

प्रीकास्ट कंक्रीट पेविंग फ्लैग — विशिष्टि

Precast Concrete Paving Flags —
Specification

ICS 93.080.20

© BIS 2024



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

FOREWORD

This Indian Standard was adopted by the Bureau of the Indian Standards, after the draft finalized by the Flooring, Wall Finishing and Roofing Sectional Committee had been approved by the Civil Engineering Division Council.

This standard specifies the requirements for the materials, properties, and testing methodologies necessary to ensure the quality and performance of cement-bound unreinforced concrete paving flags.

Concrete paving flags play a vital role in various applications, from pedestrian walkways to vehicular pavements. Their performance and durability are crucial for maintaining the safety, aesthetic appeal, and functionality of surface areas subjected to diverse environmental conditions and usage patterns.

This standard aims to provide manufacturers, engineers, and construction professionals with clear and consistent guidelines for producing paving flags that meet specified criteria. It addresses key aspects such as raw materials, dimensional tolerances, physical and mechanical properties, and testing procedures, ensuring that the paving flags are both reliable and fit for purpose.

By adhering to this standard, stakeholders can ensure that their concrete paving flags not only meet regulatory requirements but also contribute to the development of resilient and sustainable infrastructure. This document is intended to facilitate uniformity in production and evaluation, ultimately supporting the construction of safer, more durable, and aesthetically pleasing paved surfaces.

The formulation of this standard due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications:

BS EN 1339 : 2003, 'Concrete paving flags — Requirements and test methods'

BS 7263 (Part 1) : 1994, 'Precast concrete flags, kerbs, channels, edgings and quadrants — Part 1: Specification'

This standard contributes to the United Nations Sustainable Development Goal 9: 'Industry, innovation and infrastructure', particularly its target to develop quality, reliable, sustainable and resilient infrastructure, and also promote inclusive and sustainable industrialization.

The composition of the Committee responsible for the formulation of this standard is given in [Annex E](#).

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PRECAST CONCRETE PAVING FLAGS — SPECIFICATION

1 SCOPE

This standard specifies materials, properties, requirements, and test methods for cement bound unreinforced concrete paving flags.

2 REFERENCES

The standards listed in [Annex A](#) contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard, the following terms and definitions shall apply.

3.1 Arris — Part of a flag where two faces meet. It can be bevelled, rounded, chamfered, parabolic or splayed.

3.2 Bed Face — Surface generally parallel to the upper face and in contact with the bedding after laying.

3.3 Chamfer — Bevelled arris, as shown in [Fig. 1](#).

3.4 Chased Side Face — Side face of a concrete paving flag, having a recessed profile.

3.5 Concrete Paving Flag — Precast concrete unit used as a surfacing material that satisfies the following conditions: its minimum thickness is 50 mm, minimum plan area is 0.09 sq m, its overall length does not exceed 1 200 mm and its overall length divided by its thickness is greater than four.

3.6 Draw — Intended angle of the side face from the vertical plane over the full height of a flag as shown in [Fig. 1](#).

3.7 Facing Layer — Layer of concrete on the upper face of a flag of different material and/or properties to the main body or backing layer of a flag.

NOTE — To be distinguished from wipe, being a fine cement mortar or slurry applied to the surface of the flag.

3.8 Format — Work dimensions of a flag specified in order of overall length, overall width and thickness.

3.9 Nominal Size — Size which identifies the flag.

3.10 Overall Length — Longer side of the rectangle with the smallest area able to enclose the flag excluding any spacer nibs.

3.11 Overall Width — Shorter side of the rectangle with the smallest area able to enclose the flag excluding any spacer nibs.

3.12 Permeable Paving Flag — Flag intended, by its structure, to allow passage of water through the flag.

3.13 Secondary Processing — Manufacturing process to texture the whole flag or any surface, carried out after basic manufacture before or after hardening.

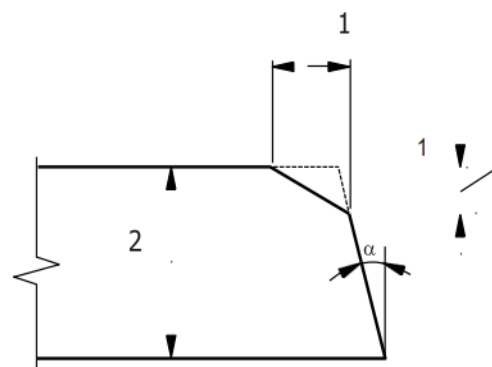
3.14 Spacer Nibs — Small protruding profiles on a side face of a flag.

