

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 2350.7—2006

Methods of testing portland, blended and masonry cements

Method 7: Determination of temperature rise during hydration of portland and blended cements

RECONFIRMATION NOTICE

Technical Committee BD-010 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.

Reconfirmed documents cannot be amended, but may be formally revised and a new edition published.

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 24 February 2016.

The following are represented on Technical Committee BD-010:

AUSTROADS

Cement & Concrete Association of New Zealand

Cement Concrete & Aggregates Australia

Cement Concrete & Aggregates Australia – Cement

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Concrete Institute of Australia

Concrete Masonry Association of Australia

Engineers Australia

Portland Cement Association

NOTES

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AS 2350.7—2006

Methods of testing portland, blended and masonry cements

Method 7: Determination of temperature rise during hydration of portland and blended cements

1 SCOPE

This Standard sets out the method for determining temperature rise during the hydration of portland and blended cements, under precisely defined conditions.

NOTES:

- 1 The testing procedure herein 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 A procedure for calculating the heat of hydration of portland and blended cements is given in AFNOR NF 15-436.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 2350 Methods of testing portland, blended and masonry cements
2350.12 Method 12: Preparation of a standard mortar and moulding of specimens

AS/NZS

- 2350 Methods of testing portland, blended and masonry cements
2350.1 Method 1: Sampling

IEC

- 751 Industrial platinum resistance thermometer sensors

AFNOR

- NF 15-436 Measuring the hydration heat of cements by means of semi-adiabatic calorimetry (Langavant method)

3 PRINCIPLE

A fixed quantity of plastic cement mortar prepared in accordance with AS 2350.12 is introduced into a calorimeter, and the subsequent rise in temperature over a period of time is recorded.

4 APPARATUS AND RELATED CONDITIONS

4.1 Laboratory

The air within the laboratory where the apparatus is located shall be maintained at a temperature of $23 \pm 2^\circ\text{C}$. The apparatus shall be located away from sources of heat and ventilation.

4.2 Enclosure

The velocity of ventilation air around the calorimeters shall be minimized by the construction of an enclosure around the calorimeter. The enclosure shall have no lid and be large enough to accommodate all calorimeters (if more than one calorimeter is used) allowing at least 120 mm clearance between the calorimeters and the inside walls of the enclosure. The walls of the enclosure shall be at least 25 mm higher than the calorimeter. The base of the enclosure shall be insulated and sealed, the airflow within the enclosure shall be less than 0.5 m/s and the enclosure shall be located well away from sources of heat and ventilation.

The temperature within the enclosure for the duration of the test shall be maintained at $\pm 0.5^\circ\text{C}$ of the temperature at the commencement of testing.

The temperature of the materials and equipment in Clauses 4.3 and 4.4 shall be brought to within $\pm 1.0^\circ\text{C}$ of the temperature of the enclosure and shall be $23 \pm 2^\circ\text{C}$.

4.3 Calorimetric apparatus

The calorimeter (see Figure 1) shall be a cylindrical vacuum flask with an insulated stopper and placed in a rigid casing that acts as support for the flask. The calorimeter shall be calibrated in accordance with Appendix A. The apparatus shall be as follows:

- (a) *Vacuum flask* The vacuum flask is made of silvered borosilicate glass with an internal diameter of 95 mm, an internal depth of 280 mm and an external diameter of 120 mm. At the bottom of the vacuum flask is a rubber disc of approximately 85 mm diameter and 20 mm thick. This disc acts as a support for the mortar container and distributes the load evenly on the glass wall.
- (b) *Casing* The casing of the vacuum flask shall have a sufficiently wide base to ensure stability of the whole unit and shall be of rigid construction (see Figure 1). The casing shall provide approximately 5 mm air space from the internal wall of the flask and shall allow the flask to rest on a support 4 to 5 mm thick, made of material of low thermal conductivity, e.g., expanded polystyrene. There shall be an abutment in the form of a 5 to 10 mm thick rim fixed to the casing where the upper edge of the flask shall be in contact. This abutment is to hold the flask in position and to provide a bearing surface for the stopper so as to ensure the tightness of the flask stopper unit. The abutment shall be made of material of low thermal conductivity. A rubber gasket shall be placed between the edge of the flask and its rim.

NOTE: Material such as an aluminium alloy 3 mm thick may be used for constructing the casing.

- (c) *Stopper unit* The stopper unit shall be made of the following parts (see Figure 1):
 - (i) *The lower part* Part of the stopper unit, which is inserted into the flask to provide maximum prevention of heat loss into the external environment. This part of the stopper shall be cylindrical in shape with a diameter equal to the internal diameter of the flask and shall have a thickness of approximately 55 mm. It shall be made of material of low thermal conductivity, such as expanded polystyrene, with its base protected by a 2 mm thick plate of rigid plastic.

- (ii) *The central part* Part of the stopper unit, which provides rigidity for the calorimeter whilst contributing to the reduction of heat loss. This part of the stopper unit shall be made of a foam rubber disc of approximately 120 mm in diameter.
- (iii) *The upper part* Part of the stopper unit, which allows the stopper to be correctly positioned on the top of the flask. It shall be an 8 mm thick disc made from a rigid material. This upper part of the stopper shall fit tightly against the casing by means of a snap locking device which compresses the rubber central part.

NOTE: The 8 mm thick disc may be made from material such as aluminium alloy.

