

Australian Standard®

AS 3583.6:2018

Methods of test for supplementary cementitious materials

Method 6: Determination of relative water requirement and strength index

PREFACE

This Standard was prepared by the Standards Australia Committee BD-031, Supplementary Cementitious Materials to supersede AS 3583.6—1995, *Methods of test for supplementary cementitious materials for use with portland cement*, Method 6: *Determination of relative water requirement and relative strength*.

METHOD

1 SCOPE

This Standard sets out the reference method for determining the relative water requirement and two methods, one the standard test and the other an accelerated test, for determining the strength index of fly ash and slag only. Both properties are determined by comparing results for a test sample mortar with results for a General Purpose cement mortar. The methods do not provide a basis for comparison between different types of supplementary cementitious materials because of the differing total binder volumes used with each. Also, since the performance of these materials is affected by interaction with the cement, the test results for a given sample are dependent upon the properties of the cement used. The results for relative water requirement and strength index should not be used to infer potential concrete performance.

Relative water requirement and strength index for amorphous silica should be performed according to the appropriate method given in ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures.

2 REFERENCED DOCUMENTS

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

AS	
2350	Methods of testing portland, blended and masonry cements
2350.12	Method 12: Preparation of a standard mortar and moulding of specimens
2701	Methods of sampling and testing mortar for masonry construction

AS

- 3582 Supplementary cementitious materials
- 3582.1 Part 1: Fly Ash
- 3582.2 Part 2: Slag—Ground granulated blast-furnace
- 3972 General purpose and blended cements

AS/NZS

- 2350 Methods of testing portland, blended and masonry cements
- 2350.11 Method 11: Compressive strength

ASTM

- C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures

3 DEFINITIONS

For the purpose of this Standard the definitions given below apply.

3.1 Control mortar

A mortar prepared using a selected General Purpose cement without addition of supplementary cementitious material.

3.2 Test mortar

A mortar prepared using a mixture of the test material and the General Purpose cement used for the control mortar.

4 PRINCIPLE**4.1 Relative water requirement**

A control mortar is prepared using the amount of water required to give a specified flow. A test mortar having the same flow is prepared and the relative water requirement is calculated from the ratio of the water additions for the respective mixes.

4.2 Strength index

Compressive strength determinations are performed on prismatic specimens made from control and test mortars prepared in the same manner as for the determination of the relative water requirement.

The strength index of the test sample is calculated by expressing the test mortar strength as a percentage (%) of the control mortar strength.

5 APPARATUS

The following apparatus is required:

- (a) All apparatus as specified in AS/NZS 2350.11 and AS 2350.12.
- (b) Flow table, callipers and tamping rod, as specified in AS 2701.
- (c) Water bath for accelerated test. A water bath capable of being maintained at $50 \pm 1^\circ\text{C}$ for a minimum time period of 46 ± 0.5 h.

6 MATERIALS

Standard sand and water as specified in AS 2350.12. The cement used shall be General Purpose (Type GP) cement conforming with AS 3972. The same sample of cement shall be used for control and test mortars.

7 PREPARATION

7.1 General

In the determination of relative water requirement and strength index, results for the test mortar are related to results for the control mortar. It is therefore necessary to prepare a control mortar on each day that one or more test mortars are prepared.

7.2 Control mortar

A batch of control mortar shall consist of 450 ± 2 g of cement, 1350 ± 2 g of sand and sufficient water to achieve a flow of $110 \pm 5\%$ when determined in accordance with AS 2701 (nominally 210 g water).

7.3 Test mortar

Slag and fly ash shall be prepared in accordance with Table 1.

A batch of test mortar shall consist of the quantities of Type GP cement and a test sample of slag or fly ash as shown in Table 1, 1350 ± 2 g of standard sand, and sufficient water to achieve a flow within ± 3 units of the flow recorded for the control mix.

TABLE 1
PROPORTIONS OF TEST MORTARS

	Slag sample g	Fly ash sample g
General Purpose cement (Type GP)	225 ± 1	360 ± 1
Test sample (see Note 1)	$77 \times$ relative density of the slag	$65 \times$ relative density of the fly ash (see Note 2)

NOTES:

- 1 The test sample calculations shown here incorporate the multipliers previously used for slag and fly ash. This results in test samples of different supplementary cementitious material types having different total binder volumes.
- 2 The proportions of Type GP cement and fly ash are designed to produce a mortar having the same absolute volume of dry materials as for a control mortar but with partial sand replacement. Material quantities have been increased to avoid the need to split a standard 1350 g bag of sand.

7.4 Strength index test specimens

Two sets of test specimens shall be prepared, one from a control mortar batch and the other from a test mortar batch. Fresh batches of mortar shall be prepared containing the quantities of water used to achieve the required flow as recorded in the procedure clauses of this Standard.

8 PROCEDURE

8.1 General

Materials and apparatus for preparing mortars shall be at laboratory temperature as specified in AS 2350.12.

8.2 Control mortar

The procedure shall be as follows:

- (a) Mix the batch of mortar as described in AS 2350.12.