IS 1757 (1988): Method for charpy impact test (V notch) for metallic material [MTD 3: Mechanical Testing of Metals]

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(Reaffirmed 2003)

Indian Standard

METHOD FOR CHARPY IMPACT TEST (V-NOTCH) ON METALLIC MATERIAL

(Second Revision)

1. Scope — This standard specifies the Charpy impact (V-notch) method for determining impact strength of the metallic material.

2. Principle — This test consists in breaking by one blow from a swinging pendulum, under conditions defined hereafter, a test piece V-notched in the middle and resting on two supports. The energy absorbed is determined.

3. Designations and Units — Designations and their units applicable to this standard are as indicated in Fig. 1 and Table 1.

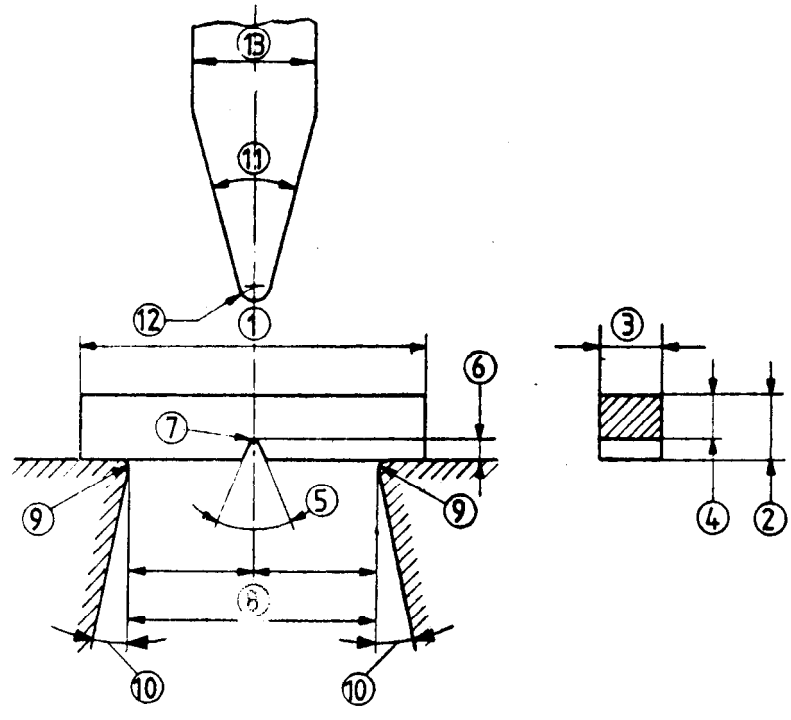

FIG. 1 CHARPY IMPACT TEST (V-NOTCH)

TABLE 1 DESIGNATIONS AND UNITS
(*Clause* 3 and *Fig.* 1)

Number	Designation	Unit
1.	Length of test piece	mm
2.	Height of test piece	mm
3.	Width of test piece	mm
4.	Height of test piece minus depth of notch (height below notch)	mm
5.	Angle of notch	deg
6.	Depth of notch	mm
7.	Radius of curvature of base of notch	mm
8.	Distance between anvils	mm
9.	Radius of anvil	mm
10.	Angle of taper of anvil	deg
11.	Angle at tip of striker	deg
12.	Radius of curvature of tip of striker	mm
13.	Width of striker	mm
—	Energy absorbed by breakage, *KV*	Joule

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4. Test Pieces

4.1 The standard test piece shall be 55 mm long and of square section with 10 mm each side. In the centre of the length there shall be a V-notch of 45° included angle, 2 mm deep, with 0·25 mm root radius.

4.1.1 If the standard test piece cannot be obtained from the material, one of the subsidiary test pieces having a width of 7·5 or 5 mm (*see* Table 2) shall be used, the notch being cut in one of the narrower faces.

The test pieces shall be machined all over.

