



Test method T266

Soundness of aggregates (By use of sodium sulphate solution)

OCTOBER 2012



Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added - 7. Calculations Revised	D.Dash	May 1999
Ed 2/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T266 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T266

Soundness of aggregates (By use of sodium sulphate solution)

1. Scope

This test method covers the procedure for determination of the resistance of aggregate particles to disintegration or drying, after soaking in a solution of sodium sulphate. The method conforms to the procedure set out in Australian Standard 1141.

2. Apparatus

- (a) Australian Standard Sieves as required.
- (b) Containers
 - (i) Baskets of suitable mesh to contain the test fractions during immersion in the test solution and during drying. The baskets shall be perforated in such a manner as to permit free access of the test solution and drainage of the solution without loss of aggregate particles.
 - (ii) Sealed or stoppered containers for storage of the test solution before use.
 - (iii) Containers for the test solution in which the test samples are immersed. The capacity of the containers shall be at least five times the volume occupied by the test sample.
- (c) Balance of 6 kg capacity, readable and accurate to 0.5 g.
- (d) Water bath fitted with temperature control apparatus to maintain the test solution in the containers at a temperature of 21°C - 25°C.
- (e) A thermostatically controlled oven with good air circulation, capable of maintaining a temperature within the range 105°C to 110°C
- (f) A 20/20 hydrometer complying with the requirements of AS R 8
- (g) Thermometer accurate and readable to 0.5°C

3. Preparation of Test Solution

- (a) Dissolve sodium sulphate in clear tap water in the proportions of either 215 g of the anhydrous salt, or 450 g of the decahydrate ('Glauber Salt'), per litre of water. The liquid may be heated and stirred in order to assist solution.
- (b) When all the salt has dissolved, cool the solution to 23°C, stirring at regular intervals during cooling, and allow it to stand at 21°C - 25°C for at least 24 hours.
- (c) At the end of this period, the density of the solution, as measured at 23°C by a 20/20 hydrometer, should be within the range of 1.155 to 1.170 g/mL.

Note:

- (i) If the density is above 1.170 g/mL, sufficient water may be added to reduce the density to the required figure. Water should be added in small amounts, followed by vigorous stirring, and the solution allowed to rest for at least two hours before a final determination of density is made.
- (ii) If the density is below 1.155 g/mL, additional salt must be added and brought into the solution by heating and stirring. In this case, the temperature must be brought back to 23°C, and the whole solution allowed to stand at that temperature for at least four hours before a final determination of the density is made.
- (d) The solution must be filtered if any cloudiness is apparent. It must be discarded if it is unduly discoloured.
- (e) A fresh batch of solution is required for each test, and it is discarded at the completion of the test.

Any solution stored before use should be stored in a sealed or stoppered container to prevent evaporation.

4. Preparation of Test Samples

4.1 Coarse Aggregate

- (a) Coarse aggregate for test shall consist of material which has been thoroughly washed, dried to constant mass at 105°C to 110°C and from which sizes finer than 4.75 mm have been removed for testing in accordance with the procedure for fine aggregate.
- (b) The sample shall be of such a size that it will yield the following amounts of the fractions indicated:

Fraction (mm)		Minimum Mass of Test Portion (g)
Passing	Retained	
53.0	37.5	2000
37.5	26.5	1500
26.5	19.0	1000
19.0	13.2	750
13.2	9.50	500
9.50	4.75	300

- (c) Only those fractions which constitute 5% or more (by mass) of the washed sample shall be tested.
- (d) After eliminating all fractions constituting less than 5% of the washed sample, recalculate the grading on the basis of the remaining fractions, so that the weighted percentage loss may be calculated on the basis of the recalculated grading.
- (e) Quarter the proper mass of test portion from each of the fractions to be tested, weigh and place each test portion in a separate container.

