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SRI LANKA STANDARD 307 : 1974

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SPECIFICATION FOR SLOTTED SECTIONS

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BUREAU OF CEYLON STANDARDS

SPECIFICATION FOR SLOTTED SECTIONS

S. L. S. 307 : 1974

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Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This Standard does not purport to include all the necessary provisions of a contract.

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SRI LANKA STANDARD SPECIFICATION FOR SLOTTED SECTIONS

FOREWORD

This Sri Lanka Standard was prepared by the Drafting Committee on Slotted Sections. It was approved by the Mechanical Engineering Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on 31st October 1974.

Easiness in welding and rivetting, quickness in construction, make the slotted sections economically feasible in industry. They are used in a number of different structures such as:

Single and multi-trier storage equipment
Light framed structures
Materials handling equipment
Partitioning
Building structures, etc.
Display equipment
Access equipment
Walkways and platforms
Suspended ceilings

All standard values given in this specification are in SI units. However, the equivalent imperial units are given for guidance. These equivalents have been calculated in accordance with C. S. 116 - Ceylon Standard on Principles of Conversion.

For the purpose of deciding whether a particular requirement is complied with, the final value observed or calculated expressing the result of a test or observation shall be rounded off in accordance with C. S. 102 - Ceylon Standard on Presentation of Numerical Values. The number of figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

In the preparation of this standard the valuable assistance derived from British Standard Institution is acknowledged.

1. SCOPE

This standard covers the specifications for materials and strength requirements of slotted sections.

2. TERMINOLOGY

2.1 **Slotted section** - For the purpose of this standard a slotted section is defined as a structural material made from cold-formed metal strip, generally of the following sections.

Angle, Channel, flat, tee.

These sections have a repetitive pattern of perforations to be fastened by bolts.

3. REQUIREMENTS

3.1 **Materials** - Steel strip used for slotted sections shall satisfy the following requirements.

(a) Chemical Composition

C - Percent by mass - 0.12 (max)
Mn - Percent by mass - 0.50 (max)
S - Percent by mass - 0.050 (max)
P - Percent by mass - 0.050 (max)

(b) Tempers available for strips upto and including 2 mm (0.08 in) thick are as given in Table 1. For materials over 2 mm (0.08 in) thick the mechanical properties shall be as agreed between the manufacturer and the purchaser.

TABLE 1

Range of tempers and mechanical properties of cold rolled steel strip

*Range of tempers	Vickers hardness number HV		* Tensile Strength				** Bend test	
			MPa		(tonf/in²)		Angle of bend	Radius
	Min	Max	Min	Max	Min	Max		
Hard	165	—	540	—	35.0	—	—	—
Half hard	135	165	415	540	26.9	35.0	90°	R = 1T
Quarter hard	110	135	355	415	23.0	26.9	90°	R = 1T
Skin-passed	—	115	275	370	17.8	24.0	180°	Flat
Annealed	—	105	275	355	17.8	23.0	180°	Flat

R = Internal radius of bend; T = Thickness of strip and axis of bend at right angles to the direction of rolling.

*[Hard - Produced by heavy cold rolling.

(Half hard) Produced by cold rolling, annealing and further cold rolling (Quarter hard) to give strip of intermediate hardness value.

Skin passed - Produced by light cold rolling after annealing.
Annealed - Produced by a final annealing process.]

3.2 Quality of the material – One tensile test in accordance with *C. S. 91 and one bend test in accordance with **C. S. 93 shall be carried out for each 15 metric ton (14.8 tons) of material from which the sections are formed. These tests may be carried out by the steel supplying mill or the slotted sections manufacturer, at the stage immediately prior to purchasing and forming.

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*C. S. 91 – Ceylon Standard Method for Tensile Testing of Steel Sheet and Strip.

**C. S. 93 – Ceylon Standard Method for Bend Testing of Steel Sheet and Strip.

Note 1:- When tested according to C. S. 93 bend test, the test piece is considered to pass the test if the convex surface is free from cracks.

