Work Lot ⁽³⁾
Construction Documentation	Binder content	One test per 150 t (refer section 10.5)
AS 5101.4	Unconfined compressive strength (strength control)	2 tests per 150 t (refer section 10.6)
AS 5101.4	Unconfined compressive strength (Binder content control)	One test per 10 000 t
Sealing aggregates⁽⁴⁾		
AS 1141.11.1	Particle size distribution	One test per Work Lot
AS 1141.15	Flakiness index	One test per Work Lot
TP244	% flat particles	One test per Work Lot
AS 1141.14	Misshapen particles	One test per Work Lot
AS 1141.23	Los Angeles value	One test per Work Lot ⁽³⁾
a) AS 1141.42; and b) AS 1141.40.	Polished aggregate friction	One test annually ⁽²⁾
TP705	Aggregate stripping	One test annually ⁽²⁾
a) AS 1141.20.1; or b) AS 1141.20.2.	Average least dimension - direct	3 tests per Work Lot
AS 1141.20.3	Average least dimension - calculated	One test per Work Lot
Asphalt aggregates⁽⁴⁾		
AS 1141.11.1	Particle size distribution	One test per Work Lot
AS 1141.15	Flakiness index	One test per Work Lot
TP240	Elongation index	One test per Work Lot
AS 1141.23	Los Angeles value	One test per Work Lot ⁽³⁾
a) AS 1141.5; b) AS 1141.6.1; and c) AS 1141.6.2	Water absorption and densities	One test per 10 Work Lots
AS 1141.24	Sulphate soundness	One test per 10 Work Lots ⁽³⁾
AS 1141.30	Unsound and marginal stone contents	One test per Work Lot ⁽¹⁾⁽³⁾
a) AS 1141.42; and b) AS 1141.40.	Polished aggregate friction	One test annually ⁽²⁾ (refer section 12h))
Sands⁽⁴⁾		
TP134	Particle size distribution	One test per Work Lot
a) AS 1289.3.1.2; b) AS 1289.3.2.1; c) AS 1289.3.3.1; and d) AS 1289.3.4.1.	Atterberg limits	One test per Work Lot ⁽³⁾
AS 1141.34	Organic impurities	One test per Work Lot ⁽³⁾

Test procedure	Property	Minimum test frequency
Mineral filler for asphalt, other than hydrated lime⁽⁴⁾		
AS 1141.11.1	Particle size distribution	One per contract
AS/NZS 1141.17	Voids in dry compacted filler	One per contract
AS 1289.B1.3	Moisture content	One per week
AS 2350.8	Specific surface	One per contract
AS 3583.3	Loss on ignition	One per contract
AS 1141.8	Water soluble fraction	One per week
Additional requirements for basic igneous source rock⁽⁴⁾		
AS 1141.26	Secondary mineral content	One test every 2 years
AS 1141.29	Accelerated soundness index	One test every 2 years
AS 1141.30.1	Unsound and marginal stone contents	3 tests per Work Lot
Arrester bed material⁽⁴⁾		
TP134	Particle size distribution	One test per Work Lot
TfNSW Test Method T239	Fractured faces	One test per Work Lot
AS 1141.14	Misshapen particles	One test per Work Lot
WA 223.1	Crushing and cracking	One test per contract
AS 1141.23	Los Angeles value	One test per Work Lot
Main Roads WA Specification 6706/02/1312 Materials Engineering Laterite Gravel Specification for Truck Arrester Bed		
AS 1141.4	Bulk density	One test per contract

Table notes:

- (1) Testing for unsound and marginal stone contents under section 15.21 (if required) will include this test in the total number required per Work Lot.
- (2) The Principal reserves the right to obtain material and undertake annual testing as necessary.
- (3) Refer to section 7.3 for more information.
- (4) Refer to the section listed for further information about the testing frequency.

7.3 Reduced rate of testing

- The Contractor may adopt a reduced frequency of testing where approval has been granted under the guidelines for the Department's prequalification scheme for the supply of pavement materials (Refer to: https://www.dit.sa.gov.au/contractor_documents/prequalification).
- Subject to the guidelines for the Department's prequalification scheme for the supply of pavement materials, the Contractor may apply for a reduced frequency of testing for the Project in accordance with PC-QA1 "Quality Management Requirements" or PC-QA2 "Quality Management Requirements for Major Projects" (as applicable).
- Acceptance of a reduced rate of testing does not derogate from the Contractor's obligation to ensure that all pavement material supplied conforms with the requirements of this Master Specification Part and the Contract Documents.

8 Recycled materials

8.1 General

- Where pavement materials derived from natural quarried sources have been specified in the Contract Documents, the Contractor may:
 - use recycled pavement materials derived from traditional recycled material, or blends of traditional recycled material and quarried pavement materials; and
 - submit a proposal to use pavement materials derived from alternative recycled materials, or blends of alternative recycled materials, traditional recycled materials, and quarried pavement materials.

- b) Proposals to use pavement materials derived from alternative recycled materials as contemplated by section 8.1a)ii) will constitute a **Hold Point**. Pavement materials derived from alternative recycled materials must not be used until this Hold Point has been released.
- c) Proposals to use pavement materials derived from alternative recycled materials as contemplated by section 8.1a)ii) must be supported by the following information, in addition to the information required under section 9:
 - i) the source of the alternative recycled materials and where it is processed;
 - ii) proposed location for use of the alternative recycled materials (within the corridor / Project area as well as within the pavement profile);
 - iii) proposed quantity (percentage replacement as well as overall tonnage);
 - iv) information necessary to demonstrate that the alternative recycled material does not present an unacceptable risk of environmental harm, including (as appropriate):
 - A. classification against EPA waste fill criteria (or other criteria deemed appropriate for the source of the material and the proposed reuse);
 - B. findings of relevant research undertaken into any potential environmental issues associated with use of the material (including leaching potential and risk of micro-plastic pollution), and details of any proposed management strategies; and
 - C. report from suitably qualified contamination consultant verifying that the proposed re-use is acceptable;
 - v) end of pavement-life disposal options, including whether the material can be recycled effectively; and
 - vi) any available information on whole-of-life carbon footprint.
- d) Where performance based materials are used and the constituent source materials vary (e.g. Recycled Crushed Concrete, and Recycled Crushed Concrete with RCG), the Contractor must prepare a separate mix design for each proposed composition in accordance with section 9.

8.2 Recycled Crushed Concrete

- a) The Contractor must ensure that pavement products comprising Recycled Crushed Concrete or blends of:
 - i) naturally sourced quarried material;
 - ii) traditional recycled materials; and
 - iii) Recycled Crushed Concrete,comply with the designated quality requirements for class 1, 2, or 3 recycled pavement materials detailed in Appendix 1: Pavement material specifications.
- b) The Contractor must ensure that no more than 20% by mass of supplementary source materials or traditional recycled materials (other than Recycled Crushed Concrete or blast furnace slag which may be added up to 100%) are incorporated into class 1, 2, or 3 recycled pavement materials, and the constituent proportions remain unchanged during production.

8.3 Recycled crushed glass (RCG)

- a) The Contractor must ensure that RCG for use as a granular material in pavement materials:
 - i) satisfies the requirements of Austroads Technical Specification ATS-3050 Supply of Recycled Crushed Glass Sand; and
 - ii) is free from asbestos.
- b) The Contractor must ensure that all RCG material is sufficiently clean for the intended use.

- c) The Contractor must submit to the Principal details of the RCG, as part of the Construction Documentation, including:
- i) source of raw materials and sensitivity of mix to input streams;
 - ii) production plant, method of production, and method of controlling the quality of the final RCG product;
 - iii) evidence that the source and method proposed are suitable for the required quantity and quality of RCG;
 - iv) evidence (including test results) that the RCG satisfies the requirements of Austroads Technical Specification ATS 3050 Supply of Recycled Crushed Glass Sand;
 - v) management of test repeatability, uniformity (no segregation), and the method of mixing of the raw materials and blending with other source materials; and
 - vi) any other information requested by the Principal or required by the Contract Documents.
- d) Subject to the overall specification and quality requirements detailed in Appendix 1: Pavement material specifications being satisfied, the Contractor may blend RCG with:
- i) asphalt aggregate;
 - ii) class 1, 2, and 3 recycled pavement materials; and
 - iii) sands,
- in accordance with the requirements of this section 8.
- e) RCG may be incorporated into pavement materials in the proportions specified in Table RD-PV-S1 8-1.
- f) For class 1, 2, and 3 recycled pavement materials, the Contractor must ensure that the total constituent proportions of supplementary source materials (brick, tile, and asphalt) and RCG combined (refer section 8.2) will not exceed 20%, noting the limits on permissible RCG proportions in Table RD-PV-S1 8-1.
- g) The Contractor must ensure that cement is not used as a stabiliser or binding agent for materials containing RCG.

