

Australian Standard®

Methods for sampling and testing aggregates**Method 28: Ball mill value**

This Standard incorporates Amendment No. 1 (August 2019). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

METHOD**1 SCOPE**

This Standard sets out the method for the determination of the ball mill value of rock spalls, drill cores and ripped or broken rock. The method measures the quantity of fines produced by milling in the presence of water, and thereby provides a measure of the ability of the material to withstand breakdown in the presence of water.

This test is based on Texas Department of Transportation 'Test procedure for Ball mill method for determining the disintegration of flexible base material' TxDOT Designation Tex-116-E (June 2000).

The method in its present form is intended to be used for, but not restricted to, testing sedimentary rock types.

2 REFERENCES

The following documents are referred to in this Standard.

AS

- 1141 Methods of sampling and testing aggregates
- 1141.2 Method 2: Basic testing equipment
- 1141.3.2 Method 3.2: Sampling—Rock spalls and boulders
- 1141.11 Method 11.1: Particle size distribution by sieving

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3 APPARATUS**3.1 Required apparatus**

A1 | The following apparatus, conforming to the relevant provisions of AS 1141.2 and the requirements given below, is required:

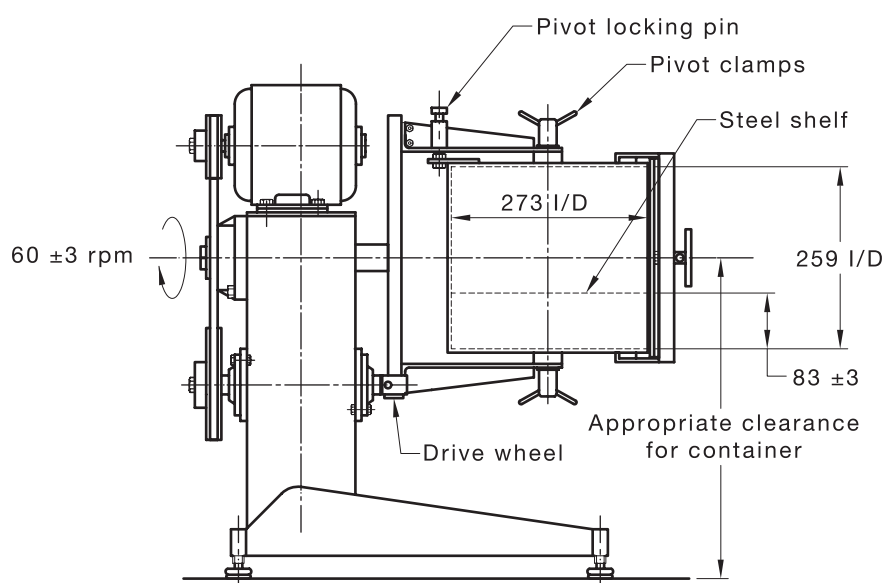
- (a) *Balance*—of adequate capacity, with a limit of performance not exceeding ± 0.5 g.
- (b) *Ball mill*—a mill generally in accordance with Figure 1, with internal dimensions of 259 mm diameter and 273 mm long, and a shelf with dimensions 83 mm ± 3 mm and 8 mm ± 3 mm. The cylinder shall be capable of rotating at 60 ± 3 revolutions per minute.

- (c) *Crusher (or other suitable equipment)*—for reducing the material to the required sizes.
- (d) *Dishes, trays and container.*
- (e) *Measuring cylinder*—2 L capacity, graduated at 50 ml.
- (f) *Oven*—thermostatically controlled to operate at a temperature of 50°C to 60°C, preferably with mechanical ventilation.
- (g) *Sample divider (riffle splitter or other suitable device for obtaining representative sub-samples).*
- (h) *Sieve brushes.*
- A1 | (i) *Sieves*—in perforated plate, aperture sizes 53.0 mm, 26.5 mm, 9.5 mm, 4.75 mm and in woven wire, aperture size 425 µm and pan.
- (j) *Steel balls*—6 steel balls, each 417.5 ±27.5 g mass and approximately 48 mm diameter.

3.2 Optional apparatus

The following apparatus, although not required, may prove useful in the performance of this method.

- (a) *Sieve shaker.*



DIMENSIONS IN MILLIMETRES

FIGURE 1 BALL MILL

4 PREPARATION OF TEST PORTION

The test portion shall be prepared in the following manner:

- (a) Obtain a sample of rock spalls, ripped or broken rock in accordance with AS 1141.3.2. Sampling of the drill core shall be as required.

- (b) Crush the sample if required so that the product substantially, but not entirely, passes a 53.0 mm sieve. In the case of N size drill cores, select sufficient representative pieces before crushing to make up a mass of about 530 g for the 53.0 mm to 26.5 mm fraction.
- (c) Dry the crushed material to constant mass at 50°C to 60°C.
- (d) Assemble the sieves in the order of 53.0 mm, 26.5 mm, 9.50 mm and 4.75 mm, 425 µm and pan.

Sieve the material to separate into fractions of size specified in Table 1. Take particular care to avoid overloading the finer sieves.

- (e) Obtain a representative test portion of the material from each fraction by splitting or quartering. Adjust to the mass given in Table 1 and combine into a test sample with a mass of 3520 ± 10 g.

TABLE 1
TEST FRACTION MASSES

Fraction size	53.0 mm to 26.5 mm	26.5 mm to 9.50 mm	9.50 mm to 4.75 mm	4.75 mm to 425 µm	less than 425 µm
Test portion mass (g)	530 ±10	880 ±5	530 ±5	790 ±5	790 ±5

NOTE: The fraction masses in Table 1 are derived from an approximate grading of 100% passing 53.0 mm, 85% passing 26.5 mm, 60% passing 9.50 mm, 45% passing 4.75 mm and 22.5% passing 425 µm.

5 PROCEDURE

The procedure shall be as follows:

- (a) Determine the mass (M_i) of the test sample.
- (b) Place the test sample in a dish or other suitable container, add up to but not more than 2 L of clean water, mix the water through the sample, and mark the water level. Soak for 1 h. During the 1 h soaking period, take care to ensure that the test sample is completely immersed in water. If it is necessary to top up the water, take care to ensure that no more than 2 L of free water remains at the end of the soaking period.
- (c) At the end of the soaking period, decant all free water into a suitable measuring cylinder and raise the level to 2 L by using additional clean water. This water is used to wash the test sample into the mill.
- (d) Unlock the pivot of the machine and swing the cylinder to the vertical position.
Place the six steel balls in the cylinder. Place the test sample into the cylinder. Using the measured 2 L of water from Step (c), wash any remaining particles of the test sample into the cylinder.
- (e) Place the watertight lid and gasket in position and tighten the lid-clamp securely.
Rotate the cylinder to the horizontal position and lock the pivot. Allow the machine to operate continuously for 600 revolutions at 60 ± 3 revolutions per minute.
- (f) On completion of milling, unlock the pivot, swing the cylinder to the vertical position and remove the lid and gasket. By inverting the cylinder, pour its contents (test sample, steel balls and water) into a clean container. Clean out the interior of the cylinder and the lid and gasket by hosing them thoroughly with water, taking care to avoid loss of material.