

FOREWORD

At the date of approval, the technical content of this standard is largely in conformity with ISO Recommendation R 85, which deals with the same subject. Any differences are differences of wording only.

1 SCOPE AND FIELD OF APPLICATION

- 1.1 This standard describes the bend test for steel.
- 1.2 It does not apply to the bend testing of certain products such as sheets, wires and tubes for which special standards are applicable.

2 PRINCIPLE OF THE TEST

- 2.1 The test consists in submitting to plastic deformation, by bending, a straight solid, circular or polygonal 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 with the extension of the other (Fig. 4). The axes of the two legs of the test piece shall 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 to maintain the required distance (Fig. 6.)

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1.6.78

This approved standard replaces these
standards of the same number
registered by decision of 25.12.74

- 2.2 Unless otherwise stipulated by the material standard or the specification, the bend test shall be carried out at ambient temperature.

3 SYMBOLS AND DESIGNATIONS

Number	Symbol	Designation
1	a	Thickness or diameter of test piece
2	b	Width of test piece
3		Distance between supports or the opening of the block
4	α	Angle of bend
5	D	Diameter of mandrel
6		Radius of curvature of pressure piece
7	R	Internal radius of the bent portion of the test piece after bending

4 TEST PIECES (*)

- 4.1 The test piece shall generally be of rectangular cross section. The edges shall be rounded to a radius not exceeding one tenth of the thickness. However, a test on a test piece, the edges of which have not been rounded, is acceptable, provided the results obtained are satisfactory. The width of the test piece shall be fixed at a value normally between 25 and 50 mm.

In case of dispute, the width of the test piece shall be fixed at 35 ± 1 mm, except where this is impossible and in the case of bars (see 4.3).

(*) See comment, page X.

4.2 The thickness shall be chosen as follows:

4.2.1 For semi-finished products and forgings, the thickness of the test piece shall not, unless otherwise specified, exceed 20 mm.

Wherever possible, one non-machined surface shall be retained. In bending, the unmachined surface shall form the outside of the bend.

4.2.2 In the case of sheets, plates ($a > 3$ mm) and structural sections, the thickness of the test piece shall be that of the material. If the thickness of the material exceeds 25 mm, it may be reduced, by machining on one side only, to a specified thickness not less than 25 mm. In bending, the unmachined surface shall form the outside of the bend.

4.3 For round or polygonal steel bars, 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 bars) does not exceed 50 mm.

4.3.1 The bar may be machined if the said diameter exceeds 30 mm and shall be machined if it exceeds 50 mm.

- on a segment in the case of a round bar;

- parallel to one face in the case of a polygonal bar;

so as to reduce the diameter of the inscribed circle (in the new section so produced) to between 30 and 50 mm (see Figs. 1 and 2).

In bending, the unmachined surface of the squares or flats shall form the outside of the bend.

5 TEST PROCEDURE

BENDING TO A GIVEN ANGLE BELOW 180°

- 5.1 The test piece is generally laid on two parallel supports (rollers or block for example) and is bent in the middle by means of a mandrel or pressure piece. The widths of the supports and of the pressure piece shall be greater than that of the test piece (see Figures 3 and 5).
- 5.2 The diameter of the mandrel shall be set by the specification for the material. The same shall apply to the distance between the support rollers: in the absence of any specification, this distance shall be taken as approximately $D + 3a$ (see Figure 4).
- 5.2.1 If it is necessary to observe the point at which cracking begins, the outer surface of the test piece shall remain clearly visible in the portion being bent, throughout the test.
- 5.3 The tapered surfaces of the block shall form an angle of $60^\circ +10^\circ_{00}$ and the opening shall be at least 125 mm. The supporting edges shall be slightly rounded off.
- In the case of a test with block, the length of the test piece is usually 250 mm.
- 5.4 The bending force shall be applied slowly, with the objective of permitting free plastic flow of the material.
- 5.5 If it is not possible to bend the test piece to the specified angle in the manner described above, the bend shall be completed by pressing directly on the ends of the two legs of the test piece (see Figure 7).

- 5.5.1 With this method, it is very difficult to maintain the specified internal radius indicated by the symbol r (see Figure 8).
- 5.6 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.

PARALLEL LEG BENDING (at 180°) (see Figure 6)

- 5.7 For this special form of the test, the two legs of the test piece to be bent shall, according to the terms of the specification:
- either have their inner faces pressed together;
 - or be bent parallel to each other at a specified distance.
- 5.7.1 In the second case, bending shall be carried out as indicated in the previous section (bending to less than 180°), with the addition that a block may be placed between two ends of the test piece in order to keep them the required distance apart.

6 INTERPRETATION OF TEST RESULTS

- 6.1 After bending, the sides and outside of the bent portion shall be examined.
- 6.1.1 The interpretation of the result from the appearance of the bent portion is a matter for the material specification.