Table RD-PV-S1 8-1 RCG in pavement materials

Base product	% RCG permitted
Class 1 recycled pavement materials	Max 5%
Class 2 recycled pavement materials	Max 10%
Class 3 recycled pavement materials	Max 15%
Asphalt aggregates	Refer RD-BP-S2 "Supply of Asphalt"
Sand	Max 100%

8.4 Blast furnace slag

- a) The Contractor must ensure that pavement material products comprising blast furnace slag or blends of quarried material, traditional recycled materials, or blast furnace slag comply with the designated quality requirements for class 1, 2, or 3 recycled pavement materials as detailed in Appendix 1: Pavement material specifications.
- b) The Contractor must ensure that blast furnace slag used in recycled pavement materials referred to in this section 8.4 is not granulated or ground.
- c) The Contractor must ensure that blast furnace slag meets the requirements of the SA EPA Waste derived fill (blast furnace slag) specification.
- d) The Contractor must submit as part of the Construction Documentation, a written statement of compliance certifying that the blast furnace slag complies with the chemical criteria of the SA EPA Waste derived fill (blast furnace slag) specification.

9 Performance based pavement materials

- a) This section 9 specifies the requirements for performance based materials, which are designed and manufactured to meet particular levels of in-service pavement performance.
- b) Performance based materials may only be used where permitted in the Contract Documents.
- c) Where the Contractor proposes to design a pavement material to meet pavement performance criteria, the Contractor must ensure that the following requirements are satisfied, and details must be submitted as part of the Construction Documentation:
 - i) the Contractor must determine the mix design properties for the product based on the full suite of tests identified in the mix design limits of the product specification;
 - ii) with the exception of resilient modulus / deformation testing and triaxial compression testing, results from testing a minimum of 10 samples of product must be used to determine the average test value. This value will be the nominated mix design value for that test property or sieve size. Each sample must be representative of a minimum of 100 t of product;
 - iii) mix designs must comply with the limits specified in mix design limits of each product specification;
 - iv) the Contractor must submit a reference sample of the product;
 - v) resilient modulus / deformation testing and triaxial compression testing must be performed in duplicate on a sample representative of the submitted mix design and reference sample;
 - vi) the Contractor may be requested to submit further evidence of conformance to resilient modulus and triaxial compression requirements on samples representative of the extremes of the permissible grading envelope for manufacturing, or field trial evidence of acceptable performance where the mix design is within one standard deviation of the mix design limit for any specified sieve size;
 - vii) the Contractor must submit supporting mix design or specification conformance documentation, including results for the full suite of tests identified in the mix design limits of the product specification. Subject to the product meeting all requirements of the product specification, the Principal will register the mix design and apply the manufacturing tolerance to the mix design for product quality control purposes; and
 - viii) the Contractor must not supply material under a mix design specification until written approval and the manufacturing tolerances have been received. Approval will remain current for a period not exceeding 2 years. The approval may be withdrawn in the event of unsatisfactory field performance of the material, or if the reference sample is no longer representative of delivered material.

10 Stabilised and wet-mixed materials (plant mixed)

10.1 General

- a) The Contractor must ensure that stabilised materials (which includes the addition of cement, fly ash, lime, bitumen, other binders, or combinations of binders) and Wet-Mixed Materials comply with this section 10.
- b) The Contractor must ensure that stabilised materials and Wet-Mixed Materials specified by binder content basis are tested for binder content in accordance with section 10.5.
- c) The Contractor must ensure that stabilised materials and Wet-Mixed Materials specified on a strength basis are tested for unconfined compressive strength in accordance with section 10.6.
- d) The Contractor must ensure that the addition of cement, fly ash, bitumen, lime, or slag and water is described by a naming convention as given in the following examples:

- i) SPM2/20QGC4 20 mm class 2, 4% cement stabilised quarried pavement material;
 - ii) SPM1/30RMC4MPa 30 mm class 1, 4 MPa cement stabilised recycled pavement material;
 - iii) SPM2/40QGB3 40 mm class 2, 3% bitumen stabilised quarried pavement material;
 - iv) SPM2/20QGL1F2 20 mm class 2 stabilised quarried pavement material with 1% lime and 2% fly ash; and
 - v) SPM2/30QGL1S4 30 mm class 2 stabilised quarried pavement material with 1% lime and 4% slag.
- e) The Contractor must ensure that Wet-Mixed Materials are identified by the suffix "W", as illustrated in the following examples:
- i) PM1/20QGW 20 mm class 1 quarried pavement material wet-mix (grading based); and
 - ii) PM1/20RMW 20 mm class 1 recycled pavement material wet-mix (performance based).

10.2 Recycled material products

- a) The Contractor must ensure that the following are not added to recycled pavement material products without prior approval:
- i) cement;
 - ii) fly ash;
 - iii) lime;
 - iv) slag;
 - v) bitumen; or
 - vi) other binders.
- b) Where the Contractor proposes to produce a stabilised recycled product, the Contractor must ensure that the following requirements are satisfied and details must be submitted as part of the Construction Documentation:
- i) the Contractor must submit evidence of compliance of the product to the full suite of tests detailed in the product material specifications (Appendix 1: Pavement material specifications) for stabilised pavement material;
 - ii) the Contractor must submit a reference sample of the untreated recycled material, which will be representative of a minimum of 10 samples of product, and a sample of the proposed binder; and
 - iii) the Contractor must undertake unconfined compressive strength testing on 3 pairs of specimens at each binder content and curing age detailed in the product specification. samples prepared for testing will be representative of the reference sample.

10.3 Strength based stabilised material

- a) Where the use of a stabilised material meeting strength-based acceptance criteria is allowed in the Contract Documents, the Contractor must ensure that the following requirements are satisfied, and details must be submitted as part of the Construction Documentation:
- i) the Contractor must submit evidence of compliance of the product to the full suite of tests detailed in Appendix 1: Pavement material specifications for stabilised pavement material (strength control);

- ii) the Contractor must submit a reference sample of the unestablished material, which will be representative of a minimum of 10 samples of product, and a sample of the proposed binder; and
 - iii) the Contractor must undertake unconfined compressive strength testing on 3 pairs of specimens at the binder contents and curing age required to meet the full range of strength targets detailed in the product specification. samples prepared for testing will be representative of the reference sample.
- b) Strength based stabilised material must not be supplied without the prior approval of the Principal.

10.4 Binders

The Contractor must ensure that binders and additives comply with the requirements of Table RD-PV-S1 10-1.

Table RD-PV-S1 10-1 Binder properties

Material	Properties
Bitumen	Class 170 residual bitumen to RD-BP-S1 "Supply of Bituminous Material" or other approved special foam binder.
Cement	Blended cement complying with AS 3972 General purpose and blended cements.
Lime	Hydrated lime or quick lime complying with AS 1672.1 Limes and limestones Limes for building. Quick lime must be fully slaked.
Fly ash	Fine, medium, or coarse fly ash meeting the requirements of AS/NZS 3582.1 Supplementary cementitious materials, Part 1: Fly ash.
Slag	Ground granulated blast furnace slag will meet the requirements of AS 3582.2 Supplementary cementitious materials Slag - Ground granulated blast-furnace.
Chemicals	Proprietary chemical binders may be used provided documented evidence as to their suitability is submitted. Procedures for the use, dosage and handling of the binder must be included as part of the Construction Documentation.
Water	Water must be potable.

10.5 Additive content determination

The Contractor must ensure that all pavement material additives comply with the requirements of this section 10.5.

10.5.1 Bitumen

- a) The bitumen content of the treated material must be supplied, as a target percentage of dry mass. The bitumen content may vary up to $\pm 0.25\%$ from that ordered.
- b) The bitumen content must be determined in accordance with AS 2891.3.3 Binder Content and Aggregate Grading - Pressure Filter Method.

10.5.2 Powder form binders

- a) The powder form binder content of the treated material must be supplied, expressed as a target percentage of dry mass. The powder form binder content may vary up to $\pm 0.5\%$ from that ordered.
- b) The Contractor must identify as part of the Construction Documentation a methodology for control, measurement, and quality assurance of the specified powder form binder content.

10.5.3 Liquid binders

- a) Liquid binders must be supplied as a minimum percentage of the dry mass of untreated product or by loose volume of untreated product.

- b) As part of the Construction Documentation the Contractor must identify a methodology for control and quality assurance of the liquid binder content.

10.5.4 Combination binders

- a) Combination binders must be supplied as a minimum percentage of the dry mass of untreated product or by loose volume of untreated product.
- b) The Contractor must identify as part of the Construction Documentation a methodology for control and quality assurance of the respective combination binder contents.

10.5.5 Water

The moisture content of bitumen, cement, lime, or fly ash treated material when combined with water, and water by itself ordered as a wet mixed product, must be ordered expressed as a percentage of dry mass. The moisture content may vary up to $\pm 1.0\%$ from that ordered.

