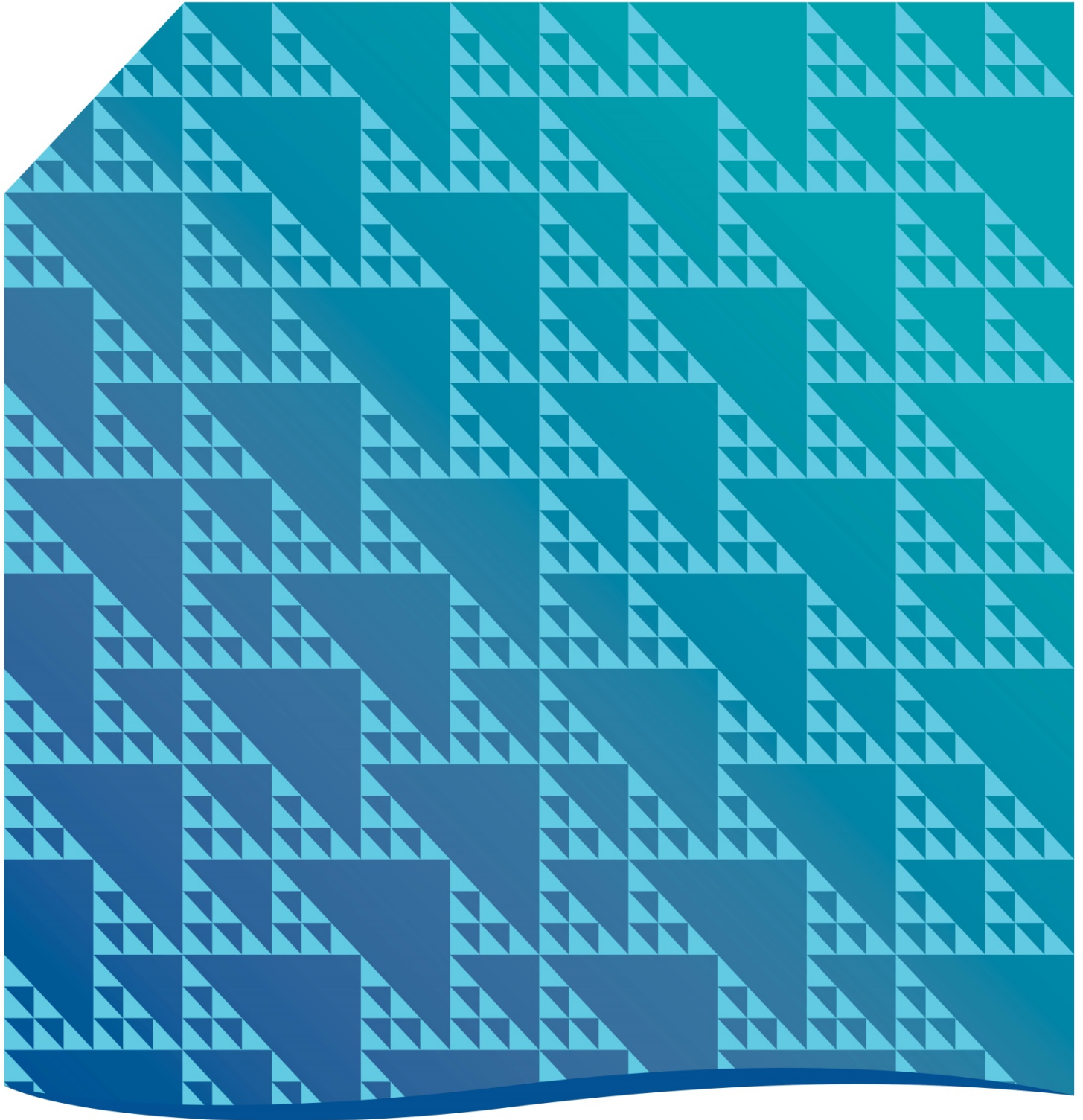


G6 Production of Aggregates and Rock Products

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General Specification



REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1 / Rev 0	All G6.4 G6.8.1 G6.8.2 G6.8.4	<i>'Department of State Growth'</i> replaces <i>'DIER'</i> <i>Reference to ENG6 added</i> Durability requirements expanded to include Secondary Mineral Content (along with previous requirements of Wet Strength and Wet/Dry Strength Variation) Inclusion of Secondary Mineral Content as Durability (soundness) measure, along with methodology for calculating the assigned value Frequency changed from m ³ to tonnes	BW (MRA)	07.07.14

