SLS 1006:Part2 :1993

(Superseding SLS 15:1968)

Sri Lanka Standard

Specification for Steels for Structural and General Engineering Purposes

Part 2: General engineering steels

SRI LANKA STANDARDS INSTITUTION

Draft Sri Lanka Standard

SPECIFICATION FOR STEELS FOR STRUCTURAL AND GENERAL ENGINEERING PURPOSES

Part 2 General engineering steels

FOREWORD

This standard was approved by the Sectoral Committee on Metal and Metal Products and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri lanka Standards Institution on..1993-12-05

The formulation of SLS 874 in Steel products (Part 1 Classification and definitions and Part 2 Identification markings) made it necessary to revise all the exsisting steel standards to bring them in line with the new classification and definitions and international standards published by the International Organization for Standardization.

This standard is issued in three parts as follows:

Part 1 Structural steels
Part 2 General engineering steels
Part 3 High yield strength structural steels for bars and stections.

Part 1 supersedes CS 14 : 1977 Mild steel for general structural purposes and Part 2 supersedes CS 15 : 1968 Mild steel for general engineering purposes.

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 an analysis shall be rounded off in accordance with CS 102. The number of significant places 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 assistance derived from the following publications is gratefully acknowledged.

ISO 1052 : 1982 (E) Steel for general engineering purposes.

1 SCOPE

This standard specifies the requirements of steels intended for general engineering purposes.

NOTES

1. This standard applies to hot rolled steel sheets 3 mm or more in thickness, flats and bars generally used in the delivered state. Typical applications are machine frames, mechanical structures and agricultural machines.

2. Dimensions and tolernces for rolling and cutting are given in the respective product standards.

2 REFERENCES

CS 12 Tensile testing of steel products other than sheet, strip, wire and tube.
CS 13 Bend testing of steel products other than sheet, strip, wire and tube.
CS 102 Presentation of numerical values
SLS 874 Steel products
Part 1 Classification and definitions
Part 2 Identification Markings

3 DEFINITIONS

For the purposes of this standard the following definitions shall apply:

3.1 killed steel : Steel that has been fully deoxidized before casting as distinct from rimmed steel.

3.2 rimmed steel : Low carbon steel in which deoxidation has been controlled to produce an ingot having a rim or skin almost free from carbon and impurities, within which is a core where the impurities are concentrated as a result of gas evolution or a rimming action.

NOTE

For other definitions see SLS 874 Steel products.
Part 1 Clasification and definitions.

4 SYMBOLS

The symbols used in this standard shall have the meanings assigned to them as given below:

t Thickness or diameter of test piece

S_o Area of cross-section of the test piece

R_m Tensile strength

A Percentage elongation after fracture

5 DESIGNATION

Steels shall be designated by the strength grade, (see Table 1)

6 REQUIREMENTS

6.1 Chemical composition

6.1.1 Ladle analysis

The maximum composition limits for phosphorus and sulphur of this analysis carried out on samples taken during casting shall be those given in Column 2 and 4 of Table 1.

6.1.2 Product analysis

The maximum composition limits of phosphorus and sulphur of the product shall be those given in Column 3 and 5 of Table 1.

The product analysis may be requested by the purchaser, in which case it shall be specified in the order.

TABLE 1 Chemical composition of ladle and product analysis

Strength Grade	Phosphorus per cent (max)		Sulphur per cent (max)	
	Ladle	Product	Ladle	Product
(1)	(2)	(3)	(4)	(5)
Fe 490	0.050	0.055	0.050	0.055
Fe 590	0.050	0.055	0.050	0.055
Fe 690	0.050	0.055	0.050	0.055

6.2 Manufacture

Unless otherwise agreed at the time of ordering, the method of manufacture is left to the manufacturer. However, the user shall have the right to be informed of the method on request at the time of delivery.

NOTE

Carbon steel is manufactured in a variety of ways and certain features affect the ingot structure and relative uniformity of composition. The method of deoxidation is of particular importance in this respect and this should be recognized when considering the application of carbon steels.

There are three fundamental conditions of supply which are available within the following broad limits.

a) Killed steel
b) Semi-killed steel
c) Rimmed steel

If any particular type of deoxidation is desired it can be agreed between the manufacturer and the purchaser at the time of order.

6.3 Finish

The products shall have a smooth surface corresponding to the rolling method used; they shall have no surface defects that are prejudicial to their subsequent processing or intended use.