10.5.6 Test frequency

The Contractor must include as part of the Construction Documentation procedures for verifying the additive content for each 150 t of treated material.

10.6 Strength determination testing

10.6.1 Powder form binders, liquid binders and combination binders

The Contractor must ensure that the strength of powder form binders, liquid binders and combination binders are determined in accordance with the following:

- a) the strength of the treated material must be as specified, expressed as a target unconfined compressive strength in MPa. The average strength of the test cylinders for each test may vary up to -0.5 MPa, +1.0 MPa as specified;
- b) strength must be determined in accordance with the requirements of AS 5101.4 Methods for preparation and testing of stabilized materials Unconfined compressive strength of compacted materials; and
- c) a contingency representative sample of the untreated material used in the production of plant treated material must be taken from each day's production.

10.6.2 Test frequency

- a) The Contractor must ensure that samples of stabilised materials are tested for strength at a rate not less than 2 tests (4 test cylinders) per 150 t.
- b) Where Contractor developed procedures for testing are proposed, the Contractor must include, as part of the Construction Documentation, procedures for verifying the additive content for each 150 t of treated material.

10.7 Addition of retarder

- a) The Contractor must ensure that a retarder is used with blended cement binders. The proposed retarder and usage rate must be nominated as part of the Construction Documentation.
- b) The Contractor must ensure that the Contractor's mixing plant is fitted with a measuring device to allow accurate measurement of the amount of retarder being added to the mix.

10.8 Mixing

The Contractor must ensure that the following mixing requirements are satisfied:

- a) the quarry material, selected additive (if specified), or water must be mixed at a central mixing plant of the pugmill type;
- b) the mixing plant contemplated by section 10.8a) may be either a batch or continuous type;

- c) the mass of charge in a batch mixer or the rate of feed to a continuous type mixer must not exceed that which will permit complete mixing of all material;
- d) mixing of material must be continued until the quarry material, binder, retarder, and water (as applicable) are evenly distributed through the mass and a uniform mixture of unchanging appearance is obtained; and
- e) sufficient mixing capacity must be provided to produce enough mixture to permit placing up to 200 t of mixture on the road bed per hour.

10.9 Transporting

- a) The Contractor must ensure that, during transportation of the pavement materials, the load is completely covered with a tarpaulin or similar heavy cover to protect the pavement material against the effect of sun and rain.
- b) The Contractor must ensure that the cover required by section 10.9a) is not removed until the load is about to be tipped.

10.10 Time requirements

The Contractor must ensure that the following time related requirements are satisfied with respect to pavement materials:

- a) cement treated material must be delivered to the road bed or construction site within a time sufficient to enable all spreading, shaping, and compaction to be carried out within 2.75 hours of the introduction of cement to the untreated material;
- b) blends of lime and fly ash or lime treated material must be delivered to the road bed or construction site on the same day as the introduction of lime or fly ash to the moist material;
- c) bitumen treated material may be stockpiled for a period not exceeding 4 weeks;
- d) wet mix material must be delivered to the road bed or construction site and placed or compacted in a time that ensures that the moisture content of the material remains within the specified tolerance of that at which it was ordered;
- e) other binders must be delivered to the site within time periods detailed as part of the Construction Documentation; and
- f) the time of binder addition must be recorded on the cart-note for each load of stabilised material.

11 Rail ballast

- a) The Contractor must ensure that the production of rail ballast complies with this section 11.
- b) The Contractor must undertake petrographic analyses of the rail ballast source rock to the extent that all mineralogical variations of the rock are examined.
- c) Where basic igneous source rock is used for the production of rail ballast, the Contractor must indicate as part of the Construction Documentation the maximum acceptable level of secondary mineralisation of the source rock and procedures for monitoring the product during quarrying and production.
- d) Notwithstanding that the source rock may comply with other requirements of this Master Specification Part, the Contractor must ensure that rail ballast does not contain minerals in a concentration that may be detrimental to the overall performance of the rail ballast in service.
- e) The Contractor must ensure that the rail ballast is managed at all stages to prevent material contamination, segregation, and degradation. The Contractor must avoid unnecessary handling of the rail ballast, such as repeated mechanical handling and dropping of material.
- f) Where the rail ballast is to be used under steel sleepers, the rail ballast must comply with classification RAIL60S as set out in Appendix 1: Pavement material specifications.

12 Asphalt aggregates and sand

- a) Where asphalt aggregates are to be produced, the Contractor must develop and implement a process control system which includes:
 - i) a description of the flow of materials and the processes carried out on them, from input materials to the plant through to delivery of aggregates to the asphalt plant;
 - ii) a flow diagram and identification of the key elements of the manufacturing process requiring monitoring, measurement, or verification; and
 - iii) constant monitoring and statistical analysis of records to verify process capability and product characteristics.
- b) The Contractor must provide details of the process control system required by section 12a) to the Principal as part of the Construction Documentation.
- c) The Contractor must ensure that the production of asphalt aggregates and sand complies with this section 12.
- d) The Contractor must ensure that the production process provides material to meet the grading requirements for the appropriate aggregate size to produce a particular asphalt type.
- e) Once the asphalt mix design has been completed, the grading of the aggregate to be supplied will be known as the nominated grading.
- f) The Contractor must ensure that the production tolerances for the assessment of conformity to the design comply with Appendix 1: Pavement material specifications.
- g) The Contractor must determine the associated properties of each aggregate type in accordance with the property limits as shown in Appendix 1: Pavement material specifications, and thereafter be referred to as the nominated property; for example, Los Angeles nominated property.
- h) Polished aggregate friction value assessment of any size product from a particular source must be undertaken on aggregates within the 6.7 mm to 9.5 mm (exclusive) size fraction of the same product source in accordance with AS 1141.40 Methods for sampling and testing aggregates Polished aggregate friction value - Vertical road-wheel machine.
- i) RCG may be incorporated into asphalt aggregates and sand, in accordance with section 8.

13 Hold Points

Table RD-PV-S1 13-1 details the review period or notification period, and type (documentation or construction quality) for each Hold Point referred to in this Master Specification Part.

Table RD-PV-S1 13-1 Hold Points

Section reference	Hold Point	Documentation or construction quality	Review period or notification period
8.1b)	Proposal to use pavement material derived from alternative recycled material	Documentation	10 Business Days review

14 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the testing undertaken pursuant to this Master Specification Part demonstrates compliance with the requirements of this Master Specification Part.

15 Appendix 1: Pavement material specifications

Table RD-PV-S1 15-1 Pavement material specification - list of products

Identification Number	Source	Mix design	Product
Spalls			
SP300	Quarry	No	300 mm spalls
Road ballast			
RB100	Quarry	No	100 mm road ballast
RB65	Quarry	No	65 mm road ballast
Rail ballast			
RAIL50	Quarry	No	50 mm rail ballast
RAIL60	Quarry	No	60 mm rail ballast
RAIL60S	Quarry	No	60 mm ail ballast (steel sleepers)
Class 3 recycled pavement materials			
PM3/20RG	Recycled	No	20 mm class 3 recycled pavement material [grading based]
PM3/40RG	Recycled	No	40 mm class 3 recycled pavement material [grading based]
PM3/55RG	Recycled	No	55 mm class 3 recycled pavement material [grading based]
PM3/75RG	Recycled	No	75 mm class 3 recycled pavement material [grading based]
Class 3 quarried pavement materials			
PM3/20QG	Quarry	No	20 mm class 3 quarried pavement material [grading based]
PM3/40QG	Quarry	No	40 mm class 3 quarried pavement material [grading based]
PM3/55QG	Quarry	No	55 mm class 3 quarried pavement material [grading based]
PM3/75QG	Quarry	No	75 mm class 3 quarried pavement material [grading based]
Class 2 recycled pavement materials			
PM2/20RG	Recycled	No	20 mm class 2 recycled pavement material [grading based]
PM2/30RG	Recycled	No	30 mm class 2 recycled pavement material [grading based]
PM2/40RG	Recycled	No	40 mm class 2 recycled pavement material [grading based]
PM2/20RM	Recycled	Yes	20 mm class 2 recycled pavement material [performance based]
PM2/30RM	Recycled	Yes	30 mm class 2 recycled pavement material [performance based]
Class 2 quarried pavement materials			
PM2/20QG	Quarry	No	20 mm class 2 quarried pavement material [grading based]
PM2/30QG	Quarry	No	30 mm class 2 quarried pavement material [grading based]
PM2/40QG	Quarry	No	40 mm class 2 quarried pavement material [grading based]
PM2/20QM	Quarry	Yes	20 mm class 2 quarried pavement material [performance based]
PM2/30QM	Quarry	Yes	30 mm class 2 quarried pavement material [performance based]
Class 1 recycled pavement materials			
PM1/20RG	Recycled	No	20 mm class 1 recycled pavement material [grading based]
PM1/30RG	Recycled	No	30 mm class 1 recycled pavement material [grading based]