3.15 Thickness — Distance between the upper face and the bed face of the flag.

3.16 Upper Face — Surface intended to be seen when in use.

3.17 Work Size — The target size of the flag specified for its manufacture.

3.18 Wipe — Fine cement mortar or slurry applied to the surface of the units.



Key

- 1 Chamfer
- 2 Thickness
- α Draw

FIG. 1 EXAMPLE OF CHAMFER AND DRAW

4 RAW MATERIAL

4.1 Cement

Cement used in the manufacture of paving blocks shall be any of the following:

- a) Ordinary Portland cement conforming to IS 269;
- b) Portland slag cement conforming to IS 455;
- c) Portland pozzolana cement (fly ash based) conforming to IS 1489 (Part 1);
- d) Portland pozzolana cement (calcined clay based) conforming to IS 1489 (Part 2);
- e) Rapid hardening Portland cement conforming to IS 8041; and
- f) Composite cement conforming to IS 16415.

4.2 Admixtures

4.2.1 Mineral Admixtures

Mineral admixtures may be used as a part replacement of ordinary Portland cement in the manufacture of paving blocks, provided uniform blending with cement is ensured.

They shall be any of the following:

- a) Pulverized fuel ash conforming to IS 3812 (Part 1);
- b) Pulverized fuel ash conforming to IS 3812 (Part 2);
- c) Silica fume conforming to IS 15388;
- d) Ground granulated blast furnace slag conforming to IS 16714;
- e) Metakaolin conforming to IS 16354; and
- f) Rice husk ash conforming to the requirements of IS 456.

4.2.2 Chemical Admixtures

Chemical admixtures, if used in the manufacture of paving flags, shall conform to IS 9103.

4.3 Aggregates

4.3.1 Coarse Aggregates

- a) Coarse aggregates shall comply with the requirements of IS 383; and
- b) The nominal maximum size of coarse aggregate used in production of paving flags shall be 12.5 mm. However, the

nominal maximum size of the coarse aggregate may be increased up to 20 mm in case of single layer paving flags having thickness of 80 mm or above, and two-layer paving flags having thickness of backing layer of 80 mm or above.

4.3.2 Fine Aggregates

Fine aggregates shall conform to the requirements of IS 383.

4.4 Pigments

4.4.1 Pigments, if used either singly or in combination in the manufacture of paving flags, shall have durable colour and free from matters detrimental to concrete. They shall be any of the following:

- a) Black or red or brown pigment conforming to IS 44;
- b) Green pigment conforming to IS 54;
- c) Blue pigment conforming to IS 55 or IS 56 or IS 3574 (Part 2);
- d) White pigment conforming to IS 411; and
- e) Yellow pigment conforming to IS 3574 (Part 1).

4.4.2 Pigment quantity shall be restricted to a maximum of 9 percent by weight of cement content. The fineness of pigment should be more than the fineness of cement.

4.4.3 The pigments shall not contain zinc compounds or organic dyes. Lead pigments shall not be used.

4.5 Water

Water used in the manufacture of concrete blocks for paving shall conform to the requirements of IS 456.

5 REQUIREMENTS

5.1 General Quality and Finish

The flags shall conform to the following requirements at the time they are declared suitable for use by the manufacturer.

5.1.1 All units shall be sound and free of cracks or other defects which interfere with the proper placing of the unit or impair the strength or performance of the construction. Minor chipping resulting from the customary methods of handling during delivery, shall not be deemed grounds for rejection. All angles of the units except for the angles resulting

from the splayed or chamfered faces shall be true right angles.

5.1.2 The colour and texture of the pigmented units shall be as mutually agreed between the manufacturer and the purchaser.

5.1.3 Flags may be produced with a single concrete throughout or with different facing and backing layers. In the case of two-layer flags there shall be no delamination or separation between the layers.

NOTE — When efflorescence occurs, it is not deleterious to the performance of the flags in use and is not considered significant.

