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IS 5268-1 (1991): Engineering Metrology - Straightedges, Part 1: Cast Iron Straightedges (Bow Shaped or Camel Back Type and 1-section or Parallel Type) [PGD 25: Engineering Metrology]
Indian Standard

ENGINEERING METROLOGY — STRAIGHTEDGES

PART 1 CAST IRON STRAIGHTEDGES (BOW SHAPED OR CAMEL BACK TYPE AND I-SECTION OR PARALLEL TYPE)

(First Revision)

(Incorporating Amendment No. 1)

UDC 531 717 85

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

Price Group 3
FOREWORD

This Indian Standard (First Revision) (Part 1) was adopted by the Bureau of Indian Standards after the draft finalized by the Engineering Metrology Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard was originally published in 1969. This first revision has been brought out in the light of prevailing technical practices in the country. Methods of testing flatness have been deleted and in their place reference to a new standard on methods of testing straightness, flatness and perpendicularity has been given. I-section or parallel type cast iron straightedges have been incorporated. Parallel type steel straightedges are covered in IS 2220 : 1962 'Steel straightedges'.

In preparation of this standard, considerable assistance has been derived from BS 5204 (Part 1) : 1975 'Straightedges: Part 1 Cast iron straightedges (bow shaped and I-section)' issued by the British Standards Institution (BSI).

This edition 2.1 incorporates Amendment No. 1 (November 1991). Side bar indicates modification of the text as the result of incorporation of the amendment.

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.
Indian Standard

ENGINEERING METROLOGY — STRAIGHTEDGES

PART 1 CAST IRON STRAIGHT EDGES (BOW SHAPED OR CAMEL BACK TYPE AND I-SECTION OR PARALLEL TYPE)

(First Revision)

1 SCOPE

1.1 This standard covers the dimensions and requirements for cast iron straightedges of bow shaped or camel back shaped and of I-section or parallel type. Three grades of accuracy are provided for each type, namely Grade 0, Grade 1 and Grade 2.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts for this standard.

<table>
<thead>
<tr>
<th>IS No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>210 : 1978</td>
<td>Grey iron castings (third revision)</td>
</tr>
<tr>
<td>2285 : 1974</td>
<td>Cast iron surface plates (first revision)</td>
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<td>8001 (Part 1) : 1985</td>
<td>Geometrical tolerancing on technical drawings: Part 1 Tolerancing of form, orientation, location and run-out, and appropriate geometrical definitions (first revision)</td>
</tr>
<tr>
<td>12937 : 1990</td>
<td>Engineering metrology — Methods of testing straightness, flatness and perpendicularity</td>
</tr>
</tbody>
</table>

3 NOMENCLATURE AND DEFINITIONS

3.0 The nomenclature indicated in Fig. 1 and 2 has been adopted and the following definitions shall apply.

3.1 Flatness Tolerance


3.2 Perpendicularity Tolerance


4 DIMENSIONS

4.1 The general dimensions of bow shaped or camel back shaped straightedges are given in Table 1.

4.2 The general dimensions of I-section or parallel type straightedges are given in Table 2.

5 MATERIAL

5.1 The straightedges shall be of close-grained cast iron conforming to grade FG 220 of IS 210 : 1978.

NOTE: Higher grades of cast iron are available which would be more resistant to possible mishandling but grade FG 220 is specified for this equipment because it offers the best combination of wear resistance and rigidity.

The material shall be sound and free from blowholes and porosity. Minor defects may, however, be repaired by plugging with material of similar composition to that from which the straightedge is made.

A suitable heat treatment to relieve internal stresses is given in Annex A.

![Diagram of Bow Shaped Straightedge]

**Fig. 1** BOW SHAPED STRAIGHTEDGE
FIG. 2 I-SECTION STRAIGHTEDGE

Table 1 General Dimensions for Bow Shaped or Camel Back Type Straightedges
(Clause 4.1)
All dimensions in millimetres.

<table>
<thead>
<tr>
<th>Length of Straightedge</th>
<th>Minimum Width of Working Surface and Feet</th>
<th>Minimum Overall Depth</th>
<th>Minimum Flange Thickness</th>
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<tr>
<td>L</td>
<td>W</td>
<td>D</td>
<td>t</td>
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<tr>
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</tr>
<tr>
<td>8000</td>
<td>100</td>
<td>800</td>
<td>55</td>
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Table 2 General Dimensions for I-Section or Parallel Type Straightedges
(Clause 4.2)
All dimensions in millimetres.

