

Australian/New Zealand Standard™

AS/NZS 2350.11

Methods of testing portland, blended and masonry cements

Method 11: Compressive strength

1 SCOPE AND GENERAL

1.1 Scope

This Standard describes the reference method for determining the compressive strength of portland, blended and masonry cements.

NOTES:

- 1 These testing procedures may involve the use of materials or equipment that require safety measures to be observed.
- 2 This Standard does not purport to address all of the safety concerns, if any, associated with its use.
- 3 The user of this Standard should establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.
- 4 The precision of the method is discussed in Appendix A.

1.2 General

The method used herein allows the use of alternative procedures provided that the alternative procedures are tested for acceptance in accordance with Appendix B.

2 REFERENCED AND RELATED DOCUMENTS

2.1 Referenced documents

The following documents are referred to in this Standard:

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| 1100 | Technical drawing (NZS 1100) |
| 1100.201 | Part 201: Mechanical engineering drawing (NZS 1100.201) |
| 2193 | Methods for calibration and grading of force-measuring systems of testing machines |
| 2349 | Method of sampling portland and blended cements |
| 2350 | Methods of testing portland and blended cements |
| 2350.12 | Method 12: Preparation of a standard mortar and moulding of specimens |

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| 2350 | Methods of testing portland and blended cements |
| 2350.18 | Method 18: Determination of water retention value |

2.2 Related documents

Attention is drawn to the following related documents:

Manual for the testing of cement strength—Cembureau, the European Cement Association.

ISO/CEN Mortar prism test for cement strength—Operator's manual, Cement and Concrete Association of Australia.



3 PRINCIPLE

The method measures the compressive strength using prismatic test specimens $40 \times 40 \times 160$ mm in size.

The mortar is prepared in accordance with AS 2350.12 for portland and blended cements, and in accordance with AS/NZS 2350.18 for masonry cements. All cements are moulded in accordance with AS 2350.12.

The specimens prepared from portland and blended cements are stored in their moulds in a moist atmosphere for 24 h, demoulded, and then placed in lime water until strength testing. The specimens prepared from masonry cement are stored in their mould in a moist atmosphere for 48 h, demoulded, and stored in the moist atmosphere for a further 5 d, before being placed in lime water until strength testing.

At the required age, the specimens are taken from their wet storage, and each end is tested for strength in compression. Three prisms are required to be tested at each age.

4 APPARATUS AND RELATED CONDITIONS

4.1 General

The apparatus specified in AS/NZS 2350.12, and the apparatus and the conditions specified in Clauses 4.2 to 4.4 are required.

4.2 Laboratory and storage facility conditions

The air within the laboratory in which the specimens are made and tested shall be maintained at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of not less than 50%. The humidity controlled room or cabinet for storing all specimens in the mould and for the initial curing of demoulded masonry cement specimens shall be continuously maintained at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of not less than 90%.

4.3 Compressive strength testing machine

The testing machine for the determination of compressive strength shall meet the Grade A requirements of AS 2193 for the range of loads measured, and it shall provide a rate of loading of 2.4 ± 0.2 kN/s. It shall be fitted with a maximum load indicator. Manually operated testing machines shall be fitted with a load pacing device.

The vertical axis of the ram shall coincide with the vertical axis of the machine and, during loading, the direction of movement of the ram shall be along the vertical axis of the machine. Furthermore, the resultant of the forces shall pass through the centre of the specimen. The surface of the lower machine platen shall be normal to the axis of the machine and remain normal during loading.

The centre of the upper platen spherical seating shall be at the point of intersection of the vertical machine axis with the plane of the lower surface of the upper machine platen with a tolerance of ± 1 mm. The upper platen shall be free to align as contact is made with the specimen, but during loading the relative attitude of the upper and lower platens shall remain fixed.

The testing machine shall be provided with platens made either of hard steel with a Vickers hardness of at least HV 600 or, preferably, of tungsten carbide. These platens shall be at least 10 mm thick, 40.0 ± 0.1 mm wide and at least 40.0 mm long. The flatness tolerance over the entire contact surface with the specimen shall be 0.01 mm. The surface texture shall be not smoother than N3 and not rougher than N6 (see AS/NZS 1100.201).

Alternatively, two auxiliary plates of hard steel or preferably of tungsten carbide, at least 10 mm thick and complying with the requirements for the platens, may be provided. Provision shall be made for centring the auxiliary plates with respect to the axis of the loading system with an accuracy of ± 0.5 mm.

Where there is no spherical seating in the testing machine or where the spherical seating is blocked, or where the diameter of the spherical seating is greater than 120 mm, a jig with a spherical seating of diameter less than 120 mm, in accordance with Clause 4.4, shall be used.

NOTES:

- 1 The machine may be provided with two or more load ranges.
- 2 It is recommended that the machine be provided with an automatic method for maintaining the rate of loading and with equipment for recording the results.
- 3 The spherical seating of the machine may be lubricated to facilitate adjustment on contact with the specimen but only to such an extent that movement of the plate cannot take place under load during test. Lubricants that are effective under high pressure are not permitted.
- 4 The terms 'vertical', 'lower' and 'upper' refer to conventional testing machines. Machines whose axes are not vertical are permitted provided they satisfy an acceptance testing procedure analogous to that described in Appendix A.

4.4 Jig for compressive strength testing machine

Where Clause 4.3 requires the use of a jig (see Figure 1), it shall be placed between the platens of the machine to transmit the load of the machine to the compression surfaces of the mortar specimen.

A lower plate shall be used in this jig and it can be incorporated in the lower platen of the machine together with a load cell. The upper platen of the jig receives the load from the upper platen of the machine through intermediate spherical seating. This seating forms part of an assembly which shall be able to slide vertically without appreciable friction in the jig guiding its movement. The jig shall be kept clean and the spherical seating shall be free to rotate in such a way that the platen of the jig will accommodate itself initially to the shape of the specimen and then remain fixed during the test.

5 DEMOULDING AND CURING OF TEST SPECIMENS

5.1 Demoulding of test specimens

The following procedure for demoulding of specimens shall be carried out:

- (a) Between 20 and 24 h after commencement of mixing for portland and blended cement (see AS 2350.12), and between 48 and 52 h after commencement of mixing for masonry cements (see AS/NZS 2350.18), carry out demoulding with care to avoid damage. As a check on the mixing and compacting operations, and air content of the mortar, weigh the specimen and record to the nearest 1 g.
- (b) Suitably mark specimens for later identification, e.g. with water-resistant ink or crayon.

NOTE: Where test results are required at more than one age, it is recommended that at each age at least one prism from each batch is tested.

5.2 Curing of specimens

5.2.1 Initial curing of masonry cement specimen

The specimens so removed from their moulds shall be placed in the humidity controlled room or cabinet for 5 d in such a manner as will allow free circulation of air around at least five faces of the specimen. The specimens shall then be removed, and either the 7 d compressive strength determined in accordance with Clause 6 or the specimens cured in water using the procedures specified in Clause 5.2.2 for subsequent determination of 28 d compressive strength.