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.

IS 8081 (1976): slotted sections [CED 7: Structural Engineering and structural sections]
Indian Standard

SPECIFICATION FOR SLOTTED SECTIONS

(Third Reprint SEPTEMBER 1998)

UDC 669-423-45

© Copyright 1976

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110 002

Gr 4 September 1976
Indian Standard

SPECIFICATION FOR
SLOTTED SECTIONS

Structural Engineering Sectional Committee, SMBDC 7

Chairman
Director Standards (Civil)

Members
Shri L. N. Agrawal
Shri M. M. Murarka (Alternate)
Shri A. K. Banerjee
Shri S. Sankaran (Alternate)
Shri P. C. Bhamn
Shri A. S. Bhattacharjee (Alternate)
Shri V. S. Bhargava
Deputy Director (Gatps & Design) (Alternate)

Representing
Ministry of Railways

Industrial Fasteners Association of India, Calcutta
Metallurgical and Engineering Consultants (India) Ltd, Ranchi
Ministry of Shipping & Transport, Department of Transport (Road Wing)
Central Water Commission, New Delhi
Government of West Bengal
Central Mechanical Engineering Research Institute (CSIR), Durgapur
Indian Institute of Technology, Kanpur
Bombay Municipal Corporation, Bombay

Dr. P. N. Chatterjee

M. N. Dastur & Co Pvt Ltd, Calcutta
Irrigation & Power Department, Government of Maharashtra, Bombay

Central Electricity Authority, New Delhi

Central Public Works Department, New Delhi

Shri P. V. N. Iyengar (Alternate)

Shri A. G. Gonsalves
Shri A. S. Bose (Alternate)
Shri G. S. Iyer
Shri S. M. Gulater (Alternate)

(C) Copyright 1976

BUREAU OF INDIAN STANDARDS

This publication is protected under the Indian Copyright Act (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under this Act.
### Members

<table>
<thead>
<tr>
<th>Representing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution of Engineers (India), Calcutta</td>
</tr>
<tr>
<td>Ministry of Railways</td>
</tr>
<tr>
<td>Electrical Manufacturing Co Ltd, Calcutta</td>
</tr>
<tr>
<td>Engineer-in-Chief's Branch, Army Headquarters, New Delhi</td>
</tr>
<tr>
<td>Jesop &amp; Co Ltd, Calcutta</td>
</tr>
<tr>
<td>Indian Institute of Technology, Kharagpur</td>
</tr>
<tr>
<td>Mantons (Bangalore) Pvt Ltd, Bangalore</td>
</tr>
<tr>
<td>National Buildings Organisation, New Delhi</td>
</tr>
<tr>
<td>Hindustan Steel Ltd, Durgapur</td>
</tr>
<tr>
<td>Braithwaite &amp; Co (India) Ltd, Calcutta</td>
</tr>
<tr>
<td>Structural Engineering Research Centre (CSIR), Roorkee</td>
</tr>
<tr>
<td>Indian Roads Congress, New Delhi</td>
</tr>
<tr>
<td>Burh &amp; Co Ltd, Howrah</td>
</tr>
<tr>
<td>Public Works Department, Government of West Bengal, Calcutta</td>
</tr>
<tr>
<td>Richardson &amp; Cruxa Ltd, Bombay</td>
</tr>
<tr>
<td>Jadavpur University, Calcutta</td>
</tr>
<tr>
<td>Government of Tamil Nadu, Madras</td>
</tr>
<tr>
<td>Bombay Port Trust, Bombay</td>
</tr>
<tr>
<td>Bharat Heavy Electricals Ltd, Trichyrapalli</td>
</tr>
<tr>
<td>Inspection Wing, Directorate General of Supplies &amp; Disposals (Ministry of Industry &amp; Civil Supplies)</td>
</tr>
<tr>
<td>Engineers India Ltd, New Delhi</td>
</tr>
<tr>
<td>Director General, ISI (Ex-officio Member)</td>
</tr>
</tbody>
</table>

### Secretary

Shri S. S. Sethi
Assistant Director (Struc & Met), ISI

(Continued on Page 13)
AMENDMENT NO. 1  DECEMBER 1979

TO

IS:8081-1976 SPECIFICATION FOR SLOTTED SECTIONS

Alterations

(Page 4, clause 2.1) - Substitute the following for the existing clause:

'2.1 Slotted Section— A structural member cold formed from a metal strip, extrusion (in case of aluminium only) generally of angle, channel, flat and tee sections. These sections have a repetitive pattern of perforation and are fastened together by bolts/screws and nuts. The shape of the perforations should be continuous curve free of a corner or a notch.'

