Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

NATIONAL FOREWORD

This Indian Standard (Part 1) which is identical with ISO 13765-1 : 2004 ‘Refractory mortars — Part 1: Determination of consistency using the penetrating cone method’ issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Refractories Sectional Committee and approval of the Metallurgical Engineering Division Council.

This standard is published in various parts. Other parts in this series are:

- Part 2: Determination of consistency using the reciprocating flow table method
- Part 3: Determination of joint stability
- Part 4: Determination of flexural bonding strength
- Part 5: Determination of grain size distribution (sieve analysis)
- Part 6: Determination of moisture content of ready-mixed mortars

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear, referring to this standard, they should be read as ‘Indian Standard’.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appear to the following International Standard for which Indian Standard also exists. The corresponding Indian Standard which is to be substituted in its place is listed below along with its degree of equivalence for the edition indicated:

<table>
<thead>
<tr>
<th>International Standard</th>
<th>Corresponding Indian Standard</th>
<th>Degree of Equivalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 8656-1 Refractory products — Sampling of raw materials and unshaped products — Part 1: Sampling scheme</td>
<td>IS 1528 (Part 7) : 2011 Methods of sampling and physical tests for refractory material: Part 7 Methods of sampling and criteria for conformity (second revision)</td>
<td>Technically Equivalent</td>
</tr>
</tbody>
</table>

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (revised)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
1 Scope

This part of ISO 13765 describes a method for the determination of the consistency of refractory mortars using a penetrating cone.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8656-1, Refractory products — Sampling of raw materials and unshaped products — Part 1: Sampling scheme

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 refractory mortar
finely ground refractory composition which, generally after the addition of water or other specified mixed liquid, is used for laying and jointing bricks

NOTE 1 The refractory components are related to the quality of the bricks with which the composition is to be used.

NOTE 2 In some cases the mortar may be supplied in a ready-mixed state.

3.2 consistency of refractory mortars
measure of the viscosity of the material in its ready-to-use state

4 Principle

The consistency of a refractory mortar is assessed by the depth of penetration of a specified cone into the sample.

5 Apparatus

5.1 Consistency determination device, consisting of a penetrometer, a cone and a container for the sample.

The penetrometer is shown in Figure 1. The requirements for the cone and the sample container are given in 5.1.1 and 5.1.2.
5.1.1 Cone.

The cone shall be made of brass or corrosion-resistant steel with a smooth, polished surface. It shall be of the dimensions shown in Figure 2, and shall be machined such that the mass of the cone and drop rod is $150 \text{ g} \pm 0.25 \text{ g}$. The cone shall be tightly fitted with no shoulder at the joint to a needle tip made of quench-hardened steel or stainless steel.
5.1.2 Sample container, a cylinder of 100 mm internal diameter and 50 mm depth.

5.2 Mixer, (see Figure 3) consisting of a stainless steel bowl and a metal blade.

**Figure 2 — Penetrometer cone**

**Key**

1. stainless steel drop rod
2. needle tip (made of quench-hardened steel or stainless steel)
   - a Machine to desired mass.
   - b Brass or corrosion-resistant steel.
   - c Smooth and polished surface.
   - d Tight fit.
   - e No shoulder, i.e. smooth transition.
5.2.1 Stainless steel bowl, with a capacity of about 5 L and of the general shape and size shown in Figure 3, and provided with means by which it can be fixed securely to the mixer frame during mixing and by which the height of the bowl in relation to the blade and, to some extent, the gap between blade and bowl can be finely adjusted and fixed;

5.2.2 Metal blade, of the general shape, size and tolerances shown in Figure 3, rotating about its own axis as it is driven in a planetary movement around the axis of the bowl by an electric motor at controlled rotational frequencies.

The two directions of rotation shall be opposite and the ratio between the two frequencies shall not be a whole number.

Where more than one mixer is used, blades and bowls shall form sets which are always used together. The gap between blade and bowl shown in Figure 3 shall be checked regularly depending on the frequency of use.

NOTE The gap indicated in Figure 3 (3 mm ± 1 mm) refers to the situation when the blade in the empty bowl is brought as close as possible to the wall. Simple tolerance gauges (feeler gauges) are useful where direct measurement is difficult.

5.3 Balance, having a maximum weighing capacity of 6 kg and capable of weighing to the nearest 1 g.

5.4 Measuring cylinder, capable of measuring to the nearest 5 ml.

5.5 Thermometer, capable of measuring to the nearest 1 °C.

Figure 3 — Mixer blade and bowl

Dimensions in millimetres

Key
1 bowl
2 blade
6 Sampling

For dry mortar, sample the mortar in accordance with ISO 8656-1 or as agreed between parties. Reduce the sample to 5 kg by quartering or with a riffle sampler.