6.3.1 Elimination of defects

Minor defects may be removed by the manufacturer by grinding, provided that the thickness is not reduced locally by more than 7 per cent (with a maximum of 3 mm) in relation to its nominal value.

6.4 Mechanical properties

The steels in the delivery condition shall comply with the mechanical properties specified in Table 2.

For products over 63 mm in thickness, the mechanical properties shall be the subject of an agreement between the manufacturer and the purchaser.

TABLE 2 - Mechanical properties

Strength Grade	Yield strengh (min.) MPa			Tensile strength R_m MPa	A % min (1) ($L_o = 5.65\sqrt{S_o}$)
	$t \leq 16$	$16 < t \leq 40$	$40 < t \leq 63$		
(1)	(2)	(3)	(4)	(5)	(6)
Fe 490	295	285	275	490 to 640	20
Fe 590	335	325	315	590 to 740	15
Fe 690	365	355	345	690 to 840	10

NOTE

1. For transverse test pieces (plates and wide flats of width 600 mm and and over), these values shall be reduced by two points, that is 18, 13 and 8 respectively.

7 MARKING

The product features shall be legibly marked as follows:

a) Manufacture's name or trade mark.
b) Steel grade (code number or material number).
c) Heat number.
d) Form of product and main dimension.
e) Quantity.

NOTES

1.Method and position of marking will depend on the type of product
(see SLS 874 Part 2 Identification markings).
2.Attention is drawn to certification facilities offered by SLSI. See the inside back cover of this standard.

8 METHODS OF TEST

8.1 Selection of test pieces

The tensile test pieces and the bend test pieces shall be selected by the purchaser, or his representative, or the testing authority, either:

i) from shearings or cuttings, or
ii)if so desired, from the material after it has been cut to the sizes required or specified. In this case, the purchaser shall accept the material from which the test pieces have been cut, provided always that the tests have proved satisfactory.

In neither case (i) or (ii) shall the test pieces be detached from the material except in the presence or with the approval of the purchaser or his representative.

8.2 Tensile test

The tensile strength and percentage elongation determined from the appropriate test pieces in accordance with the procedure given in "CS 12 shall be as given in Table 2.

Should a test piece break outside the middle third of its gauge length, and thus result in an elongation below the value specified, the test may, at the option of the manufacturer, be disregarded and another test made from the same material.

8.2.1 Tensile test pieces

The tensile test pieces shall be cut lengthwise or crosswise from plates, and lengthwise from sections and bars. The recommended locations for taking test samples are indicated in Figures 1 to 12.

8.2.1.1 Test samples shall be cut so that deformation is avoided as far as possible.

8.2.1.2 The rolled surface of the steel shall, wherever practicable, be retained on two faces of the test piece, preferably opposite faces. Bars below 25 mm in diameter or thickness shall be tested without machining. Bars having diameter or thickness not exceeding 75 mm may be symmetrically reduced by machining. For bars having diameters or thicknesses exceeding 75 mm the test sample shall be taken from the position shown in Figures 8, 9, 10 and 11.

8.2.1.3 The test pieces shall not be annealed or otherwise heat treated unless the material from which they are cut is to be similarly treated before use in which case the test pieces shall be similarly and simultaneously treated with the material before testing.

Any straightening of test pieces which may be required shall be done cold.

8.2.2 Number of tensile tests

8.2.2.1 Plates, sections and flats

A separate test being made for each class of steel product (namely plates, sections and flats, rolled from a cast.

Where plates, sections or flats of more than one thickness are rolled from the same cast, one additional tensile test shall be made from the material in each class of product for each variation in thickness of 5 mm above or below the thickness of the test piece first selected in such a class if so desired by the purchaser or his representative.

8.2.2.2 Bars

When more than one diameter or thickness of the bar is specified one additional tensile test shall be made for each diameter or thickness of bar ordered if so desired by the purchaser or his representative.

8.2.2.3 Rivet bars

Tensile test shall be made from the finished steel.

8.3 Bend test

The bend test shall be carried as an additional test if so requested by the purchaser.

Bend tests shall be conducted in accordance with CS 13.
For bend tests, except in the case of round bars 25 mm, in diameter and under, the test piece when cold shall without fracture, be doubled over, either by pressure or by blows from a hammer, until the internal radius is not greater than that specified in Table 1 and the sides are parallel.

