

Australian Standard™

**Methods of sampling and testing mortar
for masonry construction**



This Australian Standard was prepared by Committee BD-004, Masonry Structures. It was approved on behalf of the Council of Standards Australia on 20 October 2000 and published on 25 January 2001.

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- Association of Consulting Engineers Australia
- Australian Building Codes Board
- Australian Chamber of Commerce and Industry
- Building Designers Association of Australia
- Calcium Silicate Brick Manufacturers
- Cement and Concrete Association of Australia
- Clay Brick and Paver Institute
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STANDARDS AUSTRALIA

RECONFIRMATION
OF
AS 2701—2001
Methods of sampling and testing mortar for masonry construction

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NOTES

Australian Standard™

Methods of sampling and testing mortar for masonry construction

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PREFACE

This Standard was prepared by the Standards Australia Committee BD-004, Masonry Structures, to supersede all parts of test methods AS 2701, *Methods of sampling and testing mortar for masonry construction*, excluding AS 2701.4—1984, AS 2701.5—1984 and AS 2701.9—1984 which are to be withdrawn.

This Standard covers tests that can be used for masonry mortar.

The objective of this Standard is to provide laboratory staff with test methods for the testing of mortar that may be required for specific purposes.

It is considered that compression testing is inappropriate in the Standard but is being considered by Committee BD/33, Chemical Admixtures for Concrete, for inclusion in the newly proposed for the AS 1478 series. A method of test for compressive strength of masonry (the combination of mortar with masonry units) is contained in AS 3700—1998, *Masonry structures*.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

The term ‘normative’ has been used in this Standard to define the application of the Appendix to which it applies. A ‘normative’ appendix is an integral part of a Standard.

CONTENTS

	<i>Page</i>
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE.....	5
1.2 OTHER METHODS	5
1.3 REFERENCED DOCUMENTS.....	5
1.4 DEFINITIONS.....	5
1.5 DESCRIPTION OF MORTAR TYPES	6
1.6 LIST OF METHODS.....	6
SECTION 2 METHODS OF SAMPLING	
2.1 SCOPE.....	7
2.2 GENERAL REQUIREMENT FOR SAMPLES.....	7
2.3 FRESH MORTAR	7
2.4 HARDENED MORTARS.....	8
2.5 MORTAR MATERIALS	9
2.6 SIZE OF SAMPLE	11
2.7 INFORMATION TO ACCOMPANY SAMPLE	11
2.8 TRANSPORTATION OF SAMPLE.....	12
2.9 TIME BETWEEN SAMPLING AND TESTING OF MORTARS.....	12
2.10 REDUCTION OF SAMPLE SIZE	12
SECTION 3 METHOD FOR LABORATORY PREPARATION OF FRESH MORTAR FOR TESTING	
3.1 SCOPE.....	13
3.2 APPARATUS	13
3.3 MIXING PROCEDURE FOR SAMPLES TAKEN IN THE LABORATORY	14
3.4 REMIXING OF SAMPLES TAKEN ELSEWHERE THAN IN THE LABORATORY	14
3.5 PERIOD BETWEEN MIXING AND TESTING	14
SECTION 4 METHOD FOR DETERMINATION OF CONSISTENCE — CONE IMPRESSION TEST	
4.1 SCOPE.....	16
4.2 PRINCIPLE	16
4.3 APPARATUS	16
4.4 PREPARATION OF SAMPLE.....	16
4.5 PROCEDURE.....	16
4.6 REPORTING OF RESULTS	17
SECTION 5 METHOD FOR DETERMINATION OF WATER RETENTION	
5.1 SCOPE.....	18
5.2 PRINCIPLE	18
5.3 APPARATUS	18
5.4 PREPARATION OF MORTAR	18
5.5 DETERMINATION OF FLOW.....	18
5.6 PROCEDURE.....	19
5.7 CALCULATIONS	20
5.8 REPORTING OF RESULTS	20

SECTION 6 METHOD FOR DETERMINATION OF AIR CONTENT—
GRAVIMETRIC METHOD

6.1	SCOPE.....	21
6.2	PRINCIPLE	21
6.3	APPARATUS	21
6.4	CALIBRATION OF MEASURE.....	21
6.5	DETERMINATION OF DENSITY OF MATERIALS	21
6.6	PREPARATION OF SAMPLE.....	22
6.7	TESTING PROCEDURE.....	22
6.8	CALCULATIONS	23
6.9	REPORTING OF RESULTS	23