5.1.4 When flags are produced with a facing layer this shall have a minimum thickness of 6 mm over that area claimed by the manufacturer to be faced, when measured in accordance with [Annex B](#). Isolated particles of aggregate protruding into the facing layer shall be ignored. The facing layer shall be an integral part of the flag.

5.1.5 An arris described as square may be bevelled or rounded. The horizontal or vertical dimensions shall not exceed 2 mm. A bevelled arris exceeding 2 mm shall be described as chamfered. Its dimensions shall be declared by the manufacturer.

5.1.6 Draw angle α shall not exceed 1°.

5.1.7 Flags may be produced with functional and/or decorative profiles, which shall not be included in the work dimensions of a flag.

5.1.8 The surface of flags may be textured, secondary processed or treated chemically; these finishes or treatments shall be described and declared by the manufacturer.

5.2 Dimensions and Tolerances

5.2.1 The flags shall comply with the dimension requirements given in [Table 1](#), when tested in accordance with the methods given in [Annex B](#).

5.2.2 *Spacer Nibs, Draw or Chased Profiled Side Faces*

Flags may be produced with spacer nibs, a draw or chased profiled side faces. When these are provided, the manufacturer shall declare their work dimensions.

NOTE — The size of the space allocated to the flag should include an allowance for joints and deviations.

5.2.3 *Tolerances*

The maximum dimensional deviations of any flag, measured in accordance with [Annex B](#) shall be as follows:

- a) Thickness: ± 3 mm;
- b) Dome height (tactile flags): ± 1 mm;
- c) Length and width: ± 2 mm;
- d) Squareness of plan (difference between diagonals):
 - 1) Diagonal ≤ 850 mm : 2 mm; and
 - 2) Diagonal > 850 mm : 4 mm.
- e) *Flatness and Straightness* — The deviations on flatness and straightness given in [Table 2](#) shall apply to an upper face intended to be plane.

5.3 Physical and Mechanical Properties

5.3.1 *Bending Strength*

When sampled and tested according to the procedure laid down in [Annex C](#), the bending strength shall be not less than the following values:

- a) Individual: 4.0 MPa; and
- b) Average: 5.0 MPa

5.3.2 *Water Absorption*

When tested according to the procedure laid down in [Annex D](#), the average water absorption of the sample shall not exceed 6 percent.

5.3.3 *Abrasion Resistant*

When sampled and tested according to the procedure laid down in Annex E of IS 15658, the abrasion resistance (in mm³ per 5 000 mm²) shall not be more than the following values:

- a) Dry:
 - 1) Individual — 20 000;
 - 2) Average — 18 000;
- b) Wet:
 - 1) Individual — 22 000; and
 - 2) Average — 20 000.

Table 1 Concrete Paving Flags Sizes

(Clause 5.2.1)

| SI No. | Flag Type | Nominal Size | Work Size | Minimum Thickness |
|--------|-----------|--------------|-------------|-------------------|
| | | mm | mm | mm |
| (1) | (2) | (3) | (4) | (5) |
| i) | A | 600 × 1 200 | 598 × 1 198 | 80 |
| ii) | B | 600 × 900 | 598 × 898 | |
| iii) | C | 600 × 750 | 598 × 748 | 50, 60 or 80 |
| iv) | D | 600 × 600 | 598 × 598 | |
| v) | E | 600 × 450 | 598 × 448 | |
| vi) | F | 600 × 300 | 598 × 298 | |
| vii) | G | 500 × 500 | 498 × 498 | |
| viii) | H | 450 × 450 | 448 × 448 | |
| ix) | I | 400 × 400 | 398 × 398 | |
| x) | J | 300 × 300 | 298 × 298 | |

NOTE — Flags, with size and thickness other than those specified above, may be manufactured when agreed between the manufacturer and the purchaser, provided that the flags meet all other requirements of the standard.

Table 2 Permissible Deviations in Flatness and Straightness

[Clause 5.2.3, SI No.(e)]

| SI No. | Length of Gauge | Maximum Convex | Maximum Concave |
|--------|-----------------|----------------|-----------------|
| | mm | mm | mm |
| (1) | (2) | (3) | (4) |
| i) | 300 | 1.5 | 1.0 |
| ii) | 400 | 2.0 | 1.5 |
| iii) | 500 | 2.5 | 1.5 |
| iv) | 800 | 4.0 | 2.5 |
| v) | 1 200 | 5.0 | 3.5 |

6 APPLICATIONS

The choice of which flag to use in a particular location will depend on both its size and strength. The larger the flag, the higher its bending strength must be because it will have to carry more loads. The suitability of flags for various locations are given in [Table 3](#).

