ISO

Revise

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 83

CHARPY IMPACT TEST
(U-NOTCH)
FOR STEEL

1st EDITION

February 1959

BRIEF HISTORY

The ISO Recommendation R 83, *Charpy Impact Test (U Notch) for Steel*, was drawn up by Technical Committee ISO/TC 17, *Steel*, the Secretariat of which is held by the British Standards Institution (B.S.I.).

At the first meeting of ISO/TC 17, held in London, in June 1950, the Secretariat submitted a first draft proposal for the Charpy impact test, based on a document which had been drawn up by the former International Federation of the National Standardizing Associations (ISA). The Technical Committee instructed its Working Group No. 1, *Methods of Mechanical Testing for Steel*, to examine this draft proposal and to prepare a new version of it, taking into account certain observations put forward by Member Bodies.

In February 1952, the Working Group submitted a second draft proposal, which was discussed at the second plenary meeting of ISO/TC 17, held in New York, in June 1952, and which was passed back to the Working Group so that it might include therein data on tolerances.

The third draft proposal, submitted by the Working Group in August 1953, was studied by the Technical Committee during its third plenary meeting, held in London, in December 1953, along with the comments of the Member Bodies. The ISO/TC 17 Secretariat was then assigned to draw up a fourth draft proposal incorporating the changes voted during the meeting, and this was circulated in April 1954.

The comments of the Member Bodies on this fourth draft proposal were discussed at the fourth plenary meeting, held in Stockholm, in June 1955, and the Technical Committee decided to adopt it, subject to a few amendments, as a Draft ISO Recommendation.

On 31 October 1956, this Draft ISO Recommendation (No. 134) was distributed to all the ISO Member Bodies and was approved, subject to a few modifications of details, by the following Member Bodies:

Belgium	India	Spain
*Canada	*Ireland	Sweden
Denmark	Italy	Turkey
Finland	Japan	*Union of
France	Netherlands	South Africa
Germany	Pakistan	U.S.S.R.
*Greece	Poland	Yugoslavia
Hungary	Portugal	

No Member Body opposed the approval of the Draft.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in February 1959, to accept it as an ISO RECOMMENDATION.

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* These Member Bodies stated that they had no objection to the Draft being approved.

ISO Recommendation	R 83	February 1959

CHARPY IMPACT TEST
(U-NOTCH)
FOR STEEL

1. PRINCIPLE OF TEST

The test consists in breaking by one blow from a swinging hammer, under conditions defined hereafter, a test piece U-notched in the middle and supported at each end. The energy absorbed is determined, from which the impact value is obtained.

2. SYMBOLS AND DESIGNATIONS

Number	Symbol	Designation
1	—	Length of test piece
2	a	Thickness of test piece
3	b	Width of test piece
4	—	Thickness of test piece minus depth of notch
5	—	Depth of notch
6	—	Radius of curvature of base of notch
7	L	Distance between supports
8	—	Radius of curvature of supports
9	—	Taper of supports
10	—	Angle at tip of hammer
11	—	Radius of curvature of hammer
12	S_o	Cross-sectional area of test piece below the notch, measured in square centimetres before the test
13	KCU	Impact strength with U-notch (key-hole notch) $$= \frac{\text{Energy absorbed in kgf} \cdot \text{m}}{S_o}$$