4.2 The plane of symmetry of the notch shall be perpendicular to the longitudinal axis of the test piece.

4.3 The tolerances of the specified test pieces shall be as given in Table 2.

TABLE 2 TOLERANCES ON SPECIFIED TEST PIECE DIMENSIONS

Designation	Nominal Dimension mm	Mechining Tolerance mm
Length	55	± 0·60
Height	10	± 0·06
Width:		
Standard test piece	10	± 0·11
Subsidiary test piece	7·5	± 0·11
Subsidiary test piece	5	± 0·06
Angle of notch	45°	± 2°
Height below notch	8	± 0·06
Radius of curvature of base of notch	0·25	± 0·025
Distance of plane of symmetary of notch from the ends of the test piece	27·5	± 0·42
Angle between the plane of symmetry of notch and the longitudinal axis of the test piece	90°	± 2°
Angle between adjacent longitudinal faces of test piece	90°	± 2°

Note — Test pieces of widths other than those shown above, for example, with the width as the full thickness of the product, may be used provided that this is permitted in the material standard. Comparison of results, however, is only of significance when taken between test pieces of the same form and dimensions.

4.4 Preparation shall be carried out in such a way that any alteration of the test piece, for example, due to heating or cold working is minimized. The notch shall be carefully prepared so that no grooves appear at the base of the notch.

4.5 The test piece may be marked on any face not in contact with supports or anvils and at a position well away from the notch in order to avoid the effects of work hardening induced by stamping.

5. Testing Machine

5.1 The testing machine shall be constructed and installed steady and rigid.

5.1.1 The values for principal characteristics of the testing machine are specified in Fig 2 and Table 3.

5.2 Conditions for a standard test shall be where the nominal striking energy of the testing machine is 300 ± 10J and where the test piece is of standard dimensions. Absorbed energies reported under these conditions shall be prefixed by *KV*.

5.3 Testing machines with different striking energies are permitted, in which case the symbol, *KV* shall be supplemented by an appropriate index.

5.4 For a test in which a subsidiary test piece is used, the symbol *KV* shall be supplemented by indices denoting both the striking energy of the machine and the width of test piece, for example:

KV 300/7·5: striking energy 300 J, width 7·5 mm

KV 150/5 : striking energy 150 J, width 5 mm

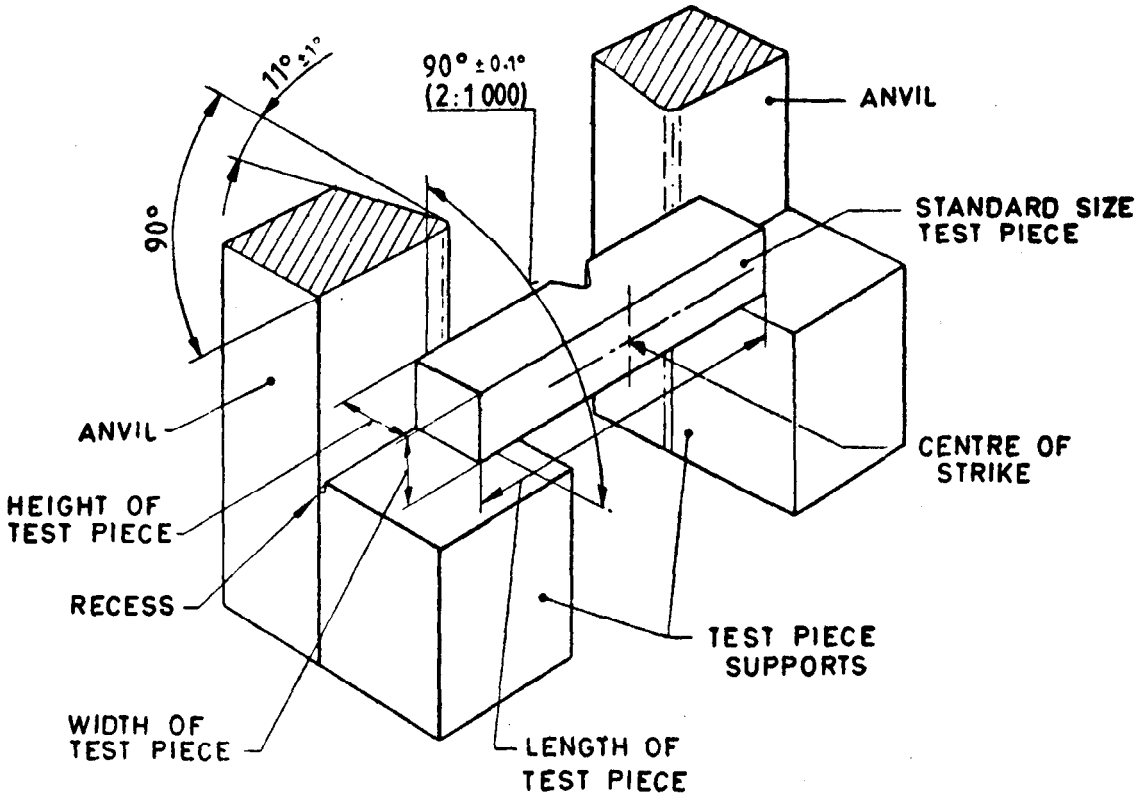

FIG. 2 CONFIGURATION OF TEST PIECE SUPPORTS AND ANVILS

TABLE 3 CHARACTERISTICS OF TESTING MACHINE

(*Clause* 5.1.1 and *Fig.* 2)

Designation	Requirement
Distance between anvils	$40 \begin{smallmatrix}+0{\cdot}1\\-0\end{smallmatrix}$ mm
Radius of anvil	$1 \begin{smallmatrix}+0{\cdot}5\\-0\end{smallmatrix}$ mm
Angle of taper of each anvil	11 ± 1°
Maximum width of striker	18 mm
Angle of tip of striker	30 ± 1°
Radius at tip of striker	$2 \begin{smallmatrix}+0{\cdot}5\\-0\end{smallmatrix}$ mm
Speed of striker at the instant of striking	5 to 5·5 m/s*
Angle between the faces of support and anvil	90 ± 0·1°

*For machines manufactured prior to the publication of this standard, a velocity of 4·5 to 7 m/s shall be permissible by agreement.

6. Test Requirements

6.1 The test piece shall lie squarely against the supports, with the plane of symmetry of the notch within 0·5 mm of the plane midway between them. It shall be struck by the striker in the plane of symmetry of the notch and on the side opposite the notch.

6.2 If the temperature of testing is not specified in the product standard, it shall be 23 ± 5°C.

6.2.1 If the temperature of testing is specified in the product standard, it shall be adhered to within ± 2°C

6.2.2 For tests at temperature other than the ambient, the test piece shall be immersed in the heating/cooling medium for sufficient time to ensure that the required temperature is reached throughout the test piece. It shall be broken within 5 s from the time of removal from the medimum.

6.2.3 The transfer device shall be designed and used so as to ensure that the temperature of the test piece remains within the temperature range permitted.

6.3 If, during the test, the test piece is deformed but not completely broken the energy absorbed is indefinite. The test report shall state that the test piece was unbroken by *x* j.

Note — It is emphasized that only results on test pieces of identical dimensions should be compared. There is no general process for converting the results obtained by one method of test into those which would be obtained by another method of test.

7. Test Report — The test report shall include the following information:

a) Reference to this standard;

b) Identification of the test piece (for example, type of material, cast number);

c) Shape and dimensions of the test piece;

d) Nominal striking energy of the pendulum;

e) Test temperature, in degrees Celcius; and

f) Absorbed energy.

EXPLANATORY NOTE

This standard was first published in 1961 and subsequently revised in 1973. In this revision the standard has been brought in line with ISO 148-1983 'Steel — Charpy impact test (V-notch)', issued by the International Organization for Standardization (ISO).

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