Identification Number	Source	Mix design	Product
PM1/40RG	Recycled	No	40 mm class 1 recycled pavement material [grading based]
PM1/20RM	Recycled	Yes	20 mm class 1 recycled pavement material [performance based]
PM1/30RM	Recycled	Yes	30 mm class 1 recycled pavement material [performance based]
Class 1 quarried pavement materials			
PM1/20QG	Quarry	No	20 mm class 1 quarried pavement material [grading based]
PM1A/20QG	Quarry	No	20 mm class 1 heavy duty quarried pavement material
PM1B/20QG	Quarry	No	20 mm class 1 heavy duty quarried pavement material
PM1/30QG	Quarry	No	30 mm class 1 quarried pavement material [grading based]
PM1/40QG	Quarry	No	40 mm class 1 quarried pavement material [grading based]
PM1/20QM	Quarry	Yes	20 mm class 1 quarried pavement material [performance based]
PM1/30QM	Quarry	Yes	30 mm class 1 quarried pavement material [performance based]
Stabilised pavement materials			
Refer section 10.1 for examples of nomenclature for this class of pavement material.			
Sealing aggregate			
SA20-14	Quarry	No	20 / 14 mm sealing aggregate
SA16-10	Quarry	No	16 / 10 mm sealing aggregate
SA14-10	Quarry	No	14 / 10 mm sealing aggregate
SA10-7	Quarry	No	10 / 7 mm sealing aggregate
SA7-5	Quarry	No	7 / 5 mm sealing aggregate
SA5-2	Quarry	No	5 / 2 mm sealing aggregate
Sand			
Sa - A	Recycled / quarry / pit	No	Type A sand
Sa - B	Recycled / quarry / pit	No	Type B sand
Sa - C	Recycled / quarry / pit	No	Type C sand
Sa - D	Recycled / quarry / pit	No	Type D sand
Asphalt aggregate			
Refer to the relevant product material specifications in Appendix 1: Pavement material specifications for requirements of source materials and product quality control.			
Mineral filler for asphalt, other than hydrated lime			
Refer to the relevant product material specifications in Appendix 1: Pavement material specifications for requirements of product quality control.			
Additional requirements for basic igneous source of rock			
Arrester bed material			

15.1 Spalls

15.1.1 Source materials

The Contractor must ensure that spalls source materials:

- a) are natural quarried material;
- b) are free from laminations or weak cleavages;
- c) of such character that they will not disintegrate from the action of the sea, sand, or weather; and
- d) do not include recycled material.

15.1.2 Product quality control

Table RD-PV-S1 15-2 Spalls quality control tests

Product		300 mm Spalls SP300
Test procedure	Manufacturing tolerance	
	Sieve size (mm)	Percent passing (%)
Particle size distribution AS 1141.11.1	300	100
	125	0 - 30
	75	0 - 2

Table notes:

(1) For all materials specifications, square aperture sieves conforming to ISO 3310-1 Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth and ISO 3310-2 Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate must be used for the determination of grading for particle sizes 75 mm and finer. Coarser sizes must be determined by linear measurement.

15.2 Road ballast

15.2.1 Source materials

The Contractor must ensure that all road ballast source materials:

- a) are natural quarried material; and
- b) do not include recycled material.

15.2.2 Product quality control

Table RD-PV-S1 15-3 Road ballast quality control tests

Product		100 mm ballast RB-100	65 mm ballast RB-65
Test procedure	Manufacturing tolerance		
Particle size distribution AS 1141.11.1	Sieve size (mm)	Percent passing (%)	
	125	100	-
	106	90 - 100	-
	75	-	100
	63	-	95 - 100
	53	-	40 - 70
	37.5	0 - 5	0 - 15
	19	-	0 - 2
AS 1141.23	Los Angeles abrasion grading A	Maximum 45%	

Table notes:

(1) For all materials specifications, square aperture sieves conforming to ISO 3310-1 Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth and ISO 3310-2 Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate must be used for the determination of grading for particle sizes 75 mm and finer. Coarser sizes must be determined by linear measurement.

15.3 Rail ballast

15.3.1 Source materials

- a) The Contractor must ensure that all rail ballast source materials:
- i) are natural quarried material; and
 - ii) do not include:
 - A. recycled materials; or
 - B. river gravel or crushed river gravel.
- b) The Contractor must ensure that all testing is undertaken on representative rail ballast samples and not the source rock within the quarry. The sampling procedure must ensure that the samples are representative of the materials supplied and have not been affected by segregation during handling and transport.

15.3.2 Product quality control

Table RD-PV-S1 15-4 Rail ballast quality control tests⁽¹⁾

Product	RAIL50	RAIL60	RAIL60S (Used under steel sleepers)	
Test procedure	Manufacturing tolerance			
	Sieve size (mm)	Percent passing (%)		
Particle size distribution AS 1141.11.1	63	-	100	100
	53	100	85 - 100	95 -- 100
	37.5	70 - 100	20 - 65	35 - 70
	26.5	-	0 - 20	15 -30
	19	40 - 60	0 - 5	5 - 15
	13.2	-	0 - 2	0 -10
	9.5	10 - 30	-	0 - 1
	4.75	0 - 20	0 - 1	-
	1.18	0 - 10	-	-
	0.075	0 - 1	0 - 1	0 - 1
AS 1141.4	Bulk density	Minimum 1200 kg/m ³		
AS 1141.6.1	Particle density	Minimum 2500 kg/m ³		
AS 1141.22	Wet / dry strength ⁽²⁾	Minimum 150 kN wet strength, Maximum 30% wet / dry strength variation		
AS 1141.23	Los Angeles abrasion grading B ⁽³⁾⁽⁴⁾	Track carrying <6 Mt (gross) per annum: max 30% Track carrying >6 Mt (gross) per annum: max 25%		
AS 1141.14 ⁽³⁾	Misshapen particles % ⁽⁵⁾	Max 30%		

Table notes:

(1) Refer to section 11 for further details.

(2) Samples must be prepared from an appropriately sized fraction of ballast from delivered Work Lots. Wet and dry strength testing must be carried out on the fraction of material passing 26.5 mm sieve and retained on 19 mm sieve.

(3) Los Angeles testing must be carried out on the fraction of ballast passing 19 mm sieve and retained on 9.5 mm sieve.

(4) In accordance with AS 2758.7 Aggregates and rock for engineering purposes, Part 7: Railway ballast, the ballast itself may be crushed to provide an appropriately graded test within the size range for Los Angeles testing only.

(5) Misshapen particles must be determined on the fraction of ballast retained on the 9.5 mm test sieve using a 2:1 calliper ratio. The report must indicate each of % flat, elongated, and flat and elongated particles.

15.4 Class 3 recycled pavement material [grading based]

15.4.1 Source materials

- Class 3 recycled pavement source materials may be natural quarried material, blast furnace slag, Recycled Crushed Concrete, or any combination of them.
- Supplementary source materials may comprise brick, tile, and asphalt or RCG in accordance with section 8.3.
- The Contractor must ensure that asbestos or asbestos fibre is not incorporated into the pavement material product under any circumstances.
- The Contractor must ensure that no more than 20% by mass of total supplementary source materials are incorporated and the constituent proportions must remain unchanged during production.

15.4.2 Product quality control

Table RD-PV-S1 15-5 Class 3 recycled pavement material [grading based] quality control tests

Product	20 mm Class 3 PM 3/20RG	40 mm Class 3 PM 3/40RG	55mm Class 3 PM 3/55RG	75 mm Class 3 PM 3/75RG
Test procedure	Manufacturing tolerance			
	Sieve size (mm)	Percent passing (%)		
Particle size distribution TP134	75	-	-	100
	53	-	100	75 - 95
	37.5	-	90 - 100	75 - 95
	26.5	100	-	50 - 75
	19	90 - 100	60 - 85	50 - 75
	13.2	-	-	-
	4.75	40 - 65	25 - 50	20 - 45
	0.075	5 - 15	3 - 11	3 - 11
AS 1289.3.1.2	Liquid limit	Maximum 35%		
AS 1289.3.3.1	Plasticity index	Maximum 15%		
AS 1289.3.4.1	Linear shrinkage	Maximum 8%		
RMS T276	Type II foreign materials	Maximum 1%		
	Type III Foreign materials excluding bitumen	Maximum 0.5%		
AS/NZS 2891.3.3	Bitumen content	Maximum 1%		
AS 1141.23	Los Angeles abrasion grading A	N/A	Maximum 45%	
	Los Angeles abrasion grading B	Maximum 45%	N/A	

Table notes:

(1) The recycled pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

15.5 Class 3 quarried pavement material [grading based]

15.5.1 Source materials

- a) The Contractor must ensure that class 3 quarried pavement source materials are natural quarried material.
- b) The Contractor must ensure that no recycled material is included in class 3 quarried pavement material.