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G6.1 INTRODUCTION

This specification sets out the minimum requirements for the assessment of a source rock and production quality control, including frequency of testing and recording that applies to rock products and aggregates used in road and bridge construction. Its provisions apply to all aggregates and rock products, which are required to meet criteria covering any or all of the following attributes:

- Durability
- Shape and dimensions
- Polishing resistance

G6.2 OBJECTIVES

The objectives of the specification are to ensure that aggregates and rock products supplied to all work sites satisfy the specified criteria and that the quality is both uniform and verifiable.

G6.3 OBLIGATIONS OF PRODUCER

The producer must work to a Third Party Certified Quality Plan. The Plan must include all the elements defined in this specification.

The Producer must be willing to:

- Supply to the Contractor the quality control charts as defined in the following clauses and if requested, the supporting test reports
- Provide samples of the materials if requested by the Contractor
- Provide access to the Contractor and Superintendent in order to inspect the plant and its operation, the quality system documentation and test records

G6.4 REFERENCES

AS 1141 – Methods of Sampling and Testing Aggregates
AS 2758 – Aggregates and Rock for Engineering Purposes

ENG6 Explanatory Notes provide background information, and should be read in conjunction with this Specification.

G6.5 DEFINITIONS

Unless specified otherwise, the relevant definitions of *AS 2758* apply with the following additions:

1. Source Rock

The insitu rock, boulder or gravel deposit, located in a quarry or pit, which is intended for the production of crushed rock or natural gravel.

2. Material Type

Material, from a particular quarry or pit, which is distinguishable on the basis of rock type, colour, texture, the degree of weathering and test properties.

3. Assigned Value

The assigned value, is the value of a property, calculated from consecutive and most recent measurements of that property. It is used to determine compliance of the product with the specified value for the particular property. It applies to a homogenous product or a material source without obvious changes in attribute values, whether or not these attribute values are directly related to the particular property.

4. Reference Specimen

A small sample of a particular material type, of known test properties, that is subsequently used to visually judge the quality and compliance of a product. For crushed products the sample will normally comprise crushed particles of 10mm size.

5. Durability

Durability is a measure of the properties of rock particles which reflects their ability to retain their external dimensions and mechanical properties under repeated loadings and long term exposure to the elements. The two facets of durability are:

- Rock strength, which is a measure of the ability of aggregates to withstand abrasion, impact and structural loadings.
- Soundness, which is a measure of aggregates to withstand the effects of exposure to the elements while in service.

6. Reactive Sulphide Bearing Ores

These are sulphide bearing ores which when exposed to air and water produce acidic conditions and/or discoloration.

G6.6 SOURCE ROCK ASSESSMENT

G6.6.1 *Delineation and Description*

The source rock assessment shall include but not necessarily be limited to:

- The delineation and mapping of material types in accordance with their durability and other characteristics that determine compliance.
- The delineation and mapping of materials containing sulphides and other inclusions potentially detrimental to the intended usage.
- The provision of reference samples.
- Testing of representative samples.

The frequency of these assessments shall not be less than once per annum. Assessments shall be undertaken more regularly if the new face of the pit or quarry is substantially different to the mapped face.

G6.6.2 *Reactive Sulphide ore*

Samples of sulphide bearing rock that have been prepared and tested in accordance with AS 1289. 4.3.1 "Soil chemical tests- Determination of the pH of a soil- Electrometric method" and which record a pH of 4.5 or less are to be classed as reactive sulphide bearing ore. Rock products and aggregates supplied to Department of State Growth shall not be sourced from reactive sulphide bearing ore.