7 SAMPLING

7.1 All concrete paving flags of same type and

thickness manufactured under identical condition from raw material of same source in a week shall constitute one batch.

7.2 When the product has been submitted to an assessment of conformity by a third party, further testing is not required. In case of any dispute between the purchaser and the manufacturer, testing may be carried out and the required number of flags shall be sampled from each batch of the

consignment of flags up to a quantity of 50 000 flags.

7.3 When the product has not been submitted to an assessment of conformity by a third party, the required number of flags shall be sampled from each batch of the consignment of flags up to a quantity of 25 000 flags.

7.4 When the quantity of a partial batch is less than half of the quantities mentioned in [7.2](#) and [7.3](#), that partial batch of the consignment shall be added to the previous full batch.

7.5 The sample of paving flags for inspection and testing shall be chosen from a batch at random. For guidance in procedure of random selection, IS 4905 may be referred.

7.6 A sample of 4 flags shall be taken from each batch for each test. If the samples drawn for testing one characteristic can be utilized for testing any other characteristic, without introducing any prejudice in the test results of the latter, it would not be necessary to take fresh samples for the latter characteristics.

8 CRITERIA FOR CONFORMITY

8.1 The lot shall be considered as conforming to the requirements of the specification, if the conditions mentioned in [8.2](#) and [8.3](#) are satisfied.

8.2 The number of units with visual defects in sample lot shall not be more than one.

8.3 The sample shall meet the dimension, physical and mechanical requirements mentioned in [5.2](#) and [5.3](#).

9 RETESTS

9.1 Any test sample which fails to comply with the

requirements of either of the tests specified in [5](#), one set of test samples from the batch/lot comprising the same order shall be tested further.

9.2 If these further test samples fail to comply with the requirements of the tests, the whole of the batch/lot represented by the samples shall be rejected.

10 MANUFACTURER'S CERTIFICATE

The manufacturer shall supply test certificate/invoice with each batch mentioning the batch number and date of manufacture, to enable to trace back the same to factory records. Also, 0.5 percent of concrete paving flags from each batch shall be marked with batch number and date of manufacture.

11 MARKING

11.1 The following particulars relating to the units shall be made available on the invoice or on the manufacturer's certificate:

- a) Source of identification of the manufacturer;
- b) Designation of the unit; and
- c) Date of production and batch number.

11.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

Table 3 Suitability of Flags for Various Locations

(Clause 6)

| SI No. | Location and Use | Flag Type | Minimum Thickness |
|--------|---|-----------|-------------------|
| | | | mm |
| (1) | (2) | (3) | (4) |
| i) | No vehicles for example, pedestrian only streets; footpaths; railway platforms; walkways with bollards, benches | C to J | 50 |
| ii) | Occasional use by cars and light mechanical sweepers example; footpaths/walkways in no-parking areas or where over-run is not a problem | C to J | 50 |

Table 3 (Concluded)

| SI No. | Location and Use | Flag Type | Minimum Thickness mm |
|--------|---|---------------------|-------------------------|
| (1) | (2) | (3) | (4) |
| iii) | Footpaths/walkways where vehicles cross sometimes example; to reach a house driveway | D, E, F, G, H, I, J | 60 |
| iv) | Footpaths and walkways where cars and occasional commercial light weight vehicles run over; unprotected pedestrian streets with about 25 vehicles each day/way for service or fire access | H, I, J | 60 |
| v) | Railway sidings with truck entries + fire tender + heavy commercial vehicle | A, B | 80 |

ANNEX A

(Clause 2)

