

Australian Standard®

AS 1141.31:2015

Methods for sampling and testing aggregates

Method 31: Light particles

1 SCOPE

This Standard sets out the method for determining the amount of light particles (i.e. particles whose density is less than 2.0 g/mL) in fine and coarse aggregates.

WARNING: SOME OF THE CHEMICALS OR PROCEDURES SPECIFIED IN THIS STANDARD COULD LEAD TO A HAZARDOUS SITUATION IF CORRECT SAFETY MEASURES ARE NOT FOLLOWED. PERSONS USING THIS AUSTRALIAN STANDARD MUST BE FAMILIAR WITH NORMAL LABORATORY PRACTICE. THIS STANDARD DOES NOT ADDRESS THE SAFETY PROBLEMS, IF ANY, ASSOCIATED WITH ITS USE. IT IS THE RESPONSIBILITY OF THE LEGAL ENTITY USING THIS STANDARD TO ESTABLISH APPROPRIATE SAFETY AND HEALTH PRACTICES, TO ENSURE COMPLIANCE WITH ANY NATIONAL, STATE OR LOCAL REGULATORY REQUIREMENTS, AND TO INSTRUCT IN, AND ENFORCE COMPLIANCE OF, THE SAFETY AND HEALTH PRACTICES.

2 APPLICATION

This method may be applied to coarse and fine ‘normal weight’ aggregates (i.e. aggregates of particle density between 2.1 t/m³ and 3.2 t/m³) drawn from sources that may contain light particles (e.g. coarse and fine particles from river gravels, estuaries, beach, lake or swamp deposits, or other consolidated sediments and some ridge gravel deposits). The test is also applicable to testing coarse vesicular aggregates (some coarse slags and scorias).

Unless required by specification it is not usually necessary to test coarse, crushed, ‘normal weight’ aggregates from hard rock quarries. A visual inspection for light particles, similar to that used for recycled aggregate will normally suffice to guard against the possibility of contaminants. Manufactured sands or crusher dusts from hard rock quarries may be tested using this method, especially if contamination is suspected.

3 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard.

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

AS	
1141	Methods for sampling and testing aggregates
1141.1	Part 1: Definitions
1141.2	Part 2: Basic testing equipment
1141.3.1	Method 3.1: Sampling aggregates
1152	Specification for test sieves

4 SAFETY PRECAUTIONS

Procedures using highly concentrated solutions of zinc chloride, including the preparation of the high-density solutions, shall be carried out in a fume cupboard. Concentrated zinc chloride solution may pose a hazard of heavy metal toxicity and is a known skin irritant. Ingestion of the liquid, inhalation of the vapour, or skin contact constitutes a health hazard.

NOTES:

- 1 Full length rubber gauntlets should be worn when handling the test liquid.
- 2 Appropriate documentation should be consulted as to safety precautions

5 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 1141.1 apply.

6 APPARATUS

The following apparatus, complying with the relevant provisions of AS 1141.2, is required:

- (a) *Balance*—of sufficient capacity with a limit of performance not exceeding ± 0.5 g.
- (b) *Container*—a 400 mL to 500 mL squat form beaker for fine aggregates, or a container of 5 L to 10 L capacity and fairly squat form for coarse aggregates.
- (c) *Drying oven*—capable of operating at 105°C to 110°C.
- (d) *Fume cupboard*.
NOTE: Advice on suitable fume cupboards can be found in AS 2243.8.
- (e) *Hydrometer*—capable of measuring liquid density between 1.90 g/mL and 2.00 g/mL.
- (f) *Sieves*—complying with AS 1152.
- (g) *Skimmer*—from 300 mm sieve cloth.
- (h) *Stirring rod*—glass or metal.

7 REAGENTS

The following reagents are required:

- (a) Zinc chloride (AR Grade).
- (b) Distilled water.

8 PREPARATION OF TEST PORTION

A test sample shall be obtained using the procedure of AS 1141.3.1.

The test portion shall be prepared from the test sample by any suitable technique that ensures the test portion remains representative of the sample. The test portion shall comply with the minimum mass given in Table 1. The test portion shall be dried to constant mass in an oven at 105°C to 110°C. The mass of the dried test portion (m_1), in grams, shall be determined and recorded.

TABLE 1
MINIMUM MASS OF TEST PORTION

Nominal size mm	Minimum mass
Less than 7	200 g
7	200 g
10	500 g
14	1 kg
20	3 kg
28	4 kg
40	5 kg
75	10 kg

9 TEST LIQUID

The test liquid shall be an inorganic liquid with a density equal to 2.0 ± 0.02 g/mL.

A suitable liquid may be made by dissolving 3175 g of AR grade zinc chloride in 0.5 L of distilled water that has been heated sufficiently to assist in dissolving the zinc chloride. The solution shall be allowed to cool to 20°C. After cooling, the test liquid shall be made up to a density of 2.0 g/mL with the addition of cold distilled water, making frequent checks of the liquid density using the hydrometer. When the required density is achieved, the test liquid may be used immediately, or stored in a suitable screw-capped Winchester or other suitable sealed storage container for future use.

NOTE: This procedure should produce approximately 2 L of test liquid.

Frequent checks, both before and after use, shall be made of the density of the test liquid to ensure that evaporation of water does not cause the density to change. The density of the test liquid may be adjusted by the addition of cold distilled water or by the addition of cold concentrated zinc chloride solution, as appropriate.

NOTES:

- 1 The colour of the solution may change if it is re-used.
- 2 The European Standard EN 1744-1 (1998) allows the use of sodium polytungstate solution ($3\text{Na}_2\text{WO}_4 \cdot 9\text{WO}_3 \cdot \text{H}_2\text{O}$) as an alternate test liquid to a solution of zinc chloride. No Australian experience in using this alternative, or of safety requirements, is available; however, provided the required liquid density can be verified and the remainder of this procedure is followed, use of this alternate is acceptable.
- 3 The Department of Transport and Main Roads Queensland allows the use of a solution of lithium heteropolytungstates in water as an alternative test liquid to a solution of zinc chloride. It provides a less hazardous alternative and, provided the required density can be verified and the remainder of the procedure followed, the use of this alternative is acceptable.

10 PROCEDURE

10.1 Fine aggregate

The procedure shall be as follows:

- (a) Pour the prepared test portion into a volume of test liquid. The liquid shall be not less than three times the apparent volume of the test portion, or not less than 300 mL.
- (b) Stir the mixture to free any light particles from the mass of the test portion then allow the mixture to come to rest. Decant the upper part through a 300 μm test sieve into a suitable container, taking care to ensure that only floating particles of the test portion are removed during decantation and that the sunken particles remain in the test vessel. Return the test liquid to the test vessel after decantation.