

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 3583.4—1991

Methods of test for supplementary cementitious materials for use with portland cement

Method 4: Determination of autoclave expansion

RECONFIRMATION NOTICE

Technical Committee BD-031 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 29 March 2016.

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Amorphous Silica Association of Australia
Ash Development Association of Australia
Australasian (iron & steel) Slag Association
AUSTROADS
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Cement Concrete & Aggregates Australia—Cement
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Concrete Institute of Australia
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NOTES

Australian Standard®

Methods of test for supplementary cementitious materials for use with portland cement

Method 4: Determination of autoclave expansion

PREFACE

This Standard was prepared by the Standards Australia Committee on Supplementary Cementitious Materials for use with Portland Cement.

METHOD

1 SCOPE This Standard sets out the reference method for determination of autoclave expansion of mortar containing supplementary cementitious materials.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard.

AS

1210 SAA Unfired Pressure Vessels Code

1315 Portland cement

1449 Wrought alloy steels—Stainless and heat-resisting steel plate, sheet and strip

2350 Methods of testing portland and blended cements

2350.3 Method 3: Normal consistency of portland and blended cements

3582 Supplementary cementitious materials for use with portland cement

3582.1 Part 1: Fly Ash

3 PRINCIPLE A specimen is prepared from a mortar containing the test sample. It is then measured and subjected to steam autoclaving for a prescribed period. After cooling it is remeasured, and the percentage change in length is reported.

4 APPARATUS The following apparatus is required:

- (a) Autoclave, specified in Appendix A.
- (b) Bar mould, specified in Appendix A.
- (c) Length comparator, specified in Appendix A.
- (d) Moist cupboard or room, capable of maintaining the atmosphere within it at a temperature of $23 \pm 2^\circ\text{C}$ and at a relative humidity of not less than 90 percent.
- (e) Water bath, of sufficient capacity to accommodate and fully immerse the test specimen, and which is capable of being controlled at 23°C to within $\pm 1^\circ\text{C}$ for not less than 15 min.

5 PREPARATION OF SPECIMENS

5.1 Preparation of paste Prepare a paste of normal consistency in accordance with the method set out in AS 2350.3, but using the following material quantities:

- (a) Fly ash 120 g
- (b) Portland cement complying with AS 1315 480 g.

5.2 Moulding of specimens Prepare the mould by thinly covering with mineral oil; set the gauge studs, taking care to keep them clean and free of oil. Immediately following completion of mixing, mould the specimen in two approximately equal layers, compacting each layer with the thumbs or forefingers by pressing the paste into the corners, around the gauge studs and along the surface of the bar mould until a homogeneous specimen is obtained. After the top layer has been completed, cut the paste off flush with the top of the mould with a thin-edged trowel and smooth the surface with a few strokes of the trowel.

NOTE: During the operations of mixing and moulding, rubber gloves should be worn to protect the specimen.

5.3 Storage of specimens Without delay, place the prepared mould in the moist cupboard or moist room. Leave specimens in the moulds in the moist cupboard or moist room for 24 h.

6 PROCEDURE The procedure shall be as follows:

- (a) Remove the specimen from the moist cupboard or room, 24 ± 0.5 h after moulding, demould and without delay measure the difference in length with the length comparator (L_1).
- (b) Place the specimen in the autoclave at room temperature on a rack so that all sides of the specimen are exposed to saturated steam.
- (c) Ensure that the autoclave contains enough water, at an initial temperature of 20°C to 37.5°C , to maintain an atmosphere of saturated steam vapour during the entire test.

NOTE: Normally, 7 percent to 10 percent of the volume of the autoclave should be occupied by water.

- (d) Leave the vent valve open until steam begins to escape which permits air to escape from the autoclave during the early stages of heating, (see Safety Precautions, Appendix A.)
- (e) Close the valve and raise the temperature of the autoclave at a rate that brings the gauge pressure of the steam to 2 MPa in 45 min to 75 min.
- (f) Maintain a pressure of 2000 ± 70 kPa within the autoclave for 3 h.
- (g) Shut off the heat supply after 3 h and cool the interior of the autoclave at a rate so that the pressure will drop to less than 70 kPa at the end of 1.5 h.
- (h) Slowly release any pressure remaining by partially opening the vent valve until ambient pressure is attained.
- (i) Open the autoclave and without delay immerse the test specimen in water at a temperature of not less than 90°C .
- (j) Cool the water surrounding the specimen at a uniform rate by adding portions of cold water so that the temperature of the bath and contents will be lowered to 23°C in 15 min.
- (k) Transfer the specimen to the water bath and maintain at 23°C for an additional 15 min.
- (l) Remove the specimen, surface dry it and again measure the difference in length between the specimen and the reference bar using the length comparator (L_2). (See Appendix A.).

7 CALCULATION Calculate the autoclave expansion to the nearest 0.01 percent by using the following equation:

$$\text{Autoclave expansion} = \frac{(L_2 - L_1)}{250} \times 100$$

where

L_1 = difference in length of specimen and reference bar before autoclaving, in millimetres

L_2 = difference in length of specimen and reference bar after autoclaving, in millimetres

NOTE: The sign (+ or -) of the result is significant. It should be retained when reporting the result.

8 REPORT The report shall include the following details:

- (a) Identification of sample, in accordance with AS 3582.1, if appropriate, including its origin.
- (b) Test method used i.e. this Method.
- (c) Result of the calculation expressed to the nearest 0.1 percent.