15.5.2 Product quality control

Table RD-PV-S1 15-6 Class 3 quarried pavement material [grading based] quality control tests

Product	20 mm Class 3 PM 3/20QG	40 mm Class 3 PM 3/40QG	55 mm Class 3 PM 3/55QG	75 mm Class 3 PM 3/75QG	
Test procedure	Manufacturing tolerance				
Particle size distribution TP134	Sieve size (mm)	Percent passing (%)			
	75	-	-	-	100
	53	-	100	100	75 - 95
	37.5	-	90 - 100	75 - 95	-
	26.5	100	-	-	50 - 75
	19	90 - 100	60 - 85	50 - 75	-
	13.2	-	-	-	-
	4.75	40 - 65	25 - 50	20 - 45	20 - 40
0.075	5 - 15	3 - 11	3 - 11	3 - 11	
AS 1289.3.1.2	Liquid limit	Maximum 35%			
AS 1289.3.3.1	Plasticity index	Maximum 15%			
AS 1289.3.4.1	Linear shrinkage	Maximum 8%			
AS 1141.23	Los Angeles abrasion grading A	N/A	Maximum 45%		
	Los Angeles abrasion grading B	Maximum 45%	N/A		

Table notes:

(1) The quarried pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

15.6 Class 2 recycled pavement material [grading based]

15.6.1 Source materials

- Class 2 recycled pavement source materials may be natural quarried material, blast furnace slag, Recycled Crushed Concrete, or any combination of them.
- Supplementary source materials may comprise brick, tile, and asphalt or RCG in accordance with section 8.3.
- The Contractor must ensure that asbestos or asbestos fibre is not incorporated into the pavement material product under any circumstances.
- The Contractor must ensure that no more than 20% by mass of total supplementary source materials may be incorporated and the constituent proportions must remain unchanged during production.

15.6.2 Product quality control

Table RD-PV-S1 15-7 Class 2 recycled pavement material [grading based] quality control tests

Product	20 mm Class 2 PM 2/20RG	30 mm Class 2 PM 2/30RG	40 mm Class 2 PM 2/40RG
Test procedure	Manufacturing tolerance		
	Sieve size (mm)	Percent passing (%)	
Particle size distribution TP134	53	-	100
	37.5	-	100
	26.5	100	90 - 100
	19	90 - 100	77 - 95
	13.2	74 - 96	-
	9.5	61 - 85	51 - 75
	4.75	42 - 66	35 - 57
	2.36	28 - 50	24 - 44
	0.425	11 - 27	9 - 22
	0.075	4 - 14	4 - 12
AS 1289.3.1.2	Liquid limit	Maximum 28%	
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 8%	
AS 1289.3.4.1	Linear shrinkage	Maximum 4%	
RMS T276	Type II foreign materials	Maximum 1%	
	Type III foreign materials excluding bitumen	Maximum 0.5%	
AS/NZS 2891.3.3	Bitumen content	Maximum 1%	
AS 1141.23	Los Angeles abrasion grading A	N/A	
	Los Angeles abrasion grading B	Maximum 45%	
			N/A

Table notes:

- (1) The recycled pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

15.7 Class 2 recycled pavement material [performance based]

15.7.1 Source materials

- a) Class 2 recycled pavement source materials may be natural quarried material, blast furnace slag, Recycled Crushed Concrete, or any combination of them.
- b) Supplementary source materials may comprise brick, tile, and asphalt or RCG in accordance with section 8.3.
- c) The Contractor must ensure that asbestos or asbestos fibre is not incorporated into the product under any circumstances.
- d) The Contractor must ensure that no more than 20% by mass of total supplementary source materials may be incorporated and the constituent proportions must remain unchanged during production.

15.7.2 Nominated mix design parameters

Table RD-PV-S1 15-8 Class 2 recycled pavement material [performance based] quality control tests - mix design limits

Product		20 mm Class 2 PM 2/20RM	30 mm Class 2 PM 2/30RM
Test procedure	Manufacturing tolerance		
Particle size distribution TP134	Sieve size (mm)	Percent passing (%)	
	37.5	-	100
	26.5	100	90 - 100
	19	90 - 100	80 - 95
	2.36	30 - 60	25 - 55
	0.075	5 - 20	5 - 20
AS 1289.3.1.2	Liquid limit	Maximum 30%	
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 10%	
AS 1289.3.4.1	Linear shrinkage	Maximum 5%	
TP183	Resilient modulus	Minimum 250 MPa	
	Deformation	Maximum 10-7	
AS 1141.23	Los Angeles abrasion grading B	Contractor nominated value	
TP184	Triaxial compression	Cohesion max 250 kPa, friction angle Min 40°	
RMS T276	Type II foreign materials	Maximum 1%	
	Type III foreign materials excluding bitumen	Maximum 0.5%	
AS/NZS 2891.3.3	Bitumen content	Maximum 1%	

15.7.3 Product quality control

Table RD-PV-S1 15-9 Class 2 recycled pavement material [performance based] quality control tests

Normal	Manufacturing tolerance	
	Sieve size (mm)	Variation in percent passing
Particle size distribution TP134	37.5	0
	26.5	0 (PM2/20), ±6 (PM2/30)
	19	±6
	9.5	±9
	2.36	±8
	0.075	±3
AS 1289.3.1.2	Liquid limit	+3
AS 1289.3.3.1	Plasticity index	+2
AS 1289.3.4.1	Linear shrinkage	+1
AS 1141.23	Los Angeles abrasion grading B	+3

15.8 Class 2 quarried pavement material [grading based]

15.8.1 Source material

The Contractor must ensure that class 2 quarried pavement source materials are natural quarried material and do not include recycled material.

15.8.2 Product quality control

Table RD-PV-S1 15-10 Class 2 quarried pavement material [grading based] quality control tests

Product		20 mm Class 2 PM 2/20QG	30 mm Class 2 PM 2/30QG	40 mm Class 2 PM 2/40QG
Test procedure	Manufacturing tolerance			
Particle size distribution TP134	Sieve Size (mm)	Percent passing (%)		
	53	-	-	100
	37.5	-	100	90 - 100
	26.5	100	90 - 100	74 - 96
	19	90 - 100	77 - 95	62 - 86
	13.2	74 - 96	-	-
	9.5	61 - 85	51 - 75	42 - 66
	4.75	42 - 66	35 - 57	28 - 50
	2.36	28 - 50	24 - 44	20 - 39
	0.425	11 - 27	9 - 22	8 - 21
0.075	4 - 14	4 - 12	3 - 11	
AS 1289.3.1.2	Liquid limit	Maximum 28%		
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 8%		
AS 1289.3.4.1	Linear shrinkage	Maximum 4%		
AS 1141.23	Los Angeles abrasion grading A	N/A		Maximum 45%
	Los Angeles abrasion grading B	Maximum 45%		N/A

Table notes:

(1) The quarried pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

15.9 Class 2 quarried pavement material [performance based]

15.9.1 Source materials

The Contractor must ensure that class 2 quarried pavement source materials are natural quarried material and do not include recycled material.

15.9.2 Nominated mix design parameters

Table RD-PV-S1 15-11 Class 2 quarried pavement material [performance based] quality control tests - mix design limits

Product	20 mm Class 2 PM 2/20QM	30 mm Class 2 PM 2/30QM
Test procedure	Manufacturing tolerance	
	Sieve size (mm)	Percent passing (%)
Particle size distribution TP134	37.5	-
	26.5	100
	19	90 - 100
	9.5	-
	2.36	30 - 60
	0.075	5 - 20
AS 1289.3.1.2	Liquid limit	Maximum 30%
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 10%
AS 1289.3.4.1	Linear shrinkage	Maximum 5%
TP183	Resilient modulus	Minimum 250 MPa
	Deformation	Maximum 10-7
AS 1141.23	Los Angeles abrasion grading B	Contractor nominated value
TP184	Triaxial compression	Cohesion max 250 kPa, friction angle min 40°

15.9.3 Product quality control

Table RD-PV-S1 15-12 Class 2 quarried pavement material [performance based] quality control tests

Test procedure	Manufacturing tolerance	
	Sieve size (mm)	Variation in percent passing
Particle size distribution TP134	37.5	0
	26.5	0 (PM2/20), ±6 (PM2/30)
	19	±6
	9.5	±8
	2.36	±6
	0.075	±2
AS 1289.3.1.2	Liquid limit	+3
AS 1289.3.3.1	Plasticity index	+2
AS 1289.3.4.1	Linear shrinkage	+1
AS 1141.23	Los Angeles abrasion grading B	+3

Table notes:

(1) Refer to the Contractor's current mix design certificate to assess compliance.