(Page 5, clause 5.4, line 3) - Delete the words 'shall be given as even finish'.

(Page 9, clause 6.6.3.1, line 1) - Substitute 'shall' for 'will'.
FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 14 May 1976, after the draft finalized by the Structural Engineering Sectional Committee had been approved by the Structural and Metals Division Council and Civil Engineering Division Council.

0.2 Slotted sections have come into use to a large extent because of their ease in erection, dismantling and re-erection and facility in transport. They have been used successfully in a number of applications like:

a) single and multi-tier storage equipment;

b) light framed structures;

c) material handling equipment;

d) partitioning;

e) display equipment;

f) access equipment;

g) walkways and platforms; and

h) suspended ceiling, etc.

0.3 This standard has been prepared to guide the industries in the manufacture and use of slotted sections.

0.4 Some design considerations have also been incorporated to facilitate the design of structures with slotted sections.

0.5 This standard keeps in view the manufacturing and trade practices being followed in the country in this field.

0.6 In the formulation of this standard, assistance has been derived from BS 4345: 1968 'Specification for slotted angles' issued by British Standards Institution.

0.7 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, shall be rounded off in accordance with IS: 2-1960. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (rounded).
IS: 8081-1976

1. SCOPE

1.1 This standard covers the requirements, such as materials, workmanship, finish, strength tests, general design provisions, tolerances on dimensions and marking for slotted sections.

1.2 This standard does not apply to steel sections used for the fabrication of metal shelving cabinet (adjustable type) and metal shelving racks (adjustable type) which are covered by IS: 3312-1974* and IS: 1883-1975† respectively.

2. DEFINITION

2.1 Slotted Section — A structural member cold formed from a metal strip, extrusion generally of angle, channel, flat and tee sections. These sections have a repetitive pattern of perforation and are fastened together by bolts/screws and nuts. The shape of the perforations should be continuous curve free of a corner or a notch.

3. MATERIALS

3.1 Steel — Steel for the manufacture of slotted sections shall conform to any one of the grades shown in Table 1.

<table>
<thead>
<tr>
<th>Steel Conforming To</th>
<th>Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>IS: 513-1973*</td>
<td>O, D, DD, EDD</td>
</tr>
<tr>
<td>IS: 1079-1973†</td>
<td>O, D, DD, EDD</td>
</tr>
<tr>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>IS: 4030-1973‡</td>
<td>St 34, St 42, St 50, St 52, Half hard, Quarter hard</td>
</tr>
</tbody>
</table>

*Specification for cold rolled carbon steel sheets (second revision).
†Specification for hot rolled carbon steel sheet and strip (third revision).
‡Specification for cold rolled carbon steel strip for general engineering purposes (first revision).

3.2 Aluminium — Aluminium for slotted sections shall conform to IS: 733-1975§ or IS: 737-1974§ as appropriate.

*Specification for steel shelving cabinets (adjustable type) (first revision).
†Specification for metal shelving racks (adjustable type) (second revision).
‡Specification for wrought aluminium and aluminium alloy bars, rods and sections (for general engineering purposes) (second revision).
§Wrought aluminium and aluminium alloys, sheet and strip (for general engineering purposes) (second revision).
3.3 Quality of Material — One tensile test and one bend test shall be conducted according to the procedure specified in IS:1663-1972* (IS: 1916-1961† for aluminium) and IS 1692-1974‡ (IS: 4598-1968§ for aluminium) for each lot of material from which the sections are formed.

3.3.1 These tests may be carried out on the strip supplied by the steel/aluminium supplying mill or by the manufacturer of slotted sections, at the stage immediately prior to punching and forming.

4. WORKMANSHIP

4.1 Sections shall be supplied free from all burrs.

5. FINISHES

5.1 The manufacturer shall state the finish applied.

5.2 Before any paint finish is applied, all surfaces shall be free from scale, grease, rust or other surface imperfections. A coat of anti-rust treatment shall be applied before painting the steel surfaces.

5.3 If galvanizing is carried out, it shall comply with IS:4759-1966*. Anodizing of aluminium sections, if required, shall comply with IS:1868-1968†.

5.4 All finishes shall cover evenly all exposed surfaces, including punched edges (this applies only to standard lengths of sections and not to sections cut after finishing) shall be given as even finish.

6. METHODS OF TEST FOR STRENGTH OF SLOTTED SECTIONS

6.1 General

6.1.1 Tests shall be carried out by the manufacturer according to the provisions contained in this standard. These tests shall be proved and authorized by an independent authority.