4.2 Fine Aggregate

- (a) Fine aggregate for test shall consist of material which has been thoroughly washed on a 300 μ m sieve and dried to constant mass at 105°C to 110°C. Ignore all fractions passing the 300 μ m sieve in the washing operation, and base the mass of sample on the material remaining.
- (b) Separate the material retained on the 300 μ m sieve into as many of the following fractions as may be present:

Fraction (mm)		Minimum Mass of Test Portion (g)
Passing	Retained	
4.75	2.36	100
2.36	1.18	100
1.18	600 μ m	100
600 μ m	300 μ m	100

- (c) Only those fractions which constitute 5% or more (by mass) of the washed material retained on the 300 μ m sieve shall be tested.

- (d) After eliminating all fractions constituting less than 5% of the washed material retained on the 300 μ m sieve, recalculate the grading on the basis of the remaining fractions, so that the weighted percentage loss may be calculated on the basis of the recalculated grading.
- (e) Weigh out the proper mass of test portion from each fraction to be tested and place the test portions in separate containers.

5. Procedure

- (a) Immerse the test sample in the prepared solution of sodium sulphate for a period of 16 to 18 hours, in such a manner that the solution covers the test sample to a minimum depth of 15 mm. Cover the containers to retard evaporation and avoid contamination. Maintain the solution at a temperature of 21°C to 25°C for the full period of immersion.
- (b) After immersion, remove the test sample and container. Drain for 10 to 20 minutes and place in the oven at 105°C to 110°C. After drying to constant mass, allow the test sample to cool to room temperature.
- (c) The above procedure constitutes one cycle: five such cycles are required. The test solution is discarded after five cycles.

Note:

- (i) The number of cycles may be varied according to specification requirements.
- (ii) A convenient arrangement is to immerse the test sample in the solution at about 4 pm and remove it at 9 am the following morning. Drying then takes place between 9 am and 4 pm which usually allows sufficient time for adequate drying.
- (iii) During weekends or holidays, test samples should be allowed to stand at room temperature, suitably covered to prevent contamination. The test sample is re-immersed when an uninterrupted cycle can be completed.
- (d) After completion of the final cycle, the test sample is allowed to cool to room temperature and washed free of sulphate solution as determined by the reaction of the wash water to barium chloride.

6. Quantitative Examination

After the sulphate solution has been removed, dry each fraction of the test sample to constant mass at 105°C to 110°C, cool to room temperature and weigh.

Sieve the aggregate particles over the sieve noted below as appropriate for the respective fractions:

Coarse Aggregate

Fraction (mm)		Sieve used to determine loss (mm)
Passing	Retained	
53.0	37.5	26.5
37.5	26.5	16.0
26.5	19.0	13.2
19.0	13.2	8.00
13.2	9.50	6.70
9.50	4.75	3.35

Fine Aggregate

Fraction (mm)		Sieve used to determine loss (mm)
Passing	Retained	
4.75	2.36	1.70
2.36	1.18	850 μm
1.18	600 μm	425 μm
600 μm	300 μm	212 μm

7. Calculations

$$C = \frac{A - B}{A} \times 100$$

Where A = mass of each fraction tested, before test.
 B = mass of each fraction tested, after test.
 C = percentage loss for each fraction tests.

And

$$W = \frac{C \times P}{100}$$

Where P = mass of fraction of each grading tested, expressed as a percentage of the material actually tested (see *Preparation of Test Samples*)

W = weighted percentage losses for each fraction tested.

Total weighted percentage loss = sum of weighted percentage losses for all fractions tested.

8. Reporting

The loss shall be reported, as calculated, to the nearest 0.1%, as follows:

- (a) The percentage loss on each fraction
- (b) The overall weighted average loss for:
 - (i) Coarse aggregate
 - (ii) Fine aggregate
 - (iii) Total aggregate where appropriate

Where possible, qualitative examination should be made on those particles coarser than 19.0 mm, and observations noted in regard to number of particles disintegrating, splitting, crumbling, cracking, flaking, etc.