

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 1774.13—2000

**Refractories and refractory materials—Physical test methods
Method 13: Permanent dimensional change**

RECONFIRMATION NOTICE

Technical Committee MN-007 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 4 April 2013.

The following are represented on Technical Committee MN-007:

Australian Institute of Mining and Metallurgy
Australian Ceramic Society
Bureau of Steel Manufacturers of Australia
Cement Industry Federation
CSIRO Manufacturing & Materials Technology
Institute of Refractories Engineers
Refractories Manufacturers Association of Australia
The University of New South Wales

NOTES

Australian Standard™

AS 1774.13

Refractories and refractory materials—Physical test methods

Method 13: Permanent dimensional change

PREFACE

This Standard was prepared by the Standards Australia Committee MN/7, Refractories and Refractory Materials under the direction of the Multitechnics Standards Policy Board to supersede AS 1774.13—1989.

METHOD

1 SCOPE

This Standard sets out a method for the determination of permanent linear and volume changes of refractories after any or all of the following processes:

- (a) Drying.
- (b) Firing.
- (c) Reheating.

This Standard is applicable to prefired and unfired refractories having either a regular or irregular shape. It is not applicable to carbon-bearing refractories, ceramic fibre products or mortars.

NOTE: Refer to AS 1774.28 for ceramic fibre products and to AS 1774.22 for mortars.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1774	Refractories and refractory materials—Physical test methods
1774.4.1	Part 4.1: Preparation of test pieces—Castable refractories
1774.4.2	Part 4.2: Preparation of test pieces—Low-cement castable refractories
1774.4.3	Part 4.3: Preparation of test pieces—Unshaped refractories on site
1774.4.4	Part 4.4: Preparation of test pieces—Mouldable refractories
1774.4.5	Part 4.5: Preparation of test pieces—Gunning refractories
1774.5	Part 5: The determination of density, porosity and water absorption
1774.22	Part 22: Refractory mortar—Test methods
1774.28	Part 28: Ceramic fibre products—Test methods
1774.30	Part 30: Drying and firing schedules
2243	Safety in laboratories (series)
2780	Refractories and refractory materials—Glossary of terms



3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 2780 and those below apply.

3.1 Drying shrinkage

Reduction in dimensions of a material as a result of drying.

3.2 Firing change

Change in dimensions of a dried material that has subsequently been fired. This may be an expansion or a shrinkage.

3.3 Initial

Either—

- (a) the undried state of the test specimen immediately after demoulding; or
- (b) the state of the test specimen as received.

3.4 Permanent dimensional change

The change in dimensions resulting from the heating and cooling of a specimen under specified conditions, expressed as a percentage of the initial dimensions.

4 PRINCIPLE

A test specimen is measured to determine either its initial linear dimensions or volume. It is then heated to a prescribed schedule, cooled and remeasured.

The results are then calculated from the differences between the relevant measurements.

5 SAFETY

This Standard may involve hazardous materials, operations and equipment. This Standard does not purport to address the safety problems associated with its use. It is the responsibility of the user of this Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Reference should be made to relevant parts of AS 2243.

6 APPARATUS

6.1 Drying oven

A fan forced ventilated oven capable of maintaining a prescribed temperature of up to $110 \pm 5^\circ\text{C}$.

6.2 Linear measuring equipment

Capable of measuring the dimensions of the test specimens to an accuracy of 0.1 mm.

6.3 Volume measuring equipment

If appropriate, the evacuation method apparatus specified in AS 1774.5 (see Clause 9.1.3).

6.4 Furnace

6.4.1 Size of heating chamber (test zone)

The heating chamber shall be of such a size that it can accommodate the test specimen(s) in the manner described in Clause 8.1.3(a).

6.4.2 Heating capability

The furnace shall be capable of meeting the provisions of AS 1774.30.

NOTE: An electric furnace is recommended, but a gas or oil fired furnace may be used provided that the furnace atmosphere is continuously oxidizing and there is provision for monitoring this condition.

6.4.3 Temperature constancy

During the constant temperature period of the test (Clause 8.1.3(b)), the furnace shall be capable of maintaining the test zone at the required temperature to within 10 °C as measured by the thermocouple/recorder system specified in Clauses 6.5 and 6.6.

6.4.4 Specimen protection

If the furnace is fired by oil or gas, means shall be adopted to prevent direct impingement of the flame on the specimen(s) or thermocouple(s).

If the furnace is electrical, either a bag wall, a muffle or a gap of 100 mm is required to protect the specimens from the heating elements.

6.5 Thermocouple

Calibrated and accurate to within 5°C over the required temperature range.

NOTE: Precautions should be taken to prevent errors by stray e.m.f. when using thermocouples in electrically heated furnaces.

6.6 Recorder

An instrument capable of recording the temperature sensed by the thermocouple either continuously or at regular short intervals, to an accuracy of 5°C throughout the test.

6.7 Ceramic marker

Unreactive with the specimen in a manner that would influence the test results, and whose mark will be clearly visible after drying and firing.

7 TEST SPECIMENS

7.1 Dense, shaped refractories

Each specimen shall be either a right rectangular prism of minimum dimensions 60 mm × 50 mm × 50 mm and maximum dimensions of 230 mm × 115 mm × 75 mm or a cylinder of minimum dimensions 60 mm long and 50 mm in diameter and maximum dimensions of 75 mm long and 50 mm in diameter. Each dimension being accurate to 2 mm.

7.2 Insulating, shaped refractories

Each specimen shall be in the form of a right rectangular prism of minimum dimensions 100 mm × 115 mm × 65 mm and maximum dimensions of 230 mm × 115 mm × 75 mm. Each dimension being accurate to 2 mm.

7.3 Monolithic refractories

Specimens shall be prepared according to AS 1774.4.1, AS 1774.4.2, AS 1774.4.3, AS 1774.4.4 or AS 1774.4.5 as appropriate. Unless otherwise specified, dimensions of each specimen shall be in accordance with those specified in Clause 7.2.

NOTE: If non-standard specimens are used, mention of this should be made in the test report.