

AS 2758.5:2020



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Australia



Aggregates and rock for engineering purposes

Part 5: Specification for aggregates for asphalt



AS 2758.5:2020

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- Australian Geomechanics Society
- Australian Road Research Board
- Austroads
- Cement Concrete & Aggregates Australia — Aggregates
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- Cement Concrete & Aggregates Australia — Concrete
- National Association of Testing Authorities Australia
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Preface

This Standard was prepared by the Standards Australia Committee CE-012, Aggregates and Rock for Engineering Purposes, to supersede AS 2758.5—2009, *Aggregates and rock for engineering purposes, Part 5: Coarse asphalt aggregates*.

This document is part of the AS 2758 series that covers specification for aggregates and rock for engineering purposes. A list of all parts in this series can be found in the Standards Australia online catalogue.

The objective of this document is to specify the properties and test procedures for aggregates used in the manufacture of asphalt mixes.

The major changes in this edition are as follows:

- (a) Removal of the Application clause.
- (b) Inclusion of an Introduction.
- (c) Inclusion of specified properties for fine aggregates.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

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Introduction

This document nominates a series of test procedures and limits that are utilized in different geographic areas of Australia. The procedures and limits have proved suitable for specifying aggregates for use in asphalts in pavements up to and including major highways.

This document is intended to be used in combination with a works specification and a supply agreement for contract purposes. It should not be used alone to control a works project or the supply of aggregate materials.

It is recommended that aggregates supplied using this document are also supplied under a quality management system such as the AS/NZS ISO 9001 series.

Although the tests and limits specified in this document are considered adequate for most applications, the works specification for specific projects may include different tests or limits (which may be from Australian Standards or other appropriate Standards). For contractual purposes, it is the works specification and the supply agreement that are binding.

Testing frequencies are not specified in this document as they vary dependent upon the importance of the work, the perceived variability of the source or sources and the likelihood of specification non-compliance among many other factors. It is usual that the testing frequency is specified in either the works specification or the supply agreement or both. However, in the event that a frequency is not nominated, the testing frequency listed in either the supplier's quality system documentation or AS 2758.0:2020 Appendix A may be used.

Where a contract document uses terms such as "material conforming to AS 2758.5" without providing a works specification or supply agreement and attempts to obtain such information have been exhausted, material would be deemed to satisfy the requirements of this document if data are provided showing that the material conforms to [Clauses 5](#) to [8](#) using one shape method and one durability set option.

Australian Standard®

Aggregates and rock for engineering purposes

Part 5: Specification for aggregates for asphalt

1 Scope

This document provides a basis for specifying requirements for aggregates intended for use in asphalt production or mix. The requirements relate to quality of rock and other properties of aggregates. Aggregates may be produced from rock, gravel, sand, metallurgical slag or suitable synthetic materials.

This document is intended for use by —

- (a) federal, state and local government authorities (whether or not they are specifiers);
- (b) consultant engineers (whether specifiers or not);
- (c) suppliers and purchasers of asphalt aggregates;
- (d) testing authorities;
- (e) quality system certifiers and accreditation authorities; and
- (f) educational organisations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1141.3.1, *Methods for sampling and testing aggregates, Method 3.1: Sampling—Aggregates*

AS 1141.6.1, *Methods for sampling and testing aggregates, Method 6.1: Particle density and water absorption of coarse aggregate— Weighing-in-water method*

AS 1141.6.2, *Methods for sampling and testing aggregates, Method 6.2: Particle density and water absorption of coarse aggregate— Pycnometer method*

AS 1141.11.1, *Methods for sampling and testing aggregates, Method 11.1: Particle size distribution— Sieving method*

AS 1141.11.2, *Methods for sampling and testing aggregates, Method 11.2: Particle size distribution for vision sizing systems*

AS 1141.12, *Methods for sampling and testing aggregates, Method 12: Materials finer than 75 µm in aggregates (by washing)*

AS 1141.14, *Methods for sampling and testing aggregates, Method 14: Particle shape, by proportional calliper*

AS 1141.15, *Methods for sampling and testing aggregates, Method 15: Flakiness index*

AS 1141.18, *Methods for sampling and testing aggregates, Method 18: Crushed particles in coarse aggregate derived from gravel*

AS 1141.22, *Methods for sampling and testing aggregates, Method 22: Wet/dry strength variation*

AS 1141.23, *Methods for sampling and testing aggregates, Method 23: Los Angeles value*

AS 1141.24, *Methods for sampling and testing aggregates, Method 24: Aggregate soundness—Evaluation by exposure to sodium sulfate solution*

AS 1141.30.1, *Methods for sampling and testing aggregates, Method 30.1: Coarse aggregate quality by visual comparison*

AS 1141.32, *Methods for sampling and testing aggregates, Method 32: Weak particles (including clay lumps, soft and friable particles) in coarse aggregates*

AS 2758.0, *Aggregates and rock for engineering purposes, Part 0: Definitions and classification*

AS ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

AASHTO T 304, *Standard method of test for uncompacted void content of fine aggregate*

3 Terms and definitions

For the purpose of this document, the terms and definitions in AS 2758.0 apply.

