

CEYLON STANDARD 13:1968
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**METHOD OF
BEND TESTING OF
STEEL PRODUCTS OTHER THAN
SHEET, STRIP, WIRE & TUBE**

BUREAU OF CEYLON STANDARDS

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BUREAU OF CEYLON STANDARDS

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CEYLON STANDARD
METHOD OF BEND TESTING OF STEEL PRODUCTS
OTHER THAN SHEET, STRIP, WIRE AND TUBE

FOREWORD

This Ceylon Standard has been prepared by the Drafting Committee on Steel. It was approved by the Civil Engineering Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on 2nd March 1968.

This standard is based on ISO Recommendation R 85:1959 Bend test for steel.

1 SCOPE

This standard prescribes the method of conducting bend test on steel products other than sheet, strip, wire and tube.

2 PRINCIPLE OF TEST

The test consists in submitting to plastic deformation by bending a straight, solid, prismatic or round-section test piece without reversing the direction of flexure during the test. The bending is carried out until one leg of the test piece makes, under load, a specified angle α with the extension of the other (see Fig. 2). The axes of the two legs of the test piece remain in a plane perpendicular to the axis of bending. In the case of 180° bend, the two lateral surfaces may, depending on the requirements of the specification, lie flat against each other, or may be parallel at a specified distance; an intermediate piece may be used for the control of this distance (see Fig. 4).

3 SYMBOLS AND DESIGNATIONS

The following reference numbers and symbols have been used in this standard.

Number	Symbol	Designation
1	a	Thickness or diameter of test piece
2	b	Width of test piece
3	-	Distance between supports (see Fig.1 and 2) or the opening of a block, U-shaped or V-shaped (see Fig.3)
4	α	Angle of bend
5	R	Radius of supports
6	D	Diameter of mandrel
7	-	Radius of curvature of pressure piece
8	r	Internal radius of the bent portion of the test piece after bending.