LIST OF REFERRED STANDARDS

| IS No. | Title | IS No. | Title |
|-------------------------|---|-------------------------------------|---|
| IS 44 : 1991 | Iron oxide pigments for paints — Specification (<i>second revision</i>) | | red; chlorinated p-nitroaniline red; arylamide yellows; and para red) |
| IS 54 : 1988 | Specification for green oxide of chromium for paints (<i>second revision</i>) | IS 3574 (Part 2) : 2000 | Organic pigments for paints — Specification: Part 2 Phthalocyanines (<i>first revision</i>) |
| IS 55 : 1970 | Specification for ultramarine blue for paints (<i>first revision</i>) | IS 3812 | Pulverized fuel ash — Specification: |
| IS 56 : 1993 | Prussian blue (iron blue) for paints — Specification (<i>second revision</i>) | (Part 1) : 2013 | For use as pozzolona in cement, cement mortar and concrete (<i>third revision</i>) |
| IS 269 : 2015 | Ordinary Portland cement — Specification (<i>sixth revision</i>) | (Part 2) : 2013 | For use as admixture in cement mortar and concrete (<i>third revision</i>) |
| IS 383 : 2016 | Coarse and fine aggregates for concrete — Specification (<i>third revision</i>) | IS 4905 : 2015/ ISO 24153 : 2009 | Random sampling and randomization procedures (<i>first revision</i>) |
| IS 411 : 2020 | Titanium dioxide, anatase, for paints — Specification (<i>fourth revision</i>) | IS 8041 : 1990 | Rapid hardening Portland cement — Specification (<i>second revision</i>) |
| IS 455 : 2015 | Portland slag cement — Specification (<i>fifth revision</i>) | IS 9103 : 1999 | Concrete admixtures — Specification (<i>first revision</i>) |
| IS 456 : 2000 | Plain and reinforced concrete — Code of practice (<i>fourth revision</i>) | IS 15388 : 2003 | Silica fume — Specification |
| IS 1489 | Portland pozzolana cement — Specification: | IS 15658 : 2021 | Concrete paving blocks — Specification (<i>first revision</i>) |
| (Part 1) : 2015 | Fly ash based (<i>fourth revision</i>) | IS 16354 : 2015 | Metakaolin for use in cement, cement mortar and concrete — Specification |
| (Part 2) : 2015 | Calcined clay based (<i>fourth revision</i>) | IS 16415 : 2015 | Composite cement — Specification |
| IS 2185 (Part 1) : 2005 | Concrete masonry units — Specification: Part 1 Hollow and solid concrete blocks (<i>third revision</i>) | IS 16714 : 2018 | Ground granulated blast furnace slag for use in cement, mortar and concrete — Specification |
| IS 3574 (Part 1) : 1965 | Specification for organic pigments for paints: Part 1 AZO pigments (toluidine | | |

To access Indian Standards click on the link below:

https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/knowyourstandards/Indian_standards/isdetails/

ANNEX B*(Clauses 5.1.4, 5.2.1 and 5.2.3)***MEASUREMENT OF DIMENSIONS****B-1 APPARATUS**

The apparatus shall comprise the following:

- a) Steel caliper; and
- b) Steel rule capable of measuring up to 300 mm to an accuracy of 0.5 mm.

B-2 PREPARATION

Remove all flashings and burrs from the unit to be measured.

B-3 DIMENSIONS**B-3.1 Thickness**

Measure the thickness of each flag to the nearest millimetre using a calliper gauge having suitable jaws, 20 mm to 30 mm from the edge of the flag and within 100 mm from each corner. From the four measurements obtained, calculate the average thickness of each flag to the nearest 1 mm.

B-3.2 Length and Width

Measure the length and width of each flag to the nearest 1 mm.

B-3.3 Squareness of Plan

Measure the two diagonals of each flag to the nearest 1 mm.

B-4 FLATNESS

Flatness of the flag upper surface is tested by means

of a metal ruler, whose length is not less than the flag diagonal. For testing upper surfaces that are concave, the ruler is placed on the surface of the flag along one of the diagonals so that the ruler touches the flag at not less than 2 points. The largest gap is measured, and the test is repeated along the second diagonal. The larger gap is the amount of concavity. For testing upper surface that is convex, the ruler is placed on the surface of the flag along one of the diagonals so that the distances between the ruler and the flag, at the ends of the diagonal, are equal. The largest gap is measured between the ruler and flag and the test is repeated along the second diagonal. The larger gap is the amount of convexity.

B-5 STRAIGHTNESS

Two corners of the flag surface shall be connected with a fine thread alongside one of the edges and the largest gap between the thread and the plane is recorded. The test is repeated alongside each of the other edges.

B-6 Alternative test methods, for example go and no-go gauges, may also be used provided at least the same accuracy is achieved as in the above test method.