<table>
<thead>
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<th>Minimum Width of Working Surface and Feet</th>
<th>Minimum Overall Depth</th>
<th>Minimum Flange Thickness</th>
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<td>18</td>
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<tr>
<td>5000</td>
<td>65</td>
<td>350</td>
<td>20</td>
</tr>
</tbody>
</table>
6 LENGTH OF STRAIGHT EDGES

6.1 The recommended lengths of straightedges are as follows:

- Bow Shaped: 300, 500, 800, 1000, 1600, 2000, 4000, 5000, 6000 and 8000 mm
- I-Section: 300, 500, 800, 1000, 1600, 2000, 3000, 4000 and 5000 mm

Straightedges of intermediate lengths should be ordered only when it is not practicable to adopt one of the recommended lengths. Such straightedges shall conform to the same tolerance as those given for the next shorter recommended length.

7 GENERAL FEATURES

7.1 Bow Shaped

The general design of the straightedge is left to the manufacturer. Provision shall be made for two feet (see Fig. 1) of the same width as the working surface and so located as to allow the straightedge to be used in the position shown in Fig. 3.

- Position A — Resting upon the feet,
- Position B — With the working surface downward, and
- Position C — Lying on either side.

In any of these positions the accuracy of the straightedge as specified in 7 to 10 shall be maintained.

The feet shall be designed in the form shown in Fig. 4, one foot having two supporting surfaces comprising not more than the two outer thirds of the foot and the other having one supporting surface comprising not more than the middle third of the foot.

For supporting in position B of Fig. 3, two or three equal and parallel blocks providing localized support may be used, disposed as shown in Fig. 5.

**NOTE:** Failure to support the straightedge in the manner shown in Fig. 5 may cause it to bend or distort over its width.

---

**FIG. 3** FOR USE OF STRAIGHT EDGES POSITIONS

**FIG. 4** DESIGN OF SUPPORTING FEET
7.2 I-Section

The general design of the straightedge is left to the manufacturer (see 3.1) but the two working surfaces shall have the same width and the rigidity shall be such that when the straightedge is supported on either working surface in the manner shown in Fig. 5 at the points indicated by the engraved arrows, or lying on either of its side faces, the working surfaces shall conform to the tolerances given in 7 to 10.

NOTE - Failure to support the straightedge in the manner shown in Fig. 5 may cause it to bend or distort over its width.

Arrows, together with the word SUPPORT, shall be engraved on the side faces to indicate the points at which the straightedge should be supported to ensure minimum deflection under its own weight. These arrows are placed two-ninths of the length of the straightedge from each end (see Fig. 2).

8 FINISH AND BEARING AREA

8.1 The working surfaces and supporting feet of Grade 0 and 1 straightedges shall be finished by scraping or any other process which produces a similar type of surface to that obtained by scraping.

The working surfaces of Grade 2 straightedges and the side faces of all straightedges, shall be finished by similar processes or by smooth machining.

8.1.1 The proportion of bearing area of the working surface shall be not less than 20 percent for Grades 0 and 1 straightedges and not less than 10 percent for Grade 2 straightedges. High spots shall be uniformly distributed and the percentage of bearing area should not be so high as to cause wrinkling.

NOTE - Recommended method of testing bearing area applicable to straightedges with scraped surfaces is given in Annex B.

All sharp edges shall be removed.

All unmachined parts shall be painted.

9 TOLERANCE ON FLATNESS OF WORKING SURFACES AND PARALLELISM TOLERANCE

9.1 Tolerance shall be as given in Table 3.

9.2 Testing shall be carried out as per IS 12937:1990.

10 FLATNESS OF SIDE FACES

10.1 Any 300 mm length of each side face of a Grade 0 and 1 straightedge shall be flat to within 0.025 mm and any 300 mm length of each side face of a Grade 2 straightedge shall be flat to within 0.05 mm.

The maximum tolerance on flatness over the whole length of straightedges up to and including 4000 mm shall be 0.05 mm for Grades 0 and 1 and 0.1 mm for Grade 2; for longer straightedges, these tolerances shall be doubled for all grades.