6.1.2 All sections shall be tested in the manner described in this specification. Further tests may be specified for applications not covered in this standard. For these tests, conditions of loading shall be representative of those applying in practice. The requirements specified in 6.1.3 and 6.1.4 shall be complied with.

*Method for tensile testing of steel sheet and strip of thickness 0.5 mm to 3 mm (first revision).
†Method for tensile test for light metal and their alloys.
‡Method of simple bend testing of steel sheet and strip less than 3 mm thick (first revision).
§Method for simple bend test for aluminium and aluminium alloy sheet and strip of thickness between 0.2 mm and 7 mm.
•Specification for hot-dip zinc coatings on structural steel and other allied products.
+Specification for anodic coatings on aluminium (first revision).
6.1.3 Evaluation of test results shall be made on the basis of the mean value obtained from not less than three identical specimens, provided the deviation of any individual test results from the mean value does not exceed ±10 percent. If such deviation from the mean value does exceed 10 percent, at least three more tests of the same kind shall be made. The average of the three lowest values of all tests made shall then be regarded as the result of the series of tests.

6.1.4 To determine the minimum yield stress (0.2 percent proof stress in case of aluminium section) of the test pieces, a coupon shall be cut from a section, produced from the same strip as the specimens and shall be loaded in tension in accordance with IS: 1663-1972* (IS: 1816-1961† for aluminium). Failure loads as determined in 6.1.3 shall be reduced in the following ratio:

Minimum yield stress of material (minimum 0.2% proof stress in case of aluminium sections)

Yield stress of test piece (0.2% proof stress in case of aluminium sections)

In no case shall this ratio be greater than one. Any results obtained from test pieces with a yield stress (0.2 percent proof stress in case of aluminium section) lower than the specified minimum shall be ignored.

Note — For the purpose of this standard the minimum yield stress of material (other than aluminium sections) shall be taken as given in Table 2.

**TABLE 2 MINIMUM YIELD STRESS VALUES FOR STEELS TO BE USED FOR MANUFACTURE OF SLOTTED SECTIONS**

<table>
<thead>
<tr>
<th>Steel Conforming To</th>
<th>Grade</th>
<th>Minimum Yield Stress in N/mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS: 513-1973*</td>
<td>O, D, DD, EDD</td>
<td>140</td>
</tr>
<tr>
<td>IS: 1079-1973†</td>
<td>O, D, DD, EDD</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>St 34</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td>St 42</td>
<td>235</td>
</tr>
<tr>
<td></td>
<td>St 50</td>
<td>295</td>
</tr>
<tr>
<td></td>
<td>St 52</td>
<td>355</td>
</tr>
<tr>
<td>IS: 4030-1973‡</td>
<td>Half hard</td>
<td>370</td>
</tr>
<tr>
<td></td>
<td>Quarter hard</td>
<td>245</td>
</tr>
</tbody>
</table>

*Specification for cold rolled carbon steel sheets (second revision).
†Specification for hot rolled carbon steel sheet and strip (third revision).
‡Specification for cold rolled carbon steel strip for general engineering purposes (first revision).

---

*Method for tensile testing of steel sheet and strip of thickness 0.5 mm to 3 mm (first revision).
†Method for tensile test for light metals and their alloys.
6.1.5 The pattern and pitch of stitching bolts in tests on compound sections shall be specified by the manufacturer and shall conform to his normal constructional practice.

6.2 Compression Test — Struts shall be tested to failure in two ways as given below:

a) Concentrically Loaded — The struts shall be ball loaded at each end through the calculated centre of area of the minimum net cross section.

Ball seatings shall be such as to offer no torsional or rotational resistance to the ends of the member. The thickness of ball seatings shall be a minimum. The length of the member shall be taken to the centre of the balls.

b) Eccentrically Loaded — The line of load shall coincide with the centre line of a specified line of holes. The end of the member shall be free to rotate about one axis and restrained at right angles to it (see Fig. 1).

---

**Fig. 1 End Conditions for Eccentric Strut Test**
(Other End Similar)
6.3 **Bending Tests** — Beams shall be supported at each end with the manufacturer's specified bolt pattern (the bolts may have to be high tensile in order to avoid being sheared). The effective span of the beam shall be taken centre-to-centre of the bolt group. Loading shall be point loads applied at one-third points of the effective span. Loading shall be through balls centred over the flanges of sections as shown in Fig. 2 and be such as to offer no restraint to torsion, lateral buckling or other deformation of the section. The deflection of the point marked A at the centre of the beam shall be measured. Loading shall be to failure. Load deflection graphs shall be plotted (see Fig. 3), and the flexural rigidity of the section (based on the effective span) calculated. Where the load deflection curve is not straight, a secant value for flexural rigidity may be taken to whatever value of deflection is considered limiting for general design. Based on the moments of resistance and flexural rigidity measured in the point load test, loads and deflections may be calculated for any other system of loading.