G6.7 PRODUCTION CONTROL

All materials shall be produced in accordance with a recorded Production Control Plan (PCP). The plan shall show and ensure that:

- Reference specimens are manufactured, collected and maintained for every material type.
- All components of a mix of material types meet the durability requirements for the intended usage.
- Sufficient and appropriate control tests are undertaken to ensure that the materials supplied meet the specified requirements.
- Both historical and current test control data are maintained on control charts.
- Assigned values for each product are up to date.
- It is possible to link the test control data to particular stockpiles and to the final placement of the product in the works.

The Contractor shall provide all control test data including test reports made during the contract as well as historical data for the particular material type and product when requested to do so by the Superintendent. Historical data requested shall be limited to the last 5 tests made prior to commencement of delivery. The information supplied shall include the results for products delivered to customers other than Department of State Growth, where such products are from a common material type and production operation.

The Plan shall also define methods and procedures that will be activated in the event that compliance is not to have occurred.

If the source rock assessment identifies the occurrence of inclusions potentially detrimental to the performance of the product, such as sulphides, micas and clay minerals, the Plan shall define:

- The methods by which these materials are identified on a day by day basis.
- The methods by which these materials are handled to ensure that they are excluded from products in which they are not permitted.
- Methods by which these materials are treated in order to permit their use in certain products.

G6.8 PRODUCT QUALITY DETERMINATION

G6.8.1 Assigned Values

The following defines the testing requirements necessary to establish the assigned value for:

- Durability – Wet Strength, Wet/Dry Strength Variation (WDSV) and where applicable Secondary Mineral Content (SMC)
- Polishing Resistance (PAFV)
- Flakiness Index (FI)
- Average Least Dimension (ALD)

The assigned value is calculated from the test results of the five (5) most recent tests using the following formula, provided that no result is older than 24 months and that the most recent result is not more than 6 months old.

$$\text{Assigned Value} = \bar{X} \pm k.s$$

Where:

\bar{X} is the average of the five (5) most recent test results

s is the sample standard deviation of the five (5) most recent test results

k is a factor between 0 and 2.0.

The negative (-) sign applies where the criteria is defined as a minimum value and the positive (+) sign where the criteria is defined as a maximum value.

The Superintendent may accept an assigned value determined using some data older than 24 months provided that there are at least two (2) measurements not older than 24 months. The Superintendent may also judge compliance based on less than five (5) measurements provided that three (3) of these measurements are not more than 24 months old and that the measurements are the only measurements that have been made for the particular product.

In both the above situations the Superintendent may require an increased frequency of testing until there are five (5) test results within the 24 month time frame.

If there are less than five (5) tests on which to calculate the assigned value by the above equation, the assigned value (that is the value on which compliance is determined) shall be the relevant minimum or maximum value of the available test results.

If the assigned value falls outside the limits for a lower frequency of testing, the higher test frequency shall apply until the limit for the lower frequency of test is satisfied.

G6.8.2 Durability

G6.8.2.1 Wet Strength and Wet/Dry Strength Variation

The rock strength aspect of Durability shall be determined in accordance with AS 1141.22 "Wet/dry strength variation".

The assigned values shall be calculated using:

- $\bar{X} - s$ for Wet Strength
- $\bar{X} + s$ for Wet/Dry Strength Variation (WDSV)

The frequency of testing shall be one (1) test per 5000m³ of in-situ material.

If the specified criteria complies using the following formula:

- $\bar{X} - 2.0.s$ for Wet Strength
- $\bar{X} + 2.0.s$ for WDSV

The frequency of testing may be reduced to one (1) test per 10,000m³ of in-situ material.

If the assigned value fails to meet the required compliance limit for a particular product, the frequency of testing shall be increased to 1 test per 2,000m³ of in-situ material until compliance is achieved.