4. WORKMANSHIP AND FINISHES

4.1 All sections shall be free from burrs.

4.2 Before any paint is applied, all surfaces shall be free from grease, rust or other surface imperfections.

4.3 Manufacturer shall state the finish applied.

4.4 All finishes shall cover evenly all exposed surfaces, including punched edges. (This applies only to standard lengths and angles not to sections cut after finishing).

5. METHODS OF TEST FOR STRENGTH OF SLOTTED SECTIONS

5.1 General

5.1.1 All tests shall be carried out in the manner described in this clause. Further tests may be specified for applications not covered here. For these tests, conditions of loading shall be respectively of these applying in practice. The requirements specified in 5.1.3 and 5.1 4 shall be complied with.

5.1.2 Evaluation of test results shall be made on the basis of the mean value obtained from not fewer than three identical specimens, provided the deviation of any individual test result from the mean value does not exceed ± 10%. If such deviation from the mean does exceed 10%, 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.

5.1.3 To determine the 0.2% proof stress of the test pieces, a coupon shall be cut from a section produced from the strip as the specimens and shall be loaded in tension according with C. S. 91. Failure loads as determined in 5.1.2 shall be reduced in the following ratio.

$$\frac{\text{minimum } 0.2\% \text{ proof stress of material}}{0.2\% \text{ proof stress of test piece}}$$

5.1.4 The pattern and pitch of stiching bolts in tests on compound sections shall be specified by the manufacturer and shall conform to his normal constructional practice.

5.2 **Compression tests –** Struts shall be tested to failure in two ways

(1) **Concentrically loaded–** The struts shall be ball loaded at each end through the calculated centre of area of the minimum nett 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.

(2) **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).

5.3 **Bending tests –** Beams shall be simply 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 either the centre or at quarter points of the effective span. Loading sahll be through balls centred over the flanges of section as shown in Fig. 2 and be such as to offer no restrain to torsion, lateral buckling or other deformation of the section.

The defection of the points 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 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.

5.4 **Tension tests** - Tensile strengths of members shall be determined under both concentric and eccentric conditions of loading. Eccentricities shall be loaded through one flange only, the line of load coinciding with a specified line of holes.

5.5 **Bearing tests** - Bearing strengths of sections shall be determined for the difference sized bolts to be used with the sections.

5.6 Presentation of test results

5.6.1 The independent test report shall quote all conditions of test, failure loads of specimens and 0.2% proof stress of specimen material.

5.6.2 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 constructions 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 :

(1) Concentrically loaded struts with an effective length factor or one.