11 SQUARENESS OF WORKING SURFACE AND SIDE FACES

When a straightedge is laid on its side on a Grade 1 surface plate conforming to IS 2285:1974, the working surface shall be square to the surface plate to within 0.008 mm per 25 mm for Grades 0 and 1 straightedges and 0.015 mm per 25 mm for Grade 2 straightedges (see also Fig. 3).

NOTE - If squareness of the individual side faces adjacent to working surfaces is required, the purchaser should specify the accuracy.

11.1 Error in Parallelism of Side Faces

The error in parallelism of the side faces shall not exceed 0.03 mm per 300 mm and 0.06 mm over the whole length on Grades 0 and 1 straightedges and 0.06 mm per 300 mm and 0.12 mm over the whole length on Grade 2 straightedges.
### Table 3  Tolerance on Flatness of Working Surfaces and Parallelism Tolerance

(Clauses 9.1)

All dimensions in millimetres.

<table>
<thead>
<tr>
<th>Length of Straightedge</th>
<th>Flatness Tolerance</th>
<th>Parallelism Tolerance</th>
</tr>
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</tbody>
</table>

**NOTE**  These tolerances apply to the straightedge supported in any of the three positions as specified in 6.

---

### 12 DESIGNATION

12.1 The straightedges shall be designated by the following:

a) Size, type and grade; and

b) Number of this standard.

*Example:*

An I-section or parallel type straightedge of 1000 mm length and Grade 1 shall be designated as:

1 SECTION STRAIGHTEDGE: 1 000 — 1 IS 5268 (Part 1)

### 13 MARKING

13.1 Each straightedge shall be legibly and permanently marked with the following particulars:

a) Indication of the source of manufacture;

b) Size, type and grade;

c) An identification number (serial number); and

d) The year of manufacture.

### 13.2 Standard Marking

Details available with the Bureau of Indian Standards.

### 14 PACKING

14.1 All finished surfaces of the straightedges shall be protected against climatic conditions by a suitable protective coating. Each straightedge shall be supplied in a protective cover.
ANNEX A
(Clause 5.1)

RECOMMENDED METHOD OF HEAT TREATMENT

A-1 The appropriate treatment for the dimensional stabilization by stress relieving of straightedges made from plain cast iron is as follows.

A-1.1 The straightedges, after being rough machined and fully fettled, should be placed in an annealing furnace and heated slowly at about 100°C/h to a temperature of 510°C to 560°C maximum, and be maintained at this temperature for a long period (25 h for best results). The casting must be protected from the direct heat of the flames by means of suitable baffle plates and the heating should be as uniform as possible throughout. Also the casting should be supported in the furnace on the points on which it will subsequently stand in service. The castings should be allowed to cool in furnace slowly up to 100°C by keeping the furnace doors and dampers closed and subsequent cooling is done by opening the doors and dampers.

A-1.2 For small castings, more uniform heating may be achieved by packing the castings in iron fillings in boxes. Rigorous control of the cooling rate must be exercised. The furnace should be fired down at a rate not exceeding 5°C/h down to 100°C before opening the furnace and allowing it to cool naturally.

ANNEX B
(Clause 8.1.1)

METHODS OF TESTING BEARING AREA

B-1 DETERMINATION OF THE PROPORTION OF BEARING AREA

B-1.1 In order to determine the proportion of the bearing area of a scraped cast iron straightedge, its surface is first blued and rubbed with a small surface plate so that the small bearing areas are brought up clearly into view. A small glass plate (these glass plates can readily be produced like lantern slides by photographing a chart drawn on paper) on which a rectangle 50 mm x 25 mm has been ruled into small rectangles 5 mm x 2.5 mm (the exact size of the rectangles is unimportant provided that they are all of the same size) is then placed upon the surface. Each small rectangle is then observed in turn and a note made of the estimated fraction of its area in tenths which is occupied by a ‘high spot’ on the surface underneath.

B-1.2 The addition of all these fractions gives the percentage of the bearing area of the surface over the region tested. The test can be repeated at other positions on the surface in order to obtain a fair average figure.

B-1.3 It may be mentioned that after testing a few surfaces by this method, the results obtained, coupled with the general appearance of the bearing areas, enable a fairly close estimate to be made of the proportion of bearing area of a surface merely from its general appearance.
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Amendments Issued Since Publication

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