4.4 Mortar container

The mortar container shall be a watertight cylindrical container with a lid, fabricated from tin plate (see Figure 1). The container shall have a maximum diameter of 82 mm and a maximum depth of 170 mm. The lid of the container shall be provided at its centre with a brass tube designed to receive the temperature-measuring device. The internal diameter of the brass tube shall be slightly larger than the sleeve of the temperature-measuring device wires. The internal length of the brass tube shall be 110 ± 10 mm.

4.5 Temperature-measuring device

The temperature-measuring device shall be a four-wire resistance temperature device (RTD) conforming to IEC 751, Class A.

The length of the measuring element of the RTD shall be 120 ± 10 mm.

The RTD shall have an integral connected extension lead, which shall have an overall maximum outer sheath diameter of 3 mm. It shall be made of a non-metallic low-thermal conductivity material.

4.6 Temperature recorder

A data logger with a precision of 0.01°C shall be used.

5 MATERIALS

5.1 General

All materials specified in AS 2350.12 are required.

5.2 Oil

A light oil and appropriate dispenser shall be used.

5.3 Sealer

A pliable sealer shall be used.

NOTE: Plasticine is a suitable sealer.

6 PROCEDURE

6.1 Preparation of test mortar

The procedure for preparing the test mortar shall be as follows:

- (a) Weigh an empty mortar container.
- (b) Prepare the mortar using the composition, weight of ingredients and mixing procedure specified in AS 2350.12.
- (c) Immediately after completion of the mixing sequence, weigh 1575 ± 1 g of the mortar into the mortar container, using a suitable scoop. Put the lid on and ensure that it is tight.

- (d) Place 2 to 3 mL of oil in the centre tube of the lid.

NOTE: The oil improves the thermal contact between the tube and the RTD. The volume of oil added will have to be small enough to ensure that the tube does not overflow when the RTD is inserted.

- (e) Reweigh the container and record the weight.

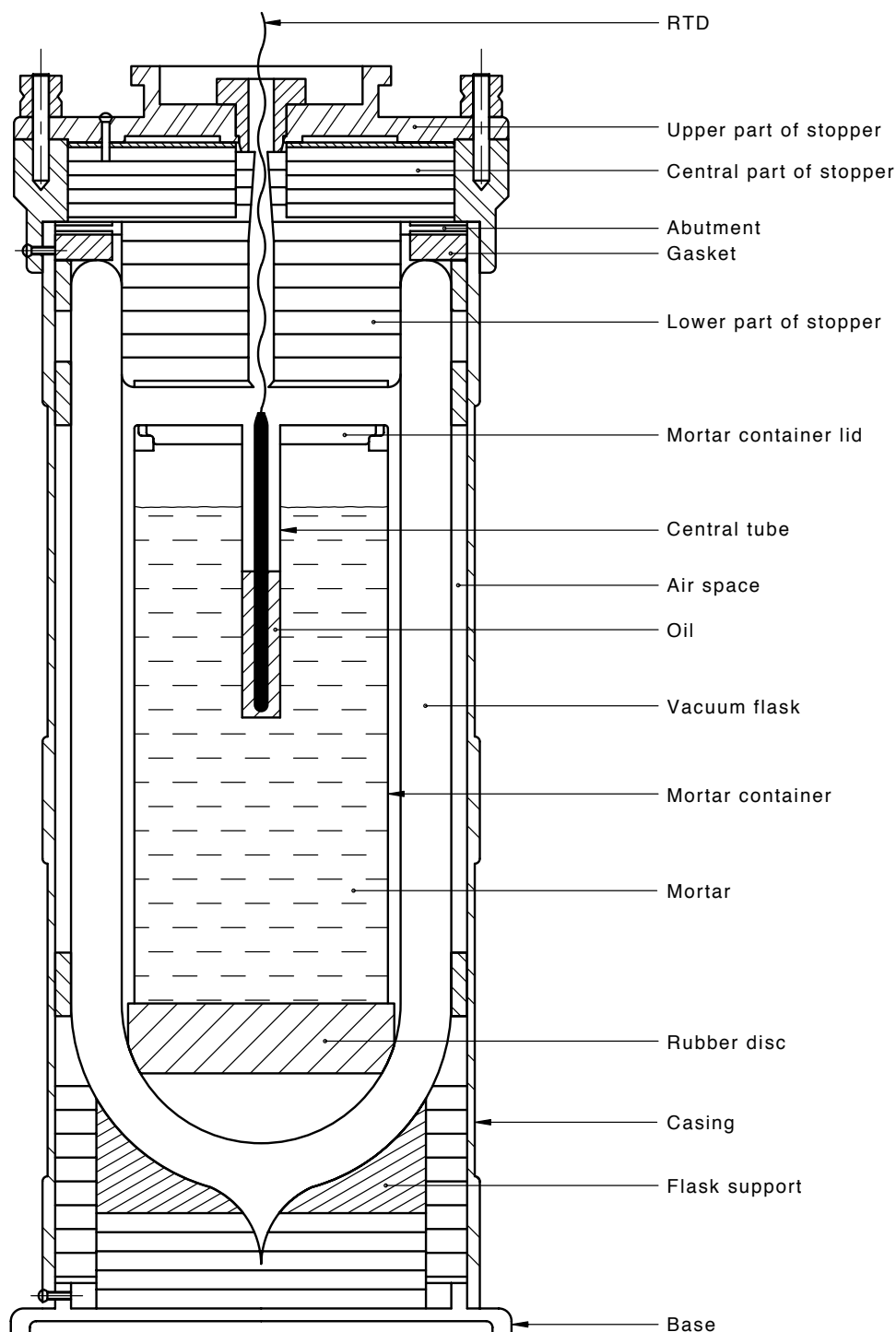


FIGURE 1 CALORIMETER