In the case of round bars, 25 mm in diameter and under, the internal radius of the bend shall be not greater than the diameter of the bar.

For sections having flanges less than 50 mm wide these bend tests may be made on the flattened section.

8.3.1 Bend test pieces

Bend tests of all steel (other than rivet bars) shall be made from test pieces prepared as follows:

Bend test pieces shall be cut lengthwise or crosswise from plates and lengthwise from sections and bars, and when the section permits, shall be not less than 40 mm wide. In cases where the section is less than 40 mm wide, or if the manufacturer so desires, bars shall be bent in the full section of the bar as rolled.

In all bend tests the rough edge or arris caused by cutting may be removed by filing, grinding or machining but the test pieces shall receive no other preparation. The test pieces shall not be annealed, or otherwise subjected to heat treatment, unless the material from which they are cut is to be similarly treated before use, in which case the test pieces shall be similarly and simultaneously treated with the material before testing.

8.3.2 Number of bend tests

The number of tests shall be as specified in Table 3. One additional test shall be made for each class of product and for each variation in thickness.

For rivet bars bend tests are not required.

TABLE 3 - Number of bend tests

Class of steel product	Number of bend tests
Sections	1 lengthwise (for each type)
Plates	1 lengthwise and/or cross-wise
Bars	1 lengthwise

8.4 Retests

Should a test piece not fulfil the test requirements, two further tests shall be made on samples taken from the plate, section or bar from which the original test piece was prepared.

Provided the results of both these further tests fulfil the test requirements, all the material represented shall be deemed to comply with this standard.

If the result of either of these additional tests does not fulfil the test requirements, the plate, section or bar from which the test pieces were cut shall be deemed not to comply with this standard, but the remaining material may be accepted, provided two of the remaining plates, sections or bars are tested in accordance with this standard and meet its requirements.

9 CERTIFICATE OF COMPLIANCE

If requested, the manufacturer shall supply the purchaser with a certificate stating the process of manufacture and a test sheet signed by the manufacturer giving the results of each of the mechanical tests applicable and, if so required, the chemical analysis shall also be provided.