Sample ready-mixed mortars by emptying the entire contents of the container in which the mortar is supplied into another container of larger capacity and mixing thoroughly. It is important that any supernatant liquid not be discarded. Ensure that a representative sample of the wet mixture is obtained.

7 Procedure

7.1 For dry mortars, place the mortar in the mixer and add water (or the specified mixing liquid) in accordance with the manufacturer's instructions and mix thoroughly. Note the quantity of liquid added. Allow the mixed mortar to stand for 15 min, unless any specific instructions are given by the manufacturer, in which case these should be followed. Ready-mixed mortar shall be tested in “as received” state.

7.2 Measure the temperature of the mixed mortar to the nearest 1 °C.

7.3 Set the penetrometer vertically and attach a clean dry cone.

7.4 Fill the sample container with the well-mixed mortar, level the surface with a levelling rod and place it on the test table.

7.5 Adjust the position of the cone so that its tip is just in contact with the centre of the surface of the mortar in the sample container. Lower the measuring gauge rod to contact the top of the drop rod and set the gauge to zero.

7.6 Depress the start (release) button and keep depressed for 5 s so that the cone can move freely. Release the button. Lower the toothed rod again to contact the top of the drop rod. Record the value on the measuring gauge scale to the nearest 0,1 mm as the consistency of the mortar.

7.7 Lift the toothed rod and cone. Clean the cone. Repeat the operation described in 7.3 to 7.6.

8 Calculation

Calculate the consistency as the mean value of the two tests to the nearest 0,1 mm.

In the case of dry mortars, calculate the percentage of the amount of water or mixing liquid added based on the mass of the dry material.

9 Test report

The report shall include the following information:

a) all information necessary for identification of the material tested, including a description of the material, manufacturer, type, brand, batch number, etc.;

b) a reference to this part of ISO 13765 (ISO 13765-1);

c) the name of the testing establishment;

d) in the case of a dry mortar, the percentage of water (or specified liquid) added;

e) the results of the test, i.e. the consistency as penetration to the nearest 0,1 mm, including the results of the individual determinations and their mean, calculated as specified in Clause 8;

f) the ambient temperature at which the test was conducted;

g) the temperature of the mixed mortar;

h) any deviations from the procedure specified;
i) any unusual features (anomalies) observed during the test;

j) the date of the test.
Bureau of Indian Standards

BIS is a statutory institution established under the Bureau of Indian Standards Act, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of ‘BIS Catalogue’ and ‘Standards: Monthly Additions’.

This Indian Standard has been developed from Doc No.: MTD 15 (5086).

Amendments Issued Since Publication

<table>
<thead>
<tr>
<th>Amendment No.</th>
<th>Date of Issue</th>
<th>Text Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephone: 2323 0131, 2323 3375, 2323 9402 Website: www.bis.org.in

Regional Offices:

<table>
<thead>
<tr>
<th>Region</th>
<th>Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Manak Bhavan, 9 Bahadur Shah Zafar Marg</td>
<td>2323 7617, 2323 3841</td>
</tr>
<tr>
<td></td>
<td>NEW DELHI 110002</td>
<td></td>
</tr>
<tr>
<td>Eastern</td>
<td>1/14, C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi</td>
<td>2337 8499, 2337 8561</td>
</tr>
<tr>
<td></td>
<td>KOLKATA 700054</td>
<td>2337 8626, 2337 9120</td>
</tr>
<tr>
<td>Northern</td>
<td>SCO 335-336, Sector 34-A, CHANDIGARH 160022</td>
<td>260 3843, 260 9285</td>
</tr>
<tr>
<td>Southern</td>
<td>C.I.T. Campus, IV Cross Road, CHENNAI 600113</td>
<td>2254 1216, 2254 1442</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2254 2519, 2254 2315</td>
</tr>
<tr>
<td>Western</td>
<td>Manakalaya, E9 MIDC, Marol, Andheri (East)</td>
<td>2832 9295, 2832 7858</td>
</tr>
<tr>
<td></td>
<td>MUMBAI 400093</td>
<td>2832 7891, 2832 7892</td>
</tr>
<tr>
<td>Branches</td>
<td>AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAJKOT. THIRUVANATHAPURAM. VISAKHAPATNAM.</td>
<td></td>
</tr>
</tbody>
</table>

Published by BIS, New Delhi