15.10 Class 1 recycled pavement material [grading based]

15.10.1 Source materials

- Class 1 recycled pavement source materials may be natural quarried material, blast furnace slag, Recycled Crushed Concrete, or any combination of them.
- Supplementary source materials may comprise brick, tile, and asphalt or RCG in accordance with section 8.3.
- The Contractor must ensure that asbestos or asbestos fibre is not incorporated into the pavement material product under any circumstances.
- The Contractor must ensure that no more than 20% by mass of total supplementary source materials are incorporated and the constituent proportions must remain unchanged during production.

15.10.2 Product quality control

Table RD-PV-S1 15-13 Class 1 recycled pavement material [grading based] quality control tests

Product	20 mm Class 1 PM 1/20RG	30 mm Class 1 PM 1/30RG	40 mm Class 1 PM 1/40RG
Test procedure	Manufacturing tolerance		
	Sieve size (mm)	Percent passing (%)	
Particle size distribution TP134	53	-	100
	37.5	-	100
	26.5	100	95 - 100
	19	95 - 100	79 - 93
	13.2	77 - 93	-
	9.5	63 - 83	53 - 73
	4.75	44 - 64	36 - 56
	2.36	29 - 49	25 - 43
	0.425	13 - 23	10 - 21
	0.075	5 - 11	4 - 10
AS 1289.3.1.2	Liquid limit	Maximum 25%	
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 6%	
AS 1289.3.4.1	Linear shrinkage	Maximum 3%	
AS 1141.23	Los Angeles abrasion grading A	N/A	Maximum 30%
	Los Angeles abrasion grading B	Maximum 30%	N/A
RMS T276	Type II foreign materials	Maximum 1%	
	Type III foreign materials excluding bitumen	Maximum 0.5%	
AS/NZS 2891.3.3	Bitumen content	Maximum 1%	

Table notes:

(1) The recycled pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

15.11 Class 1 recycled pavement material [performance based]

15.11.1 Source materials

- a) Class 1 recycled pavement source materials may be natural quarried material, blast furnace slag, Recycled Crushed Concrete, or any combination of them.
- b) Supplementary source materials may comprise brick, tile, and asphalt or RCG in accordance with section 8.3.
- c) The Contractor must ensure that asbestos or asbestos fibre is not incorporated into the pavement material product under any circumstances.
- d) The Contractor must ensure that no more than 20% by mass of total supplementary source materials are incorporated and the constituent proportions must remain unchanged during production.

15.11.2 Nominated mix design parameters

Table RD-PV-S1 15-14 Class 1 recycled pavement material [performance based] quality control tests - mix design limits

Product		20 mm Class 1 PM 1/20RM	30 mm Class 1 PM 1/30RM
Test procedure	Manufacturing tolerance		
Particle size distribution TP134	Sieve size (mm)	Percent passing (%)	
	37.5	-	100
	26.5	100	-
	19	95 - 100	80 - 95
	9.5	65 - 85	50 - 75
	2.36	30 - 50	25 - 45
	0.075	5 - 15	5 - 15
AS 1289.3.1.2	Liquid limit	Maximum 25%	
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 6%	
AS 1289.3.4.1	Linear shrinkage	Maximum 3%	
TP183	Resilient modulus	Minimum 300 MPa	
	Deformation	Maximum 10-8	
AS 1141.23	Los Angeles abrasion grading B	Contractor nominated value	
TP184	Triaxial compression	Cohesion max 150 kPa, friction angle min 40°	
RMS T276	Type II foreign materials	Maximum 1%	
	Type III foreign materials excluding bitumen	Maximum 0.5%	
AS/NZS 2891.3.3	Bitumen content	Maximum 1%	

15.11.3 Process quality control

Table RD-PV-S1 15-15 Class 1 recycled pavement material [performance based] quality control tests

Test procedure	Manufacturing tolerance	
Particle size distribution TP134	Sieve size (mm)	Variation in percent passing
	37.5	0
	26.5	0 (PM1/20), ±6 (PM1/30)
	19	±6
	9.5	±9
	2.36	±8
	0.075	±3
AS 1289.3.1.2	Liquid limit	+3
AS 1289.3.3.1	Plasticity index	+2
AS 1289.3.4.1	Linear shrinkage	+1
AS 1141.23	Los Angeles abrasion grading B	+3

Table notes:

(1) Refer to the Contractor's current mix design certificate to assess compliance.

15.12 Class 1 quarried pavement material [grading based]

15.12.1 Source materials

The Contractor must ensure that class 1 quarried pavement source materials are natural quarried material and no recycled material is included.

15.12.2 Product quality control

Table RD-PV-S1 15-16 Class 1 quarried pavement material [grading based] quality control tests

Product	20 mm Class 1 PM 1/20QG	30 mm Class 1 PM 1/30QG	40 mm Class 1 PM 1/40QG	
Test procedure	Manufacturing tolerance			
Particle size distribution TP134	Sieve size (mm)	Percent passing (%)		
	53	-	-	100
	37.5	-	100	95 - 100
	26.5	100	95 - 100	79 - 91
	19	95 - 100	79 - 93	65 - 83
	13.2	77 - 93	-	-
	9.5	63 - 83	53 - 73	44 - 64
	4.75	44 - 64	36 - 56	29 - 49
	2.36	29 - 49	25 - 43	20 - 38
	0.425	13 - 23	10 - 21	8 - 18
0.075	5 - 11	4 - 10	3 - 9	
AS 1289.3.1.2	Liquid limit	Maximum 25%		
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 6%		
AS 1289.3.4.1	Linear shrinkage	Maximum 3%		
AS 1141.23	Los Angeles abrasion grading A	N/A		Maximum 30%
	Los Angeles abrasion grading B	Maximum 30%		N/A

Table notes:

(1) The quarried pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

15.13 Class 1 quarried pavement material [performance based]

15.13.1 Source materials

The Contractor must ensure that class 1 quarried pavement source materials are natural quarried material and no recycled material is included.

15.13.2 Nominated mix design parameters

Table RD-PV-S1 15-17 Class 1 recycled pavement material [performance based] quality control tests - mix design limits

Product	20 mm Class 1 PM 1/20QM	30 mm Class 1 PM 1/30QM
Test procedure	Manufacturing tolerance	
	Sieve size (mm)	Percent passing(%)
Particle size distribution TP134	37.5	-
	26.5	100
	19	95 - 100
	9.5	65 - 85
	2.36	30 - 50
	0.075	5 - 15
AS 1289.3.1.2	Liquid limit	Maximum 25%
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 6%
AS 1289.3.4.1	Linear shrinkage	Maximum 3%
TP183	Resilient modulus	Minimum 300 MPa
	Deformation	Maximum 10-8
AS 1141.23	Los Angeles abrasion grading 'B'	Contractor nominated value
TP184	Triaxial compression	Cohesion max 150 kPa, friction angle min 45°

15.13.3 Product quality control

Table RD-PV-S1 15-18 Class 1 quarried pavement material [performance based] quality control tests

Test procedure	Manufacturing tolerance	
	Sieve size (mm)	Variation in percent passing
Particle size distribution TP134	37.5	0
	26.5	0 (PM1/20), ±6 (PM1/30)
	19	±6
	9.5	±8
	2.36	±6
	0.075	±2
AS 1289.3.1.2	Liquid limit	+3
AS 1289.3.3.1	Plasticity index	+2
AS 1289.3.4.1	Linear shrinkage	+1
AS 1141.23	Los Angeles abrasion grading B	+3

Table notes:

(1) Refer to the Contractor's current mix design certificate to assess compliance.

15.14 Class 1 heavy duty quarried pavement material [grading based]

15.14.1 Source materials

The Contractor must ensure that class 1 heavy duty quarried pavement source materials are natural quarried material and no recycled material is included.