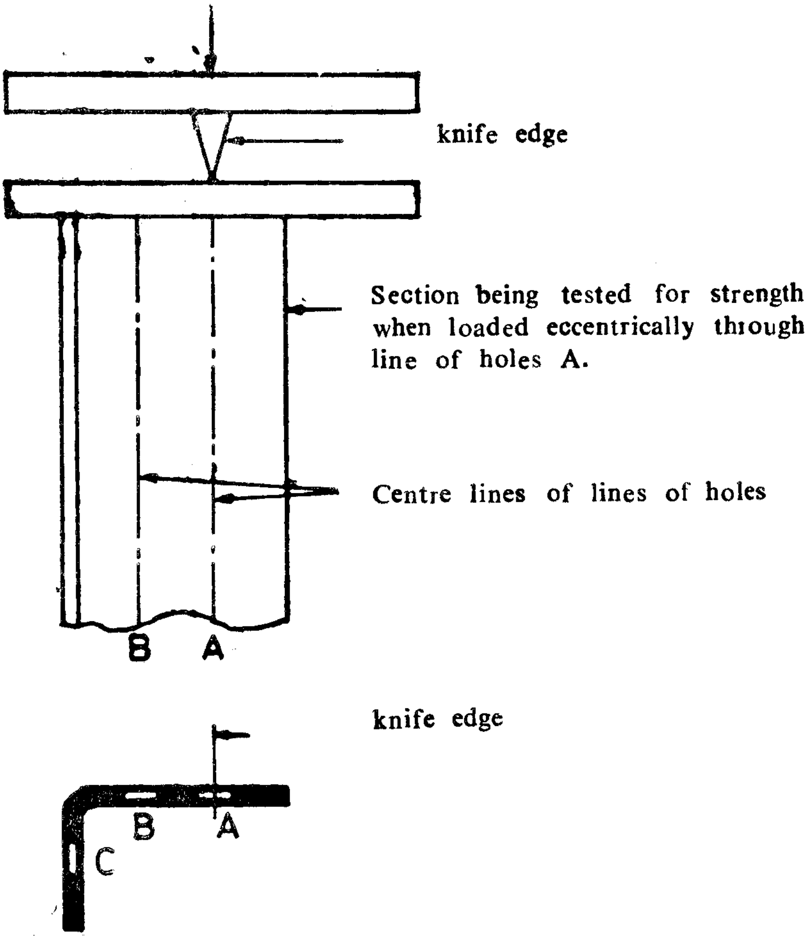


Fig. 1. End conditions for eccentric strut test (other end similar)

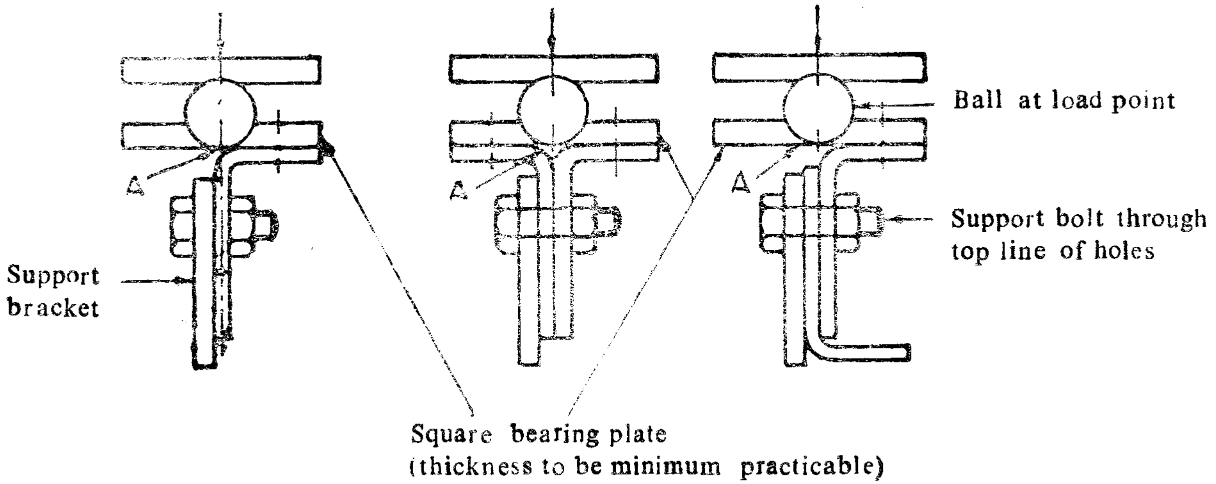
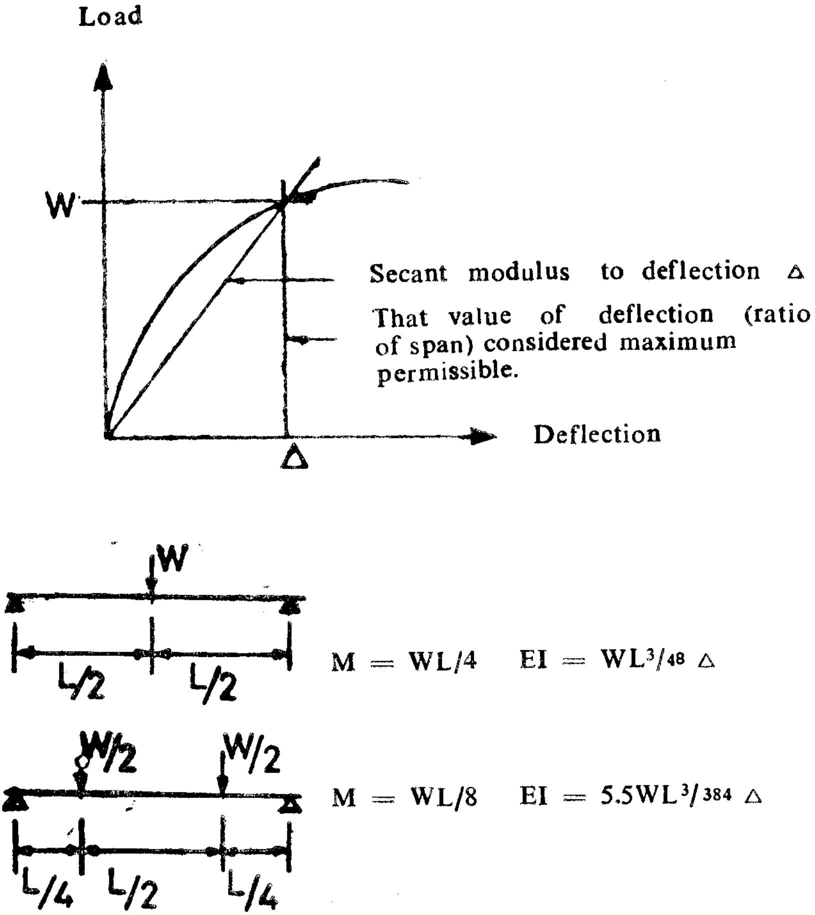