4 Sampling

Sampling of an aggregate shall be carried out in accordance with the methods in AS 1141.3.1.

NOTE 1 The frequency of sampling should be nominated in the works specification or the supply agreement or as agreed with the supplier. In the absence of any of these documents, refer to AS 2758.0: 2020 Appendix A for a sampling scheme.

NOTE 2 Reference samples may be taken during the course of supply and retained for later testing.

5 Testing

Testing of aggregates shall be carried out in accordance with the relevant requirements of the applicable method.

Laboratories that perform the tests outlined in this document shall meet the requirements of AS ISO/IEC 17025.

The testing requirements and specified limits for all asphalt aggregates are prescribed in [Clauses 4 to 10](#).

NOTE A number of requirements in this document are fundamental and this specification provides a single test method and limits for these properties. Alternative test procedures and limits are presented for the determination of both shape and durability. For these properties, it is recommended that the test procedure and limits that are particular to the geographic area in which the aggregate source is located should be used in specifying supply.

6 Dimensional requirements

6.1 Particle size distribution requirements for aggregate

Particle size distribution test results in accordance with AS 1141.11.1, AS 1141.11.2 or AS 1141.12 (as appropriate) shall be provided to indicate the average grading of the aggregate proposed for supply. This shall be known as the nominated grading.

When required, a representative sample, the grading of which shall be the basis for acceptance of the quotation, tender or source of supply shall be provided. The grading of this sample shall be known as the nominated grading.

For each aggregate, the allowable tolerances for the supply of the nominated grading shall conform to the tolerances shown in [Table 1](#).

Table 1 — Allowable tolerances on the nominated grading

Dimensions of aggregate	Tolerance %
Pass 26.5 mm sieve and larger	±10
Pass 4.75 mm sieve to 19.0 mm sieve inclusive	±8
Pass 1.18 mm sieve to 2.36 mm sieve inclusive	±6
Pass 0.300 mm sieve to 0.600 mm sieve inclusive	±5
Pass 0.150 mm sieve	±3
Pass 0.075 mm sieve	±2

6.2 Particle shape of coarse aggregate

The shape of aggregate particles shall be determined by one of the following methods:

- (a) *Particle shape* — When determined in accordance with AS 1141.14, the proportion of misshapen particles in the fraction of coarse aggregate retained on the 9.5 mm test sieve, using a 3:1 ratio, shall not exceed 10 % and using a 2:1 ratio shall not exceed 35 %.
- (b) *Flakiness index* — When determined in accordance with AS 1141.15, the flakiness index of coarse aggregate shall not exceed 35 %.

6.3 Crushed particles of coarse aggregate

When determined in accordance with AS 1141.18, coarse aggregate that is derived from gravels or conglomerates shall consist of at least 75 % by mass of particles with at least two crushed faces.

NOTE With the exclusion of quarries in hard conglomerates, coarse aggregates derived from a hard rock quarrying process where all particles are crushed do not require testing.

6.4 Shape of fine aggregate used in stone mastic asphalt

When determined in accordance with AASHTO T 304 Method A, the angularity of fine aggregate used in stone mastic asphalt shall be equal to or greater than 43 %. Stone mastic asphalt is defined as a gap graded wearing course mix with a high proportion of coarse aggregate that interlocks to form a skeletal structure which is bound with a mastic mortar.

7 Durability

7.1 General

Not more than one of the three sets of methods for the assessment of aggregate durability shall be specified. These sets of methods represent those most commonly used in Australia and are provided in this document. The set of methods specified should be the one which has been shown by local experience to be valid for rock sources likely to be used in the works.

NOTE All available tests and associated specification limits attempt to ensure adequate durability in service by measuring a change in properties over a short period of time (varying from minutes to days). This necessarily involves the imposition of conditions (e.g. loadings, temperature, exposure to reagents) that are unlikely to be met in service, in order to accelerate the change. Some aggregates may behave differently in service than predicted by a given durability testing regime. These differences arise from the different responses of the rock mineralogy and texture to the actual conditions. Experience with the material in service is essential in interpreting the testing results.

If aggregate is to be supplied from a source for which no experience is available with any of these assessment methods, the assessment procedure considered most appropriate for that source shall

be specified. This decision will require some level of investigation before the appropriate procedure is determined.

The durability assessment method options require the use of one of the following sets of test methods:

- (a) Wet strength and wet/dry strength variation (see [Clause 7.2](#)).
- (b) Los Angeles value and sodium sulfate soundness (see [Clause 7.3](#)).
- (c) Los Angeles value and unsound and marginal stone content (see [Clause 7.4](#)).