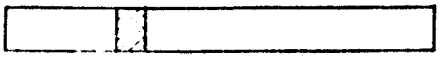

FIGURE 1 - Plate

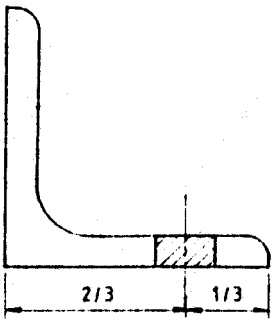

FIGURE 2 – L-section

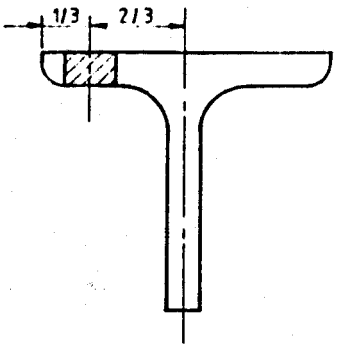

FIGURE 3 – T-section

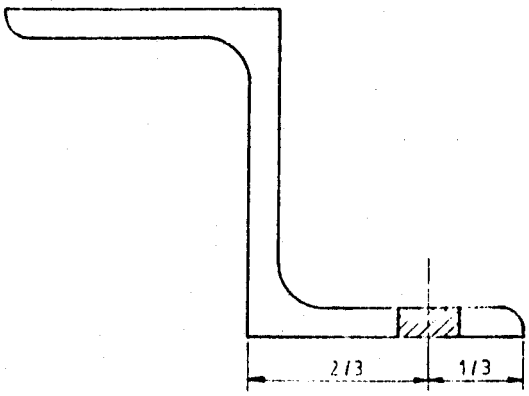

FIGURE 4 – Z-section

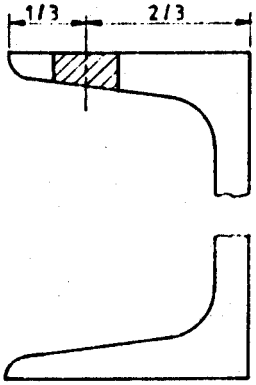

FIGURE 5 – U-section

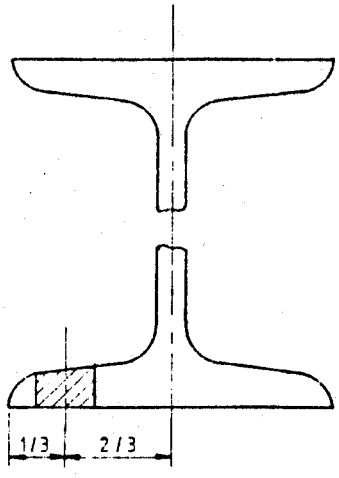

FIGURE 6 – I-section

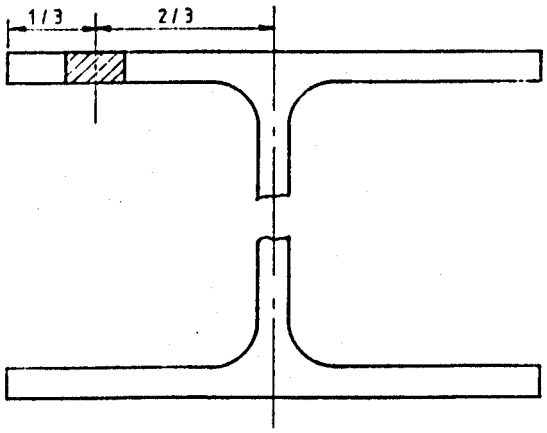

FIGURE 7 - H-section

Position of samples

POSITION AND ORIENTATION OF SAMPLES

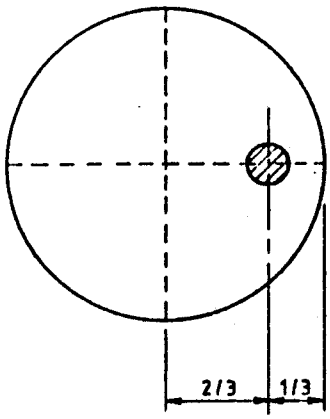

FIGURE 8 - Round bar

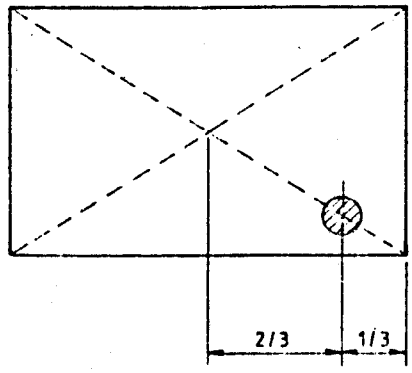

FIGURE 9 - Flat or rect. bar

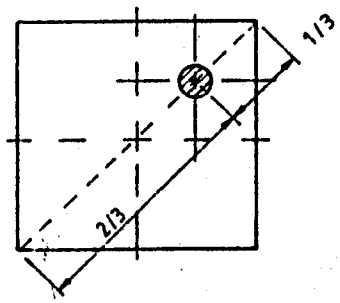

FIGURE 10 - Square bar

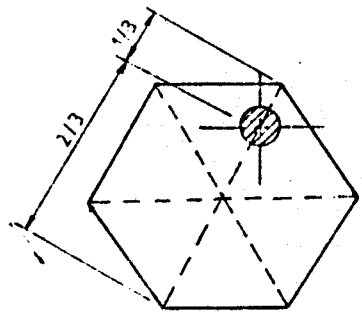

FIGURE 11 - Hexagonal bar

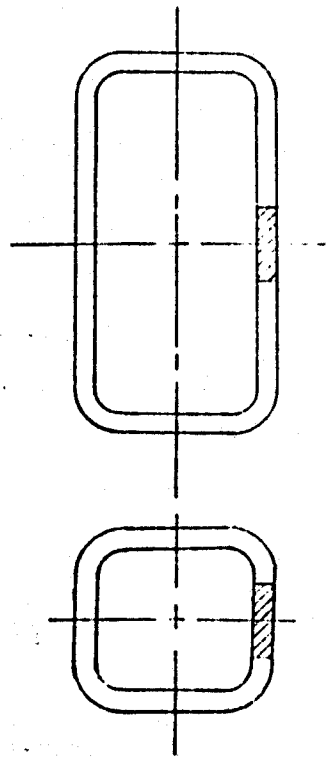

FIGURE 12 - Hollow section

Position of samples

POSITION AND ORIENTATION OF SAMPLES