Fig. 2. - Method of support and load application in bending tests.



Secant modulus to deflection Δ

That value of deflection (ratio of span) considered maximum permissible.

$M = WL/4 \quad EI = WL^3/48\,\Delta$

$M = WL/8 \quad EI = 5.5WL^3/384\,\Delta$

Fig. 3 – Typical load/deflection graph from bending test and expressions for bending moment and flexural rigidity.

(2) Simply supported beams carrying a uniformly distributed load.

(3) Concentrically loaded ties.

(4) Bearing strengths.

Any other information, based on test procedures described in 5.1.2 and 5.1 3 which the manufacturer may consider relevant, shall be given.

5.6.3 Design strength should be quoted for not more than 0.3m (0.98 ft.) increments of length. Design strength in 5.6 (1), (2), (3) and (4) shall be obtained from tests specified in 5.2, 5.3, 5.4 and 5.5 respectively.

5.6.4 The strengths shall be certified as having been obtained from tests in accordance with the relevant clauses of this standard and adjusted for the minimum specified 0.2% proof stress for the material.

6. TOLERANCES ON DIMENSIONS

Tolerances on dimensions shall be as follows:

6.1 Flange sectional dimensions – The tolerance on the sum of the dimensions of all flanges shall not exceed the following :

Nominal Size				Tolerance %
Over		upto and including		±
mm	(in)	mm	(in)	
—	—	40	(1.6)	5
40	(1.6)	50	(2.0)	4
50	(2.0)	75	(3.0)	3
75	(3.0)	—	—	2

6.2 Flange thickness - The tolerance on the flange thickness, excluding any protective coating, shall be as follows:

Nominal thickness		
Over mm (in)	upto & including mm (in)	Tolerance mm ±
0.80 (0.031)	1.60 (0.063)	0.05
1.60 (0.063)	3.15 (0.124)	0.06

6.3 Internal radius of bend - The internal radius of bend shall be not less than the thickness, and shall have a tolerance of ± 0.4 mm (0.016 in) on the nominal radius.

6.4 Angle of bend - The angle of bend shall be ± 2° throughout the width of the flanges.

6.5 Size of holes - The size of holes shall be ± 0.04 mm (0.0156 in).

6.6 Pitch of holes - The pitch of holes shall be ± 0.08 mm (0.003 in).

6.7 Overall length

6.7.1 Standard length - The standard length shall be ± 1.6 mm (0.064 in).

6.7.2 Overall centre-to-centre of end holes - The overall centre-to-centre of end holes shall be ± 1.6 mm (0.064 in).

6.8 Straightness - The offset shall be not more than 1/600 of the length.

6.9 Twist of section - The twist of section shall be not more than 39 minutes of angle per metre (12 minutes of angle per foot).

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SRI LANKA STANDARDS INSTITUTION

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All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

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