15.14.2 Product quality control

Table RD-PV-S1 15-19 Class 1 heavy duty quarried pavement material [grading based] quality control tests (20 mm class 1A PM1A/20QG)

Product		20 mm Class 1APM1A/20QG			
Test procedure		Manufacturing tolerance [grading based]			
Particle size distribution TP134	Percent passing		Percent retained		
	Sieve size (mm)	%	Sieve size (mm)	%	
	37.5	-	-	-	
	26.5	100	26.5 - 19.0	0 - 5	
	19.0	95 - 100	19.0 - 13.2	7 - 18	
	13.2	78 - 92	13.2 - 9.5	10 - 16	
	9.5	63 - 83	9.5 - 4.75	14 - 24	
	4.75	44 - 64	4.75 - 2.36	10 - 20	
	2.36	30 - 48	2.36 - 0.425	14 - 28	
	0.425	14 - 22	0.425 - 0.075	6 - 13	
0.075	7 - 11	-	-		
AS 1289.3.1.2	Liquid limit	Maximum 25%			
AS 1289.3.3.1	Plasticity index	Minimum 2% - maximum 6%			
AS 1289.3.4.1	Linear shrinkage	Maximum 3%			
AS 1141.23	Los Angeles abrasion grading B	Maximum 25%			

Table notes:

(1) The quarried pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

Table RD-PV-S1 15-20 Class 1 heavy duty quarried pavement material [grading based] quality control tests (20 mm Class 1B PM1B/20QG)

Product		20 mm class 1B PM1A/20QG			
Test procedure		Manufacturing tolerance [grading based]			
Particle size distribution TP134	Percent passing		Percent retained		
	Sieve size (mm)	%	Sieve size (mm)	%	
	37.5	-	37.5	-	
	26.5	100	26.5 - 19.0	0 - 5	
	19.0	95 - 100	19.0 - 13.2	7 - 18	
	13.2	78 - 92	13.2 - 9.5	10 - 16	
	9.5	63 - 83	9.5 - 4.75	14 - 24	
	4.75	44 - 64	4.75 - 2.36	10 - 20	
	2.36	29 - 48	2.36 - 0.425	15 - 29	
	0.425	13 - 21	0.425 - 0.075	7 - 14	
0.075	5 - 9	0.075	5 - 9		
AS 1289.3.1.2	Liquid limit	Maximum 25%			
AS 1289.3.3.1	Plasticity index	Minimum 2% - maximum 6%			
AS 1289.3.4.1	Linear shrinkage	Maximum 3%			
AS 1141.23	Los Angeles abrasion grading B	Minimum 25% - maximum 30%			

Table notes:

(1) The quarried pavement material must have a uniform grading and must not be graded from the coarse 1/3 of the grading envelope to the fine 1/3 of the grading envelope, or vice versa.

15.15 Stabilised pavement material [binder control]

15.15.1 Source materials

- The Contractor must ensure that stabilised pavement source materials are quarried pavement material or, where approved in accordance with this Master Specification Part, recycled pavement material.
- The Principal may specify in the Contract Documents class 1 quarried, class 1 recycled, or performance based pavement materials as an alternative to class 2 pavement material (grading based).
- When class 1 materials are specified in the Contract Documents, product quality control criteria for the appropriate class 1 pavement material must apply.

15.15.2 Raw feed product quality control

Table RD-PV-S1 15-21 Stabilised pavement material [binder control] quality control tests

Product	20 mm Class 2 PM 2/20 ⁽¹⁾	30 mm Class 2 PM 2/30 ⁽¹⁾	40 mm Class 2 PM 2/40 ⁽¹⁾
Test procedure	Manufacturing tolerance [grading based]		
	Sieve size (mm)	Percent passing (%)	
Particle size distribution TP134	53	-	100
	37.5	-	100
	26.5	100	90 - 100
	19	90 - 100	77 - 95
	13.2	74 - 96	-
	9.5	61 - 85	51 - 75
	4.75	42 - 66	35 - 57
	2.36	28 - 50	24 - 44
	0.425	11 - 27	9 - 22
	0.075	4 - 14	4 - 12
AS 1289.3.1.2	Liquid limit	Maximum 28%	
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 8%	
AS 1289.3.4.1	Linear shrinkage	Maximum 4%	
AS 1141.23	Los Angeles abrasion grading A	N/A	
	Los Angeles abrasion grading B	Maximum 45%	N/A

Table notes:

(1) Raw feed material must be: PM2/20QG, PM2/30QG, PM2/40QG, or, with prior approval, PM2/20RG, PM2/30RG or PM2/40RG.

15.15.3 Stabilised product quality control

Table RD-PV-S1 15-22 Stabilised pavement material [binder control] - Product quality control

Test	Product	Refer section 10.5 for nomenclature
Construction Documentation	Target binder Content (% dry mass)	Within the tolerance specified in section 10.5 of the binder content specified in the material description in accordance with section 10.1
AS 5101.4	Unconfined compressive strength (96% MDD - 7 days curing)	Reported value
AS 5101.4	Unconfined compressive strength (96% MDD - 28 days curing)	Strength must not be less than the value specified in the material description in accordance with section 10.1

15.16 Stabilised pavement material [strength control]

15.16.1 Source material

- The Contractor must ensure that the stabilised pavement source materials are quarried pavement material or, where approved in accordance with this Master Specification Part, recycled pavement material.
- The Principal may specify in the Contract Documents class 1 quarried, class 1 recycled, or performance based pavement materials as an alternative to class 2 pavement material (grading based).
- When class 1 materials are specified in the Contract Documents, product quality control criteria for the appropriate class 1 pavement material must apply.

15.16.2 Raw feed product quality control

Table RD-PV-S1 15-23 Stabilised pavement material [strength control] quality control tests

Product	20 mm Class 2 PM 2/20 ⁽¹⁾	30 mm Class 2 PM 2/30 ⁽¹⁾	40 mm Class 2 PM 2/40 ⁽¹⁾	
Test procedure	Manufacturing tolerance [grading based]			
	Sieve size (mm)	Percent passing (%)		
Particle size distribution TP134	53	-	-	100
	37.5	-	100	90 - 100
	26.5	100	90 - 100	74 - 96
	19	90 - 100	77 - 95	62 - 86
	13.2	74 - 96	-	-
	9.5	61 - 85	51 - 75	42 - 66
	4.75	42 - 66	35 - 57	28 - 50
	2.36	28 - 50	24 - 44	20 - 39
	0.425	11 - 27	9 - 22	8 - 21
0.075	4 - 14	4 - 12	3 - 11	
AS 1289.3.1.2	Liquid limit	Maximum 28%		
AS 1289.3.3.1	Plasticity index	Minimum 1% - maximum 8%		
AS 1289.3.4.1	Linear shrinkage	Maximum 4%		
AS 1141.23	Los Angeles abrasion grading A	N/A		Maximum 45%
	Los Angeles abrasion grading B	Maximum 45%		N/A

Table notes:

(1) Raw feed material must be: PM2/20QG, PM2/30QG, PM2/40QG, or, with prior approval, PM2/20RG, PM2/30RG or PM2/40RG.

15.16.3 Stabilised product quality control

Table RD-PV-S1 15-24 Stabilised pavement material [strength control] product quality control

Test	Product	Refer section 10.5 for nomenclature
Construction Documentation	Target binder content (% dry mass)	Within the tolerance specified in section 10.5 of the binder content specified in the material description in accordance with section 10.1.
AS 5101.4	Unconfined compressive strength (96% MDD - 7 days curing)	Reported value
AS 5101.4	Unconfined compressive strength (96% MDD - 28 days curing)	Strength must not be less than the value specified in the material description in accordance with section 10.1.

15.17 Sealing aggregate

15.17.1 Source materials

The Contractor must ensure that all sealing aggregate source materials are natural quarried material which do not include any recycled material.

15.17.2 Product quality control

Table RD-PV-S1 15-25 Sealing aggregate quality control tests

Product		SA 20-14	SA 16-10	SA14-10	SA 10-7	SA 7-5	SA 5-2
Test procedure	Manufacturing tolerance [grading based]						
AS 1141.11.1	Sieve size (mm)	Percent passing (%)					
	26.5	100	-	-	-	-	-
	19	95 - 100	100	-	-	-	-
	16	35 - 65	65 - 90	100	-	-	-
	13.2	0 - 10	15 - 40	90 - 100	100	-	-
	9.5	0 - 2	0 - 8	0 - 15	85 - 100	100	-
	6.7	-	0 - 2	0 - 2	0 - 15	80 - 100	100
	4.75	-	-	-	0 - 3	0 - 20	80 - 100
	2.36	-	-	-	-	0 - 5	0 - 10
1.18	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	
AS 1141.15	Flakiness index	Maximum 25%				Reported value	N/A
TP244	% Flat particles	N/A				Maximum 35%	N/A
AS 1141.14 ⁽³⁾	Misshapen particles %	Reported value			N/A		
AS 1141.23	Los Angeles abrasion grading H	Maximum 25%		N/A			
	Los Angeles abrasion grading J	N/A		Maximum 25%	N/A		
	Los Angeles abrasion grading K	N/A			Maximum 25%	Maximum 30%	Maximum 30% ⁽¹⁾
AS 1141.42 and AS 1141.40 ⁽¹⁾	PAFV ⁽⁴⁾	Minimum 48 ⁽²⁾	Minimum 45 ⁽²⁾				
TP705 ⁽¹⁾	Aggregate stripping	Maximum 15% wet and maximum 5% dry					
AS 1141.20.1	ALD - direct	Reported value				N/A	
AS 1141.20.2		N/A				Reported value	
AS 1141.20.3	ALD - calculated	Reported value				N/A	

Table notes:

- (1) Sample must be prepared from an appropriately sized fraction of identical source rock.
- (2) A minimum value of 55 must apply to sites requiring high skid resistance.
- (3) Calliper ratio = 2:1; report each of % flat, elongated, and flat and elongated particles.
- (4) Sites requiring high skid resistance are defined as having traffic volumes exceeding 2500 vehicle per day and either of the following:
 - roads with curves <250 m radius; or
 - gradients >5% and >50 m long

This does not apply for signalised intersections, pedestrian crossings and railway level crossings, roundabouts or curves with radius <100 m where site specific high friction treatments are required.

