

Australian Standard[®]

Refractories and refractory materials—Physical test methods

Method 35: Guide to the determination of resistance to corrosive reagents

PREFACE

This Guide was prepared by Standards Australia Committee MN-007, Refractories and Refractory Materials as an addition to the AS 1774 series of Standards.

This Guide was prepared in consultation with the ferrous and non-ferrous industries and refractory manufacturers.

The objective of this Guide is to bring the various tests relating to the determination of the resistance of refractories to corrosive reagents into one document.

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 METHOD

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Guide sets out five methods that may be used to give a qualitative estimate of corrosion due to corrosive reagents.

1.2 REFERENCES

The following documents are referred to in this Standard:

AS

1774	Refractories and refractory materials—Physical test methods
1774.4	Part 4: Preparation of test pieces (series)
1774.30	Part 30: Drying and firing schedules
1774.32	Part 32: Refractory products containing carbon—Test methods
2243	Safety in laboratories (series)
2780	Refractories and refractory materials—Glossary of terms

1.3 DEFINITIONS

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

1.4 SAFETY

For information on laboratory safety, reference should be made to the relevant parts of AS 2243.

Reagents used may be hazardous or toxic and reference should be made to the appropriate Material Safety Data Sheets.

1.5 PRINCIPLE

Corrosive reagent is introduced into a refractory cup and fired to a prescribed temperature for a specified time. The cup is then sectioned and examined for corrosion.

1.6 REAGENT

Any reagent which can cause corrosive damage to a refractory. Examples are—

- (a) potassium sulphate in an alkali test;
- (b) mixture of fluoride salts in a cryolite test; and
- (c) molten aluminium in a molten metal cup test.

1.7 APPARATUS

1.7.1 General

All apparatus shall be constructed from materials that are thermally stable and chemically inert under the conditions of the procedure.

1.7.2 Mould

For preparing cup test samples from monolithic refractories.

Specifically designed for preparing cup test samples. A mandrel may be attached.

1.7.3 Core drill

1.7.4 Hammer and cold chisel

1.7.5 Drying oven

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

1.7.6 Kiln

Electric or gas fired, capable of maintaining the required temperature to within $\pm 10^\circ\text{C}$.

1.7.7 Camera

1.7.8 Lid mortar

As specified in succeeding sections.

1.7.9 Mould release agent

Suitable for coating the mandrel in Clause 1.8(b)(i).

1.7.10 Measuring device

Calliper or rule capable of measuring to an accuracy of at least 0.5 mm.

1.8 SAMPLE PREPARATION

Prepare the sample for testing as follows :

(a) *Preformed shapes*

- (i) Cut a sample from the preformed shape to nominal dimensions 115 mm × 115 mm × 75 mm.
- (ii) In the centre of one face, core a 50 mm diameter section to a depth of 50 mm.
- (iii) Cut a slice to nominal dimensions 115 mm × 115 mm × 25 mm for a lid.
- (iv) Remove the cored section ensuring that the bottom of the cavity is as flat as possible.

NOTES:

- 1 A hammer and cold chisel or a reamer have been found to be suitable.
- 2 It may be necessary to core small holes into the centre piece in order to make the removal easier.

- (v) Dry the sample and the lid in the drying oven.
- (vi) If the preformed shape is unfired, then prefire the specimens to the test temperature, unless otherwise specified, using the schedules set out in AS 1774.30.

(b) *Monolithic refractories*

- (i) Cast a sample in a mould according to AS 1774.4 series to nominal dimensions of 115 mm × 115 mm × 75 mm. A mandrel of 50 mm diameter and 50 mm length may be used to form a cavity.

NOTE: If a mandrel is used a suitable mould release agent should be used.

- (ii) Prepare a lid from the same material as the sample with nominal dimensions 115 mm × 115 mm × 25 mm according to AS 1774.4 series.
- (iii) Prefire the specimens to the test temperature, unless otherwise specified, using the schedules set out in AS 1774.30.

1.9 PROCEDURE

The recommended procedure is as follows:

- (a) Fill the cup with the specified premixed reagent, tamping if necessary. Record the mass of reagent used.
- (b) Cover the cup with a lid unless specified. If mortar is used ensure that it does not contaminate the reagent, otherwise an air-setting mortar is recommended.

NOTES:

- 1 The use of a lid is to protect the furnace from reagent spillage.
- 2 The lid should be mortared if volatiles are generated and need to be contained.

- (c) Place the test assembly in a kiln and heat to the specified temperature using the schedules set out in AS 1774.30.

NOTE: Different reaction products may be produced under oxidising or reducing conditions.

- (d) Hold the soak temperature for the specified time.
- (e) Cool naturally to room temperature. Remove sample from kiln.
- (f) Visually inspect the sample for cracking, deformation and staining and photograph the sample.