7.2 Wet strength and wet/dry strength variation

When tested in accordance with AS 1141.22, the aggregate wet strength shall be not less than 150 kN for aggregates intended for use in open-graded asphalt (bituminous mix using aggregate containing only small amounts of fine material and providing a high percentage of air voids) and 100 kN for all other mixes. For all cases, the wet/dry strength variation shall not exceed 35 %.

7.3 Los Angeles value and sodium sulfate soundness

The Los Angeles value of the aggregate, when determined in accordance with AS 1141.23, shall conform to the relevant requirements in [Table 2](#).

In addition, the sodium sulfate soundness, when determined in accordance with AS 1141.24, shall show a weighted average loss not greater than 12 % for coarse aggregate and 6 % for fine aggregate.

Table 2 — Los Angeles value, maximum percentage

Rock type	LA (maximum %)
ACID IGNEOUS	
Granitic rocks	35
Others	30
INTERMEDIATE IGNEOUS	30
BASIC IGNEOUS	30
METAMORPHIC	30
SEDIMENTARY	
Sedimentary rocks	25
River gravel	*
Dense metallurgical slags	30
Scoria	*
Vesicular slags	*
* Not usually recommended	
NOTE 1 Some very coarse-grained rocks, e.g. granite, have been known to lose whole crystals. Therefore, care should be exercised when interpreting the results of Los Angeles value tests from quarries containing rock of this type.	
NOTE 2 Refer to AS 2758.0 for terminology and petrographic classification of rocks.	

7.4 Los Angeles value and unsound and marginal stone content

The Los Angeles value, when determined in accordance with AS 1141.23, shall conform to the relevant values in [Table 2](#).

In addition, when determined in accordance with AS 1141.30.1, the maximum unsound stone content shall be 5 % and the maximum unsound stone and marginal stone content shall be 10 %.

NOTE Sound, marginal and unsound stone are as defined in the works specification or AS 2758.0.

8 Weak particles

When tested in accordance with AS 1141.32, the proportion of weak particles shall not exceed 1 %.

9 Water absorption and particle density

An aggregate may be tested to determine the water absorption characteristics. Either the maximum acceptable absorption should be specified, or the use of absorption values should be explained. Similarly, the tolerable range of particle density may be specified.

If water absorption and particle density tests are required, they shall be carried out in accordance with AS 1141.6.1 or AS 1141.6.2 for coarse aggregate and AS 1141.5 for fine aggregate.

10 Requirements for steel furnace slag used as a coarse aggregate

Steel furnace slag used as an aggregate in asphalt shall be processed to be free from discrete metallic coarse particles and weathered for a minimum of 28 days from the time of stockpiling.

When tested in accordance with ASTM C114-10 Method B as detailed in section 29 the free lime content of basic oxygen steel furnace (BOS) slag aggregate shall be ≤ 6 % and for electric arc furnace (EAF) slag shall be ≤ 3 %. The testing should be carried out at the premises of the steel furnace slag aggregate supplier before transport to the asphalt plant.

11 Frictional characteristics

NOTE Guidance for determination of susceptibility of aggregate to polishing is given in [Appendix A](#).

Appendix A

(informative)

Determination of susceptibility of aggregate to polishing

Aggregate for asphalt to be used as the wearing surface may, at the option of the purchaser, be tested to determine the susceptibility to polishing expressed as the polished aggregate friction value (PAFV) or the polished stone value (PSV). The minimum acceptable PAFV or PSV, or the basis on which the PAFV or PSV will be taken into consideration, should be specified or explained.

NOTE 1 The selection of a satisfactory and available polishing resistant aggregate can be made by comparing the PAFV or PSV data for aggregates from the area of interest.

NOTE 2 Mandatory PAFV or PSV limits for aggregates are not universally specified, as both the rate of polishing and the acceptable service life of an aggregate are dependent upon several interrelated factors. Such factors include road geometry, environmental conditions, economic life, type, volume and speed of traffic.

AS 1141.40, AS 1141.41, and AS 1141.42 are suitable test methods for the determination of PAFV.

Bibliography

AS 1141.40, *Methods for sampling and testing aggregates, Method 40: Polished aggregate friction value—Vertical road-wheel machine*

AS 1141.41, *Methods for sampling and testing aggregates, Method 41: Polished aggregate friction value—Horizontal bed machine*

AS 1141.42, *Methods for sampling and testing aggregates, Method 42: Pendulum friction test*

AS/NZS ISO 9001, *Quality Management Systems—Requirements*

NOTES

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GPO Box 476 Sydney NSW 2001
Phone (02) 9237 6000
mail@standards.org.au
www.standards.org.au