15.18 Sand

15.18.1 Source materials

- a) RCG can be incorporated into, or replace, sand products in accordance with section 8.3 of type:
 - i) Type A and B washed or unwashed natural pit, river, or crushed quarry material;
 - ii) Type C crushed quarry product; or
 - iii) Type D natural pit material, dune sand, or crushed quarry product.
- b) The Contractor must ensure that no other recycled material is included in sand products.
- c) Where sand includes RCG, the product must be described by a naming convention as given in the following example:
 - i) Sa-C-G15 Sa-C sand blended with 15% RCG.

15.18.2 Product quality control

Table RD-PV-S1 15-26 Sand quality control tests

Product	Sa-A	Sa-B	Sa-C	Sa-D	
Test procedure	Manufacturing tolerance				
Particle size distribution TP134	Sieve size (mm)	Percent passing			
	9.5	100	100	-	-
	6.7	-	-	100	95 - 100
	4.75	95 - 100	95 - 100	70 - 100	-
	2.36	75 - 100	75 - 100	35 - 100	-
	1.18	55 - 90	45 - 90	-	-
	0.600	35 - 70	30 - 70	-	-
	0.425	-	-	25 - 70	-
	0.300	20 - 40	20 - 42	-	-
	0.150	5 - 20	15 - 30	-	-
0.075	0 - 10	5 - 20	8 - 23	0 - 10	
AS 1289.3.1.2	Liquid limit	Non-plastic	Maximum 25%		Non-plastic
AS 1289.3.3.1	Plasticity index		Maximum 6%		
AS 1289.3.4.1	Linear shrinkage		Maximum 3%		
AS 1141.34	Organic impurities	Satisfactory			

15.19 Asphalt aggregate

15.19.1 Source material

- a) The Contractor must ensure that asphalt aggregate source materials are natural quarried material, except for quarry sand which may be blended, or substituted, with RCG in accordance with section 8.3.
- b) The Contractor must ensure that highly micaceous materials (such as granite and gneiss) are not used for asphalt aggregates unless the Contractor can provide evidence in the Contraction Documentation that the aggregate particles will maintain long term strength and not exfoliate when subject to processing through an asphalt plant (or equivalent).
- c) The Contractor must ensure that materials of the same size from 2 or more sources are not mixed.

15.19.2 Product quality control

Table RD-PV-S1 15-27 provides percentage tolerances for the assessment of conformity of aggregate and sand production.

Table RD-PV-S1 15-27 Asphalt aggregate percentage passing tolerances

Product	Small aggregate (D ≤ 20) ⁽¹⁾	Large aggregate (D > 20) ⁽¹⁾	Natural sand	Quarry sand
Sieve size	Percentage passing tolerance			
One sieve less than D*	±8	-	-	-
Closest sieve to d*	±2.5	±5	-	-
2.36 mm sieve	-	-	±5	±5
1.18 mm sieve	±0.5	±0.5	±4	±4
0.075 mm sieve	-	-	±3	±3

Table notes:

(1) Where aggregate size D-d, e.g. 10-7.

Table RD-PV-S1 15-28 Asphalt aggregate quality control tests

Product ⁽⁵⁾	Coarse fraction (-37.5 mm, +19.0 mm)	Medium fraction (-19.0 mm, +6.7 mm)	Fine fraction (-6.7 mm, +2.36 mm)	Natural sand	Quarry sand	
Test procedure	Manufacturing tolerance					
AS 1141.24	Sulphate soundness	Maximum 12			Maximum 15	
AS 1141.30.1	Unsound and marginal stone Content	Maximum 5% (unsound stone) ⁽⁶⁾				N/A
AS 1141.30.1		Maximum 10% (marginal and unsound stone)				
AS 1141.15	Flakiness index	Maximum 30		N/A		
Department Test Procedure TP240	Elongation index	Maximum 35		N/A		
AS 1141.23	Los Angeles abrasion	Maximum 35%	Maximum 25%	Maximum 30%		
AS 1289.3.1.2	Liquid limit	N/A			NP	Max 25
AS 1289.3.3.1	Plasticity index					Max 6 ⁽¹⁾
AS 1289.3.4.1	Linear shrinkage					Max 3
AS1141.34	Organic impurities	N/A			Satisfactory	
AS 1141.42; and AS 1141.40 ⁽²⁾	PAFV ⁽⁴⁾	N/A	Minimum 48 ⁽³⁾	N/A		
AS 1141.5; AS 1141.6.1 and AS 1141.6.2	Water absorption and densities	Report only				

Table notes:

- (1) Sand may be non-plastic.
- (2) Sample must be prepared from an appropriately sized fraction of identical source rock.
- (3) A minimum value of 55 must apply to all OGA and SMA mixes. A minimum value of 55 must also apply to specified sites requiring high skid resistance.
- (4) Aggregates within -9.5 mm to +6.7 mm fraction, prepared in accordance with AS 1141.40 Methods for sampling and testing aggregates Polished aggregate friction value - Vertical road-wheel machine.
- (5) Product for asphalt aggregates refers to the fractions of individual asphalt aggregate products used in the asphalt mix; common asphalt aggregate products include 20/14 mm, 10/7 mm and 7/2 mm.
- (6) Refer to section 15.21 for criteria which takes precedence where basic igneous source rock is used.

15.20 Mineral filler for asphalt, other than hydrated lime

15.20.1 Product quality control

Table RD-PV-S1 15-29 Mineral filler for asphalt, other than hydrated lime quality control tests

Test procedure	Manufacturing tolerance	
AS 1141.11.1	Gradings (0.60, 0.3, and 0.075 mm sieves) (%)	Report only
AS 1141.17	Voids in dry compacted filler (%)	Report only
AS 1289.B1.3	Moisture content (%)	3% maximum
AS 2350.8	Specific surface (m ² /kg)	Report only
AS 3583.3	Loss on ignition (% by mass)	4% maximum
AS 1141.8	Water soluble fraction (% by mass)	20% maximum

15.21 Additional requirements for basic igneous source rock

- a) This section 15.21 applies where basic igneous source rock (as defined in AS 2758 Aggregates and rock for engineering purposes) is used for the production of a pavement material.
- b) The Contractor must ensure that the presence of secondary minerals does not have a deleterious effect of the pavement material's intended performance.
- c) The Contractor must ensure that basic igneous source rock is classified in accordance with Table RD-PV-S1 15-30.
- d) The Contractor must ensure that unsound and marginal basic igneous source rock in that fraction of the product retained on a 4.75 mm AS sieve does not exceed the percentages listed in Table RD-PV-S1 15-31.

Table RD-PV-S1 15-30 Basic igneous source rock classifications

Rock classification	Secondary mineral content (%) AS1141.26	Accelerated soundness index AS 1141.29
Sound rock	<25	>94
Marginal rock	26-30	90-93
Unsound rock	>30	<90

Table RD-PV-S1 15-31 Basic igneous source rock marginal and unsound rock percentages

Material class	Total of marginal and unsound rock % (max)	Unsound rock % (max)
PM 1	10	5
PM 2	10	7
PM 3	20	10
Sealing and asphalt aggregate	10	3

15.22 Arrestor bed material

15.22.1 Source material

- a) The Contractor must ensure that arrestor bed material has a smooth surface and is relatively spherical, well-rounded, hard, and durable.
- b) The Contractor must ensure that arrestor bed source materials:
 - i) are from a natural source (such as river gravel);
 - ii) are uncrushed, unblended, and from a single quarry;
 - iii) do not include recycled material; and
 - iv) are free of deleterious inclusions such as concrete, bitumen, bricks, and organic matter.

15.22.2 Product quality control

Table RD-PV-S1 15-32 Arrestor bed material quality control tests

Test procedure	Manufacturing tolerance	
	Sieve size (mm)	Percent passing (%)
Particle size distribution TP134	19	100
	9.5	0 - 5
	0.075	Maximum 2
TfNSW Test Method T239	Fractured faces	Maximum 10%
AS 1141.14 ⁽¹⁾	Misshapen particles %	Maximum 10%
WA 223.1	Crushing	Maximum 5%
AS 1141.23	Los Angeles value grading B	Report only
WA 223.1	Cracking	Maximum 5%
Main Roads WA Specification 6706/02/1312 Materials Engineering Laterite Gravel Specification for Truck Arrestor Bed ⁽²⁾	Slump angle	Maximum 30°
AS 1141.4	Bulk density	Maximum 3.4 t/m ³

Table notes:

(1) Calliper ratio = 2:1; report each of % flat, elongated, and flat and elongated particles.

(2) Also report measured radius points and height of slump; repeat the test for a non-inverted cone.