B-7 REPORT

Report individual and mean values of measured dimensions.

ANNEX C*(Clause 5.3.1)***DETERMINATION OF BENDING STRENGTH****C-1 APPARATUS**

The transverse testing machine shall have a scale with an accuracy of ± 3 percent over the range of the anticipated test loads and be capable of increasing the load at specified rates.

It shall be constructed in such a way that it can induce 3 points bending into the specimen without torsion.

The load inducing bar shall be equidistant between the supports.

The length of the supports and the load inducing bar shall be equal to the width of the sample to be tested (*see Fig. 2*). If not possible, sample may be cut to suit the apparatus.

The upper and lower bearers shall be parallel and rigid and round or rounded to a radius of (20 ± 1) mm. If plywood packing pieces are used their width shall not exceed 25 mm. Their thickness shall be (4 ± 1) mm and at least 10 mm longer than the size of the anticipated fracture plane.

C-2 PREPARATION

C-2.1 Use whole flags when their plan shape includes at least two parallel straight edges. In other cases use sawn specimens with the largest possible plan area which includes two parallel straight edges.

C-2.2 If necessary, remove any burrs, high spots, etc. Immerse the flags under water at $(20 \pm 5) ^\circ\text{C}$ for (24 ± 3) h, remove, wipe dry and test immediately.

C-2.3 A rough, textured or curved face shall be prepared by grinding or capping. Capping should be done by one of the methods described in **D-3.1** and **D-3.2** of Annex D of IS 2185 (Part 1).

C-2.4 Alternatively, 3 mm thick plywood sheets of size larger than the specimens by a margin of at least 5 mm from all edges of the specimen shall be used for capping the specimens.

C-2.5 Other methods of preparation may be used for routine testing providing there is a correlation between the results of the two methods, for example, using unground rough, textured or curved flags instead of ground flags.

NOTE — Faces that are not rough, textured or curved may be prepared by grinding or capping.

C-3 PROCEDURE

C-3.1 Place the flag in the testing machine. The distance between the load bearing supports and the edge of the flag shall be 50 mm, but if the span be less than three times the thickness, the distance between the load bearing supports and the edge of the flag shall be reduced to half the thickness of the flag.

The span shall be within 0.5 percent of the specified span rounded to the nearest millimetre and recorded.

C-3.2 Place the specimen with its upper face uppermost, symmetrically on the load bearing supports of the testing machine and with its shorter side parallel to the load bearing supports.

C-3.3 Apply the load without shock and increase the load uniformly so that the breaking load is reached within (45 ± 15) s. The maximum load applied shall be recorded to the nearest N.

C-4 CALCULATION

The bending strength of the specimen shall be calculated as follows:

$$F_b = 3Pl/2bd^2$$

where

F_b = bending strength, MPa;

b = width of the flag at the failure plane, mm;

P = breaking load, N;

l = distance between central lines of supporting rollers, mm; and

d = thickness of the flag at the failure plane, mm.

C-5 REPORT

Report the individual and mean values of the bending strength, correct to the nearest 0.1 MPa and breaking load of the flag, correct to the nearest 0.1 kN.