SECTION 7 METHOD FOR DETERMINATION OF SOLUBLE SILICA AND
CALCIUM OXIDE CONTENT

7.1	SCOPE.....	24
7.2	REAGENTS	24
7.3	APPARATUS	24
7.4	PROCEDURE.....	25
7.5	REPORTING	27

APPENDICES

A	WATER RETENTION APPARATUS.....	28
B	FLOW TABLE AND FRAME.....	30
C	MOULD.....	36

STANDARDS AUSTRALIA

Australian Standard

Methods of sampling and testing mortar for masonry construction

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out a range of methods for testing mortar used or being investigated for use in the construction of masonry in accordance with AS 3700 excluding mortars intended to be used in thin bed construction. Each method provides a method for obtaining a single sample. The way in which it is applied would depend on the particular circumstance of the investigation and should be specified accordingly.

NOTE: Information on the selection of mortar type, the use of mortar in masonry construction, and tests for the determination of flexural strength and compressive strength of masonry units bonded with mortar are given in AS 3700.

1.2 OTHER METHODS

These methods shall not be interpreted as preventing the use of methods that are not specifically referred to herein.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 1141 Methods for sampling and testing aggregates
 - 1141.1 Method 1: Definitions
 - 1141.3 Method 3: Sampling
 - 1141.3.1 Method 3.1: Sampling—Aggregates
 - 1141.5 Method 5: Particle density and water absorption of fine aggregate
- 1152 Specification for test sieves
- 1316 Masonry cement
- 2162 Verification and use of volumetric apparatus
 - 2162.1 Part 1: General—Volumetric glassware
- 3700 Masonry structures
- 3972 Portland and blended cements

ASTM

- C 91 Standard Specification for Masonry Cement
- C 230 Flow Tables for Use in Tests of Hydraulic Cement

1.4 DEFINITIONS

For the purposes of this Standard, the definitions below apply.

1.4.1 Cement

Cement as defined in AS 3972 and AS 1316, as appropriate.

1.4.2 Mortar

A mixture of cementitious material, sand (fine aggregate) and water, with or without additives or chemical admixtures.

1.4.3 Construction mortar

Mortar intended for building work.

1.4.4 Laboratory mortar

Mortar made in the laboratory.

1.4.5 Binders

Cement, masonry cement, lime.

1.5 DESCRIPTION OF MORTAR TYPES

In descriptions of mortar types, the proportions of the constituent materials shall be given in the following order:

- (a) Cement.
- (b) Masonry cement.
- (c) Lime.
- (d) Sand.

Each proportion shall be preceded by the letter C, M, L or S respectively, except that no mention need be made of materials not actually included. The proportion of the chief cementing agent should be given as unity, e.g. 'C1:L2:S9', 'M1:S4.5', 'C1:L0.5:S4.5'.

1.6 LIST OF METHODS

The following is the list of methods set out in this Standard:

2	Methods of sampling
3	Method for laboratory preparation of fresh mortar for testing
4	Method for determination of consistence—Cone impression test
5	Method for determination of water retention
6	Method for determination of air content—Gravimetric method
7	Methods for determination of soluble silica and calcium oxide content

SECTION 2 METHODS OF SAMPLING

2.1 SCOPE

This Section sets out methods of sampling mortar materials, a batch of fresh mortar and hardened mortar, and their subsequent reduction to a quantity suitable for testing in the laboratory. It also includes directions for packaging and labelling of the samples.

2.2 GENERAL REQUIREMENT FOR SAMPLES

Each sample shall consist of a part or parts, as appropriate, selected at random from an identifiable location and the test results shall apply to that sample.

2.3 FRESH MORTAR

2.3.1 General

Samples of fresh mortar shall be obtained by taking uniformly distributed sub-samples from the mortar to be sampled. The sub-samples shall be immediately combined and mixed together to form a representative bulk sample. The number of portions and size of bulk sample necessary will depend upon the quality and variability of the material and the number of test results required.

2.3.2 Batch mixers

The mortar shall be sampled at the discharge point of a batch from the mixer. At least three portions shall be taken, one each at about the time when one-quarter, one-half and three-quarters of the batch have been discharged. If more than three portions are taken, they shall be at correspondingly shorter, equally spaced, intervals. The portions shall be taken by passing a dry, clean, non-absorbent receptacle across the stream of mortar in such a manner as will ensure the collection of representative sample.