![Fig. 2 Method of Support and Load Application in Bending Tests](image)

6.4 **Tension Tests** — Tensile strengths of members shall be determined under both concentric and eccentric conditions of loadings. Eccentric ties shall be loaded through one flange only, the line of load coinciding with a specified line of holes.

6.5 **Bearing Test** — Bearing strength of section shall be determined for the different sized bolts to be used with the sections.

6.6 **Presentation of Test Results**

6.6.1 The report of the independent supervising engineer shall quote all conditions of test, failure loads of specimens and yield stresses (0.2 percent proof stress in case of aluminium sections) of specimen material.
6.6.2 Technical data sheets giving safe working loads for design purposes shall state clearly the applicability and limitations of all information including minimum factor of safety on collapse. Information should be given on the design and construction of connections so that these can be effected in such a way that the conditions of loading on a section in practice are similar to, or less severe than, the conditions imposed in the tests. Design strengths shall be given for:

a) concentrically loaded struts with an effective length factor of one,

b) simply supported beams carrying a uniformly distributed load in accordance with 7.3,

c) concentrically loaded ties, and

d) bearing strength.

Any other information based on test procedures described in 6.1.3 and 6.1.4, which the manufacturer may consider relevant shall be given.

6.6.2.1 The manufacturer will be responsible for the values of safe working loads for design purposes and other information furnished by him.
6.6.3 Design strength should be quoted for not more than increments of 30 cm length. Design strengths in 6.6.2 (a), (b) and (c) shall be obtained from tests specified in 6.2, 6.3 and 6.4 respectively. Any additional information if required shall be supplied by the manufacturer regarding the tests prescribed in 6.2, 6.3 and 6.4.

6.6.4 The safe load values shall be certified as having been obtained from tests in accordance with the relevant clauses of this standard and adjusted for the minimum specified yield stress (0.2 percent of proof stress in case of aluminum section) for the material. The certificate shall be signed by an independent qualified engineer supervising the tests.

7. GENERAL DESIGN PROVISIONS

7.1 Permissible Loads and Factors of Safety — For design purpose the safe working loads shall be obtained by dividing failure load value (based on the procedure described in 6.1.3 and 6.1.4) by the minimum factor of safety as given below:

Steel Conforming to                      Factor of Safety

<table>
<thead>
<tr>
<th>Steel</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IS : 513-1973* and IS : 1079-1973†</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>(IS : 733-1975‡ and IS : 737-1974§)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for aluminium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS : 4030-1973‖</td>
<td>1.85</td>
<td></td>
</tr>
</tbody>
</table>

7.1.1 For permissible stresses in aluminum alloys, reference may be made to IS : 8147¶.

7.2 Limiting Beam Deflection — The deflection of member shall not be such as to impair the strength or efficiency of the structure or lead to damage. Generally the deflection should not exceed 1/180 of the span.

7.3 The safe load values for beams shall be determined as given in 7.1 and 7.2. The lesser of the two values shall be specified as safe working load for beams. However, in case of loads which are determined purely on the basis of the deflection, this value should be given in different colour or

---

*Specification for cold rolled carbon steel sheets (second revision).
†Specification for hot rolled carbon steel sheet and strip (third revision).
‡Specification for wrought aluminium and aluminium alloy bars, rods and sections (for general engineering purposes) (second revision).
§Specification for wrought aluminium and aluminium alloys, sheet and strip (for general engineering purposes) (second revision).
‖Specification for cold rolled carbon steel strip for general engineering purposes (first revision).
different type of print. In no case shall the design loads exceed the safe working load limits.

8. TOLERANCES ON DIMENSIONS

8.0 Tolerances on dimensions shall be as given in 8.1 to 8.9.

8.1 Flange Sectional Dimensions — The tolerances on sum of the dimensions of all flanges shall not exceed the following:

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>Tolerance percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over Up to and Including mm</td>
<td>mm</td>
</tr>
<tr>
<td>40</td>
<td>±5</td>
</tr>
<tr>
<td>50</td>
<td>±4</td>
</tr>
<tr>
<td>75</td>
<td>±3</td>
</tr>
</tbody>
</table>

8.2 Flange Thickness — The tolerances on the thickness of the section, for three grades of steel and for aluminium section shall conform to the respective specification as appropriate.