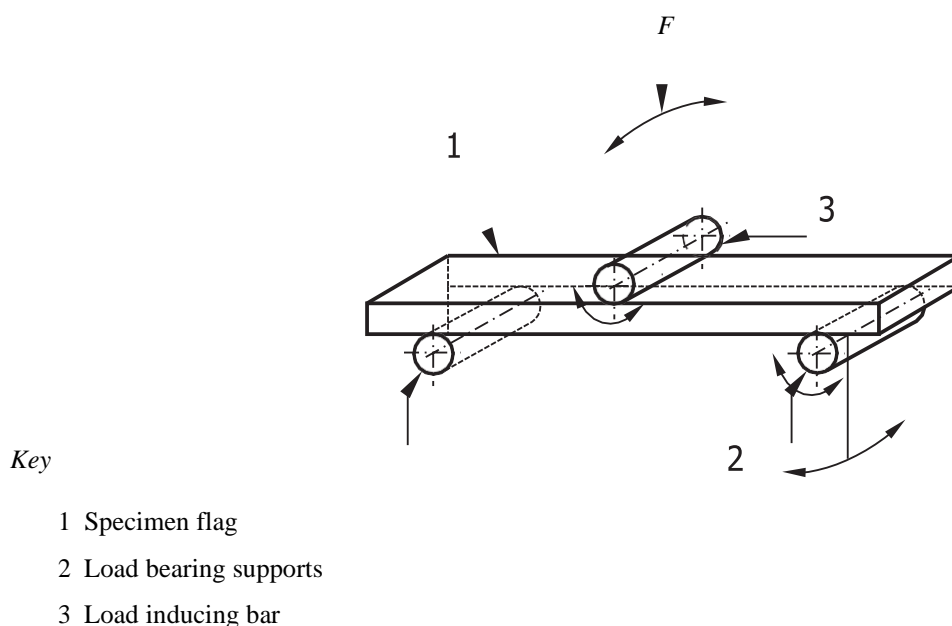


FIG. 2 PRINCIPLE OF TESTING

ANNEX D(Clause [5.3.2](#))**DETERMINATION OF TOTAL WATER ABSORPTION****D-1 APPARATUS**

The balance used shall be sensitive to within one percent of the mass of the smallest specimen tested.

D-2 SPECIMENS

If the flag weighs more than 5 kg, cut two square test pieces from diagonally opposite corners of the flags, of size 100 mm × 100 mm minimum and each weighing between 2.5 kg to 5.0 kg, cut from the full thickness of the flag and having two cut and two moulded edges.

D-3 PROCEDURE**D-3.1 Saturation**

The test specimen shall be completely immersed in water at room temperature for 24 h ± 2 h. The specimen then shall be removed from the water and allowed to drain for 1 min by placing them on a 10 mm or coarser wire mesh. Visible water on the specimens shall be removed with a damp cloth. The specimen shall be immediately weighed and the weight for each specimen noted in grams to the nearest 1 g, W_w .

D-3.2 Drying

After saturation, the specimens shall be placed at a distance of 15 mm from each other and subsequently dried in a ventilated oven at 105 °C ± 5 °C for not less than 24 h and until two successive weighing at intervals of 2 h show an increment of loss not greater than 0.2 percent of the previously determined mass of the specimen. The dry weight of each specimen, W_d , shall be recorded in grams to the nearest 1 g.

D-4 CALCULATION

The percent water absorption shall be calculated as follows:

$$W \text{ percent} = (W_w - W_d)/W_d \times 100$$

D-5 REPORT

Report the individual and mean values of water absorption of specimens tested as per [D-1](#) to [D-4](#), correct to 0.1 percent.

ANNEX E

(Foreword)

COMMITTEE COMPOSITION

Flooring, Wall Finishing and Roofing Sectional Committee, CED 05

| <i>Organization</i> | <i>Representative(s)</i> |
|---|---|
| In Personal Capacity (<i>L/109, Sarita Vihar, New Delhi - 110076</i>) | MS ASHOK KHURANA (<i>Chairperson</i>) |
| Acropolis Institute of Technology and Research, Indore | DR SATISH KUMAR SHARMA SHRI JAYANT AWASTHY (<i>Alternate</i>) |
| Aludecor Lamination Private Limited, Kolkata | SHRI DEVESH KUMAR SHRI PRAVEEN RANJAN (<i>Alternate</i>) |
| Ardex Endura India Private Limited, Bengaluru | SHRI K. P. PAULSON SHRI GOPINATH KRISHNAN (<i>Alternate</i>) |
| CSIR - Central Building Research Institute, Roorkee | SHRI S. K. SINGH DR KISHORE KULKARNI (<i>Alternate I</i>) DR GOVIND GAURAV (<i>Alternate II</i>) |
| CSIR - Central Road Research Institute, New Delhi | DR RAKESH KUMAR |
| H. R. Johnson (India) Limited, Dewas | SHRI SUDIPTA SAHA SHRI SUBHASHISH MUKHOPADHYA (<i>Alternate</i>) |
| Indian Council of Ceramic Tiles and Sanitaryware, Mumbai | SHRI SUDIPTA SAHA |
| Indian Institute of Technology Gandhinagar, Gandhinagar | SHRI GAURAV SHRIVASTAVA |
| Mapei Company Construction Products India Private Limited, Bengaluru | SHRI HANUMANTHA RAJU S. N. SHRI RAVI JAGATAP (<i>Alternate I</i>) SHRI ASHUTOSH KANDWAL (<i>Alternate II</i>) |
| Morbi Ceramic Association, Morbi | SHRI HARESHBHI RAMJIBAHI BHOPLIYA SHRI ALAKESH MAHATA (<i>Alternate</i>) |
| MYK Laticrete India, Hyderabad | DR P. ARJUNAN SHRI N. RADHAKANTH (<i>Alternate</i>) |
| National Council for Cement and Building Materials, Faridabad | SHRI AMIT TRIVEDI SHRI SANJAY MUNDRA (<i>Alternate I</i>) SHRI AMIT SAGAR (<i>Alternate II</i>) |
| National Test House, Kolkata | REPRESENTATIVE DR SOMIT NEOGI (<i>Alternate</i>) |
| NTC Tiles LLP, Panchkula | SHRI PREM CHAND GUPTA SHRI SUSHANT GUPTA (<i>Alternate</i>) |
| Pavers and Blocks Manufacturers Association, Mumbai | SHRI VIJAY KUMBHANI SHRI MEHUL JAIN (<i>Alternate</i>) |
| Plast India Foundation, Mumbai | SHRI ARVIND GOENKA DR E. SUNDARESAN (<i>Alternate</i>) |