G6.8.2.2 Secondary Mineral Content

This clause applies to basic igneous rock only, as defined in AS 2758. The soundness aspect of Durability shall be determined in accordance with AS 1141.26 "Methods for sampling and testing aggregates – Secondary minerals content in igneous rocks". Alternative test methodologies may be used (such as the X-ray Diffraction test on the coarse aggregate component only) provided the Contractor submits evidence of its equivalency to the AS 1141.26 test method.

The assigned values shall be calculated using the following formula:

- $\bar{X} + s$

The frequency of testing shall be one (1) test per 5000m³ of in-situ material.

If the specified criteria complies using the following formula:

- $\bar{X} + 2.0.s$

The frequency of testing may be reduced to one (1) test per 10,000m³ of in-situ material.

If the assigned value fails to meet the required compliance limit for a particular product, the frequency of testing shall be increased to 1 test per 2,000m³ of in-situ material until compliance is achieved.

The assigned value is used to determine the soundness of stone, in accordance with AS 2758.0, as follows:

- Sound rock has a SMC equal to or less than 25%
- Marginal rock has a SMC greater than 25% but less than or equal to 30%
- Unsound rock has a SMC greater than 30%

G6.8.3 Polished Aggregate Friction Value (PAFV)

Aggregates intended for use in sprayed seals or for use as the coarse fraction of wearing course asphalts shall be tested for polishing resistance using either AS 1140 "Polished Aggregate Friction Value – Vertical Road-wheel Machine" or AS 1141.41 "Polished Aggregate Friction Value – Horizontal Bed Machine".

The assigned value shall be calculated using the following formula:

- $\bar{X} - 0.5.s$

The frequency of testing shall be one (1) test per 2,000 tonnes of aggregate supplied for the production of surface course asphalt and/or sprayed seal.

If the specified criteria can be complied with using the following formula:

- $\bar{X} - s$

The frequency of testing can be reduced to 1 test per 4,000 tonnes of aggregate supplied for asphalt and sprayed seals.

G6.8.4 Flakiness Index (FI)

The Flakiness Index shall be determined in accordance with AS 1141.15 "Flakiness Index".

The assigned value shall be calculated using the following formula:

- $\bar{X} + s$

For single size aggregates, intended for use in sprayed seals under *Standard Specification R51 Sprayed Bituminous Surfacing*, the testing frequency shall be one (1) test per 500 tonnes of supplied aggregate. In the event that the specified criteria can be complied with using the following formula:

- $\bar{X} + 2.0s$

the frequency of testing may be reduced to 1 test per 1,000 tonnes of supplied aggregate.

The frequency of testing for aggregates supplied under *Standard Specifications R40 Pavement Base and Sub Base and R55 Asphalt Placement* is one test per 5,000 tonnes of supply.

If the specified criteria can be complied with using the following formula:

- $\bar{X} + 2.0s$

the frequency of testing may be reduced to one (1) test per 10,000 tonnes of supply.

G6.8.5 Average Least Dimension (ALD)

The ALD shall be determined in accordance with AS 1141.20 "Average Least Dimension of Aggregate by Direct Measurement".

The assigned value, for the estimation of sprayed seal design application rates, (refer *Standard Specification Clause R51.6*), shall be calculated by the average (\bar{x}) of the most recent five (5) measurements.

The assigned value, for assessing compliance with AS 2758.2, Table 4, "Minimum Average Least Dimension, (ALD)", is:

- $\bar{X} - s$

The frequency of testing shall be one (1) test per 250 tonnes of supply.

G6.9 CONTROL CHARTS

Control charts shall be kept and maintained for all products supplied under this specification. All test data shall be entered onto a quality control chart for the particular product.

The control chart shall include the following:

- Test date and report number.
- Plot of the measured result.
- Plot of the progressive assigned value calculated from the last five (5) test results.
- The specified assigned value for the particular product.

Test results shall be entered onto the chart within three (3) working days of receipt of the test report.



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