8.3 Internal Radius of Bend — The internal radius of bend shall be not less than the thickness, and shall have a tolerance of 1·00 mm on the nominal radius.

8.4 Angle of Bend — The angle of bend shall be ±2° throughout the width of the flange.

8.5 Size of Holes — The tolerance on size of holes shall be ±0·1 mm.

8.6 Pitch of Holes — The deviation in the pitch of holes shall be ±0·1 mm.

8.7 Overall Length

8.7.1 Standard Length — The tolerance on standard lengths shall be ±1·6 mm.

8.7.2 Overall Centre-to-Centre of End Holes — The tolerance on overall centre-to-centre of end holes shall be ±1·6 mm.

8.8 Straightness — The offset shall not be more than 1/600 of the length.

8.9 Twist of Section — The twist of section shall not be more than 40 minutes of angle per metre.
9. BOLTS AND NUTS

9.1 Bolts or screws and nuts used in conjunction with slotted section shall generally be of hexagonal type. The detail specification of fastening may be mutually decided between manufacturer and the purchaser.

10. MARKING

10.1 The slotted sections shall be marked with manufacturer’s identification at suitable intervals not exceeding 300 mm. The cutting mark may be provided at appropriate intervals not exceeding 100 mm.

10.1.1 The product may also be marked with Standard mark.

10.2 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.
Panel for Slotted Sections, SMBDC 7 : P 28

Consumer

LT-COL I. B. GOEL

Members

MAJ A. THOMAS (Alternate to
Lt-Col I. B. Goel)

Assistant Director (Standards)
(B & S)-I

SHRI S. N. BASU

SHRI E. D. D'SILVA

SHRI S. M. BILGRAM (Alternate)

DR P. A. JOSHI

DR M. P. KAPOOR

SHRI MAHESH NEVATIA

SHRI V. P. VIG (Alternate)

SHRI P. D. SAJNIANI

SHRI M. SADIQ (Alternate)

Representing

Ministry of Defence, New Delhi

Research Designs & Standards Organisation,
Lucknow

Inspection Wing, DGS & D, New Delhi

Kullick Slotted Sections Ltd, Bombay

Godrej & Boyce Mfg Co Pvt Ltd, Bombay

JIT, Kanpur

Vinar Systems Pvt Ltd, Calcutta

Mck Engineering Works, Bombay
BUREAU OF INDIAN STANDARDS

Headquarters
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones. 323 0131, 323 3375, 323 9402
Fax 91 11 3234062, 91 11 3239389, 91 11 3239382

Central Laboratory
Plot No 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010

Regional Offices:
Central Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Eastern 1/14 CIT Scheme VII M, V I P Road, Maniktola, CALCUTTA 700054
Northern SCO 335-336, Sector 34-A, CHANDIGARH 160022
Southern CIT Campus, IV Cross Road, CHENNAI 600113
Western Manakalaya, E9, Behind Marol Telephone Exchange, Andheri (East), MUMBAI 400093

Branch Offices:
'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001
Peenya Industrial Area, 1st Stage, Bangalore-Turnkur Road, BANGALORE 560058
Gangotri Complex, 5th Floor, Bhadbhada Road, T T Nagar, BHOPAL 462003
Plot No. 62-63, Unit VI, Ganga Nagar, BHUBANESHWAR 751001
Kalakathir Buildings, 670 Avinashi Road, COIMBATORE 641037
Plot No. 43, Sector 15 A, Mathura Road, FARIDABAD 121001
Savitri Complex, 116 G T. Road, GHAZIABAD 201001
53/5 Ward No 29, R G Barua Road, 5th By-lane, GUWAHATI 781003
5-5-56C, L N Gupta Marg, Nampally Station Road, HYDERABAD 500001
E-52, Chitaranjan Marg, C-Scheme, JAIPUR 302001
117/418 B, Sarvodaya Nagar, KANPUR 208005
Seth Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road, LUCKNOW 226001
NIT Building, Second Floor, Gokulpatt Market, NAGPUR 440010
Pattiputra Industrial Estate, PATNA 800013
Institution of Engineers (India) Building 1332 ShivaNagar, PUNE 411005
T.C No 14/1421, University P O Palayam, THIRUVANANTHAPURAM 695034

Sales Office is at 5 Chowringhee Approach, P.O Prinsep Street, CALCUTTA 700072
Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007
Sales Office is at 'F' Block, Unity Building Narashimarahaj Square, BANGALORE 560002

Printed at Pratograph New Delhi, Ph