| <i>Organization</i> | <i>Representative(s)</i> |
|---|--|
| Premier Polyfilm Limited, Ghaziabad | SHRI PRAVEEN KUMAR SHRI HARENDRA KUMAR (<i>Alternate</i>) |
| RMG Polyvinyl India Limited, Ghaziabad | SHRI ASHISH MOHAN SHRI A. N. SINGH (<i>Alternate</i>) |
| Shriram Institute for Industrial Research, Delhi | SHRI MUKESH GARG SHRI RAMAN DHYANI (<i>Alternate</i>) |
| Steuler Industrial Solutions (India) Private Limited, Ankleshwar | SHRI CHIRAG K. BAXI SHRI BHARATBHAI D. PATEL |
| In Personal Capacity (<i>N-96, Mayfield Garden, Sector 51, Gurugram - 122018</i>) | SHRI R. D. MATHUR |
| BIS Directorate General | SHRI DWAIPAYAN BHADRA, SCIENTIST 'E'/DIRECTOR AND HEAD (CIVIL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)] |

Member Secretary
SHRI PRASHANT YADAV
SCIENTIST 'B'/ASSISTANT DIRECTOR
(CIVIL ENGINEERING), BIS

Working Group for New Indian Standard on Concrete Paving Blocks — Specification, CED 05/WG09

| <i>Organization</i> | <i>Representative(s)</i> |
|---|--------------------------|
| In Personal Capacity (<i>N-96, Mayfield Garden, Sector 51, Gurugram - 122018</i>) | SHRI R. D. MATHUR |
| CSIR - Central Road Research Institute, New Delhi | DR RAKESH KUMAR |
| MYK Laticrete India, Hyderabad | SHRI N. RADHAKANTH |
| National Test House, Kolkata | DR SOMIT NEOGI |
| NTC Tiles LLP, Panchkula | SHRI SUSHANT GUPTA |
| Pavers and Blocks Manufacturers Association, Mumbai | SHRI MEHUL JAIN |
| Shriram Institute for Industrial Research, Delhi | SHRI MUKESH GARG |
| Swatik Tiles, Alwar | SHRI RAJESH KHANDELWAL |

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 2016* 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 the 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 Head (Publication & Sales), 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 website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: CED 05 (24822).

Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
|-----------|---------------|---------------|
| | | |
| | | |
| | | |
| | | |

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

Website: www.bis.gov.in

Regional Offices:

| | Telephones |
|---|--------------------------|
| Central : 601/A, Konnectus Tower -1, 6 th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002 | { 2323 7617 |
| Eastern : 8 th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091 | { 2367 0012 2320 9474 |
| Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019 | { 265 9930 |
| Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113 | { 2254 1442 2254 1216 |
| Western : 5 th Floor/MTNL CETTM Technology Street, Hiranandani Gardens, Powai, Mumbai - 400076 | { 25700030 25702715 |

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYANA (CHANDIGARH), HUBLI, HYDERABAD, JAIPUR, JAMMU, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.