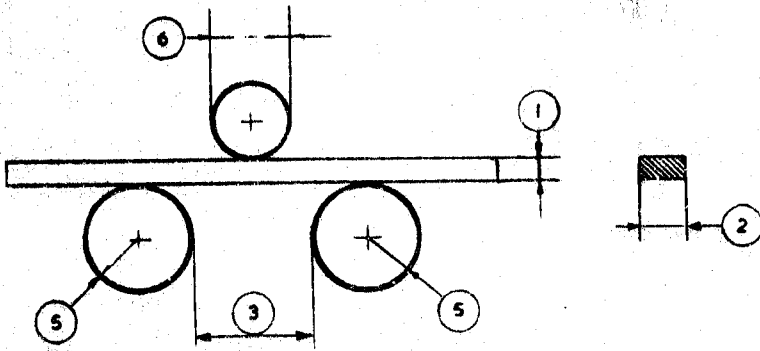


FIGURE 1

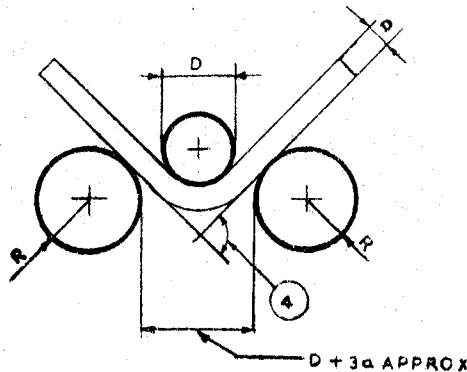


FIGURE 2

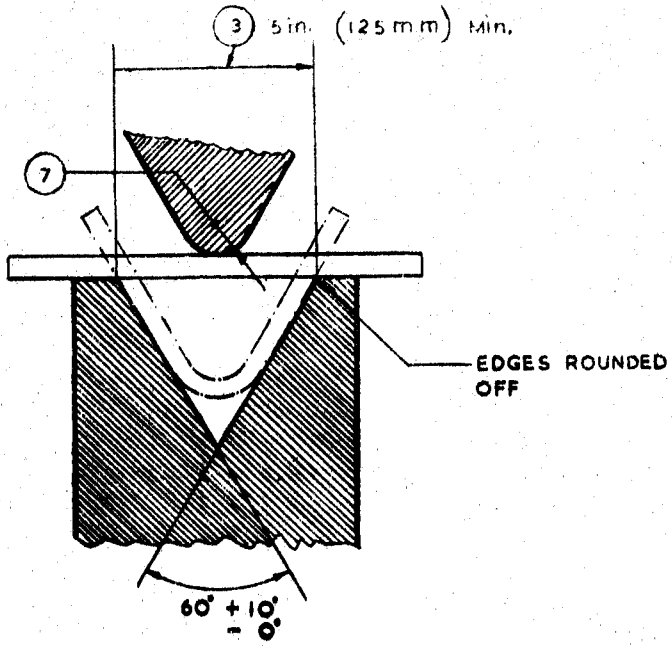


FIGURE 3

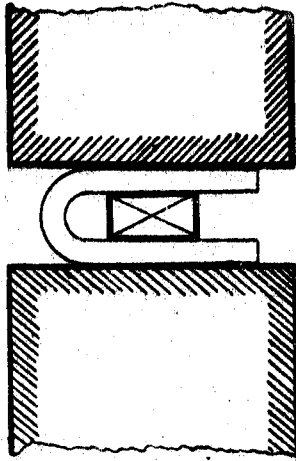


FIGURE 4

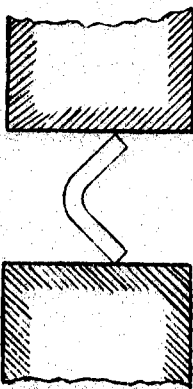


FIGURE 5

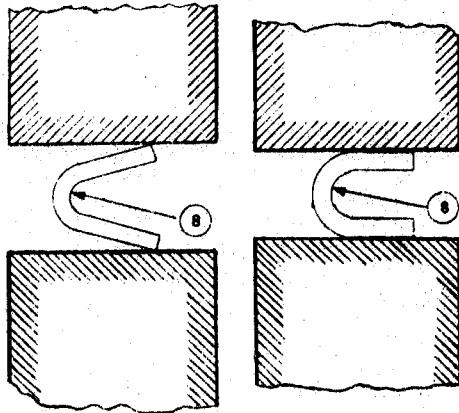


FIGURE 6

4 TEST PIECES

4.1 The test piece is generally of rectangular cross section. The edges should be rounded to a radius not exceeding $1/10$ th of the thickness. However, a test on a test piece, the edges of which have not been rounded, is acceptable, provided that the resultant bend is satisfactory. The width is fixed at a value normally between 1 in and 2 in (25 mm and 50 mm), with a tolerance of ± 0.20 in (5 mm).

4.2 The thickness of the test piece should be chosen as follows:

4.2.1 For semi-finished products and forged pieces, the thickness of the test piece is 0.8 ± 0.2 in (20 ± 5 mm), unless another thickness is specified.

4.2.2 For specimens cut from sheets, plates and structural sections, the thickness of the test piece should be the thickness of the material to be tested. If the rolled thickness is greater than 1 in (25 mm), it may be reduced by machining on one side to a specified thickness not less than 1 in (25 mm). In bending, the machined surface shall be on the outside.

4.3 For steel of round or polygonal section, the test may be carried out on a piece as cut from the bar, if the diameter of a round cross section or the diameter of the inscribed circle (for a polygonal cross-section) does not exceed 2 in (50 mm).

4.3.1 Material over 1.2 in (30 mm) may, and over 2 in (50 mm) should, be reduced to a convenient size of approximately 0.8 in (20 mm) to 2 in (50 mm) in diameter.

5 METHOD OF TEST

The common method of carrying out the test includes the following operations:

5.1 Lay the test piece on two parallel supports and bend it in the middle by means of a mandrel.

5.1.1 The widths of the supports and of the mandrel should be greater than the width of the test piece (see Fig. 1 and 2). The radii of the supports and of the mandrel shall be as specified in the material specification.

5.1.2 The distance between the supports shall be as specified in the material specification. If it is not specified in the material specification this distance should be taken as approximately $D + 3a$ (see Fig. 2)

5.1.3 If it is necessary to observe the bend at which cracking begins, the outer surface of the test piece should remain clearly visible in the portion being bent, during the conduct of the test.

5.2 Lay the test piece on a block, U-shaped or V-shaped, according to the pressure piece used and apply the bending force slowly, with the object of permitting free plastic flow of the material.

5.2.1 The tapered surface of the U or the V-block (see Fig. 3) should form an angle of $60^{\circ} + 10^{\circ}$
 $- 0^{\circ}$ and the opening should be at least 5 in (125 mm).

5.2.2 In this case, the length of the test piece is generally 10 in (250 mm). The supporting edges should be slightly rounded off.

5.3 If it is not possible to bend the test piece to the specified angle in the manner described above, the bend is completed by pressing directly on the ends of the two legs of the test piece.

5.3.1 In this method of testing, it is very difficult to maintain the specified radius of bend indicated by the symbol "r" (see number 8, Fig. 6).

5.3.2 The angle of bend is always specified as a minimum. In cases where the internal radius of the bend is specified, it is specified as a maximum.

5.4 If the test is to be effected by bringing the two legs of the test piece parallel to each other, two methods are permissible.

5.4.1 One method is based on the method described above (see Fig. 1 to 4).

5.4.2 The second method involves two stages:

a) The test piece is supported at the ends on supports or cylinders or laid across a block, U-shaped or V-shaped. The widths of the supports and of the pressure-piece should be greater than that of the test piece. The bending is started by the application of a steady pressure.

b) The specimen is then placed in a press (see Fig. 5) and pressure is applied until the internal radius of the specimen and the angle between the legs reach those specified for the bend (see Fig. 6).

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