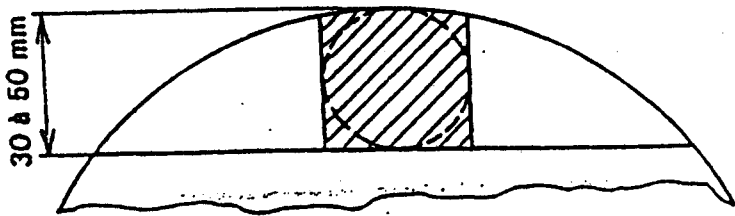


Figure 1 - a) Round bar

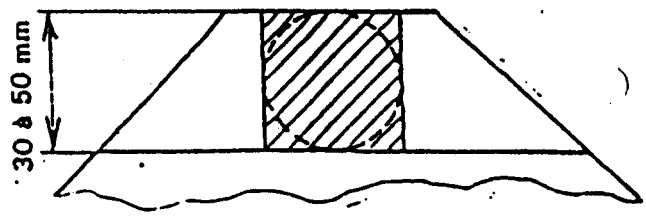


Figure 2 - b) Polygonal bar

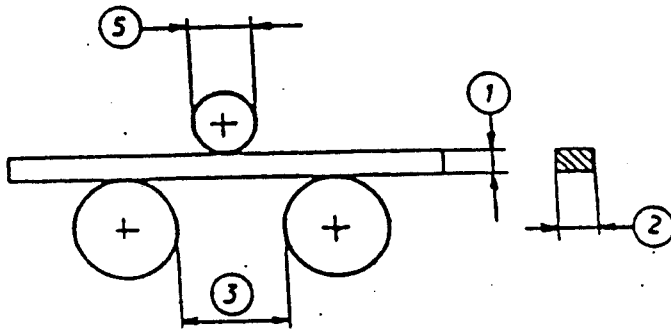


Figure 3

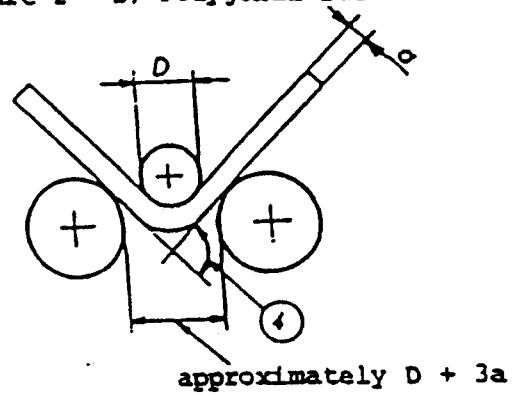


Figure 4

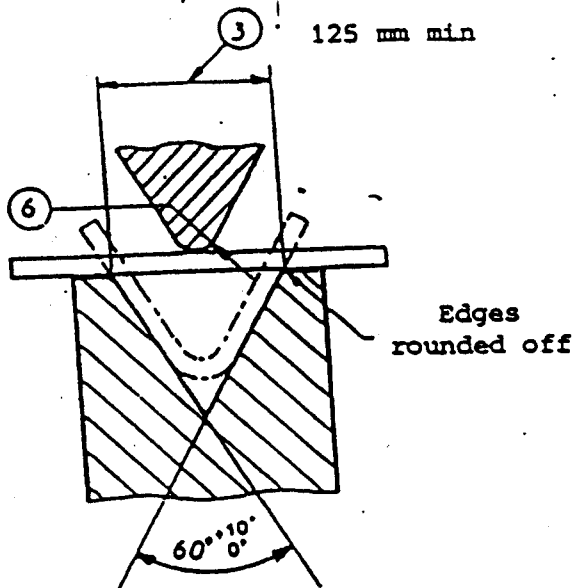


Figure 5

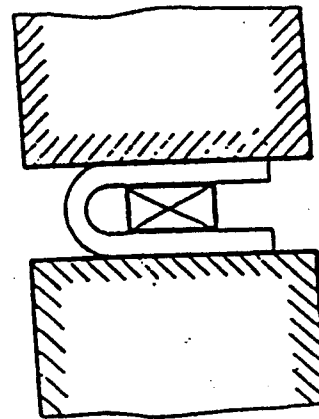


Figure 6

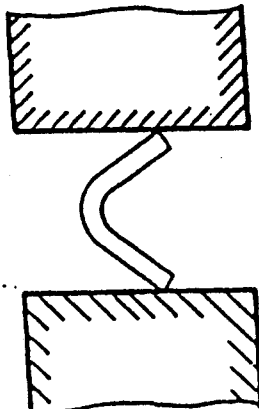


Figure 7

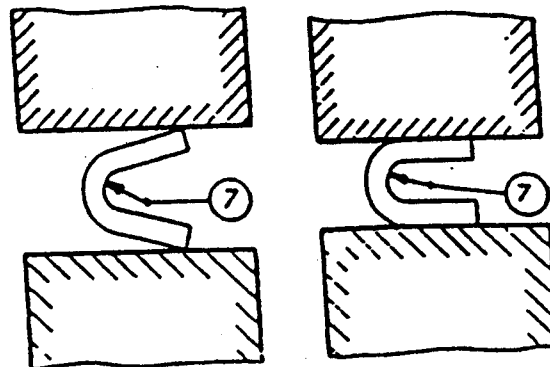


Figure 8

CUTTING OF TEST PIECE FROM HEAVY BARS

COMMENT

When the material standard or specification allows a choice between alternatives, all necessary details shall be given in the order.