2.3.3 Conveyors

It is preferable that portions be taken at the discharge of a conveyor. This shall be done by passing a dry, clean, non-absorbent receptacle across the stream of mortar, if possible so as to catch the whole of the stream. If it is not possible to catch the whole stream at once, the receptacle should be passed through the stream at varying rates to obtain the best representative sample.

Where it is not possible to sample at the discharge point, portions shall be taken from the full width and thickness of the stream of mortar on the conveyor. The scoop used shall sweep the surface of the conveyor.

Not less than 12 portions shall be taken at regularly spaced intervals from the mortar which is being sampled. The portions shall be combined to form one bulk sample.

2.3.4 Hoppers, bins or heaps

Mortar shall be sampled when hoppers, etc, are being filled or emptied. The procedures given in Clause 2.3.1 shall be followed.

Small hoppers and bins and very small heaps shall be sampled as follows:

- (a) *Small hoppers, bins or heaps* The mortar shall be sampled by means of a scoop at regular spacings throughout the batch. Portions shall be taken from well below the surface in at least 12 different places, distributed in a regular manner, to ensure, when mixed, a thoroughly representative combined sample.

- (b) *Very small heaps* When sampling from very small heaps, e.g. mortar turned out from a site mixer onto a mortar board, the heap shall be carefully turned over with a clean dry shovel and samples taken by means of a scoop at regular spacings.

2.3.5 Bulk transport vehicles

The contents of bulk transport containers shall be sampled during either filling or emptying by the procedures given in Clause 2.3.2 or, when this is not practicable, by taking sub-samples as described in Clause 2.3.4.

2.4 HARDENED MORTARS

2.4.1 General

For hardened mortar, samples shall be obtained by either of the following methods:

- (a) *Preferred method* From lumps, in accordance with Clause 2.4.2.
- (b) *Alternative method* By using a mortar sampler, in accordance with Clause 2.4.3.

For both methods, to achieve the best results, general rules of good sampling practice should be observed, as follows:

- (i) Collect equal-sized increments from as many as practicable, but not less than three, uniformly spaced locations throughout the area to be sampled.
- (ii) Ensure that each increment collected properly represents the mortar at that location.
- (iii) Combine the increments to make a sample not less than 100 g.
- (iv) Store and transport in closed containers to prevent loss of fines.

NOTES:

- 1 The preparation of hardened mortars often involves the separation by suitable means of the various layers of a multi-layer system and freeing them from contaminating materials, such as—
- (a) paint;
- (b) gypsum plasters;
- (c) spatterdashes including those based on organic additives;
- (d) atmospheric grime;
- (e) constructional material such as brick and concrete.
- 2 Treatment of multi-layer samples: Where difficulty arises in finding the interface between what are reputedly two layers of mortar, the analyst should take samples as near to the outside faces of the composite layer as possible. If the composite layer is too thin to allow this, it should be analysed as one layer, with an appropriate note to this effect in the report.

2.4.2 Preferred method—Collection of lumps

The procedure is as follows:

- (a) Collect lumps that have been squeezed out of joints and not trimmed off by the mason.
- (b) Use these lumps to form the sample in accordance with Clause 2.4.1.

2.4.3 Alternative method—Use of masonry drill

2.4.3.1 Apparatus

The following apparatus is required:

- (a) *Masonry drill.*

- (b) *Mortar sampler*—which shall consist of a metal box of the type shown in Figure 2.1. A plastic cover should be taped over the face to limit the loss of dust through the front opening. A plastic or equivalent bag shall be taped around the open base of the box to catch all the mortar released by drilling. A hinged leaf should be fitted on the back face below the opening, which fits into the horizontal ledge of raked joints, or folds back for flush joints.

2.4.3.2 Procedure

The procedure shall be as follows:

- (a) Hold the sampler box with its back hard up against the masonry wall, the front opening opposite a vertical joint, and the hinged leaf on a bed joint.
- (b) Using the masonry drill, obtain mortar from the vertical joint and collect it in the plastics bag.
- (c) Repeat steps (a) and (b) to form the sample in accordance with Clause 2.4.1.

2.4.4 Information to accompany sample

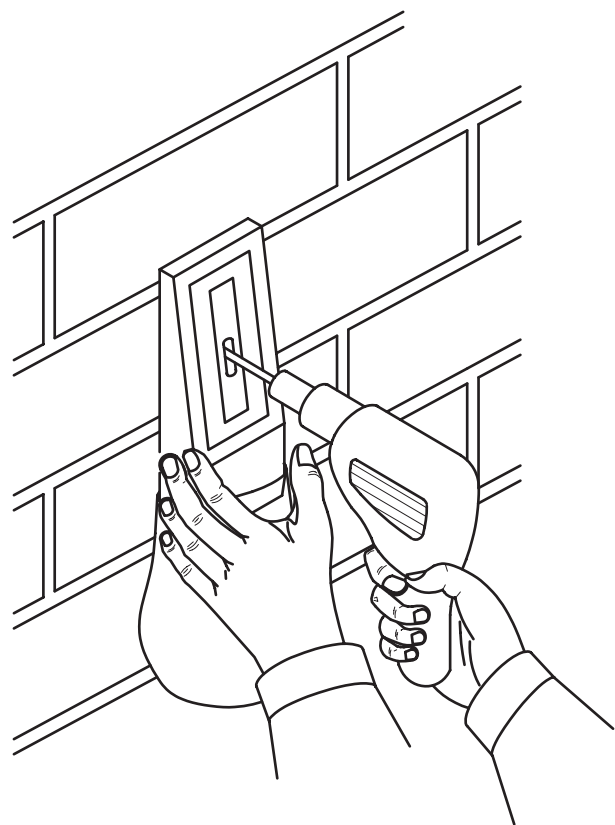
Full particulars of the sample shall be given by the sampler to the analyst, including—

- (a) the date, place, and method of sampling, including drill size where applicable; and
- (b) such information as may be available on the materials and proportions thereof specified for the mortar.

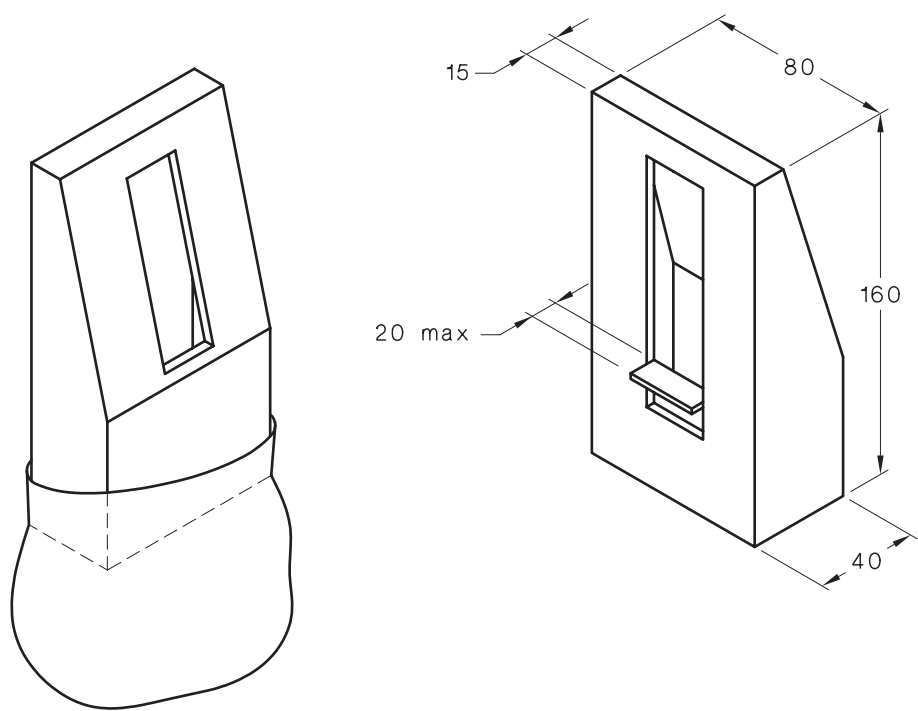
2.5 MORTAR MATERIALS

Where mortar materials are being sampled from a site for laboratory investigation, they shall be sampled as follows:

- (a) *Binders* The sample shall be obtained, where the nominated lot is a stockpile of bags in use, by selecting the sample at random from the bags as they are opened for the purpose of making mortar.
- (b) *Sand* The sample shall be selected in accordance with AS 1141.3.1.
- (c) *Workability agents and modifying agents* In sampling powders, they shall be treated as for binders. In the case of liquids the container liquid shall be stirred thoroughly before removing the required quantity.



(a) General view



(b) Front view

(c) Back view

DIMENSIONS IN MILLIMETRES

FIGURE 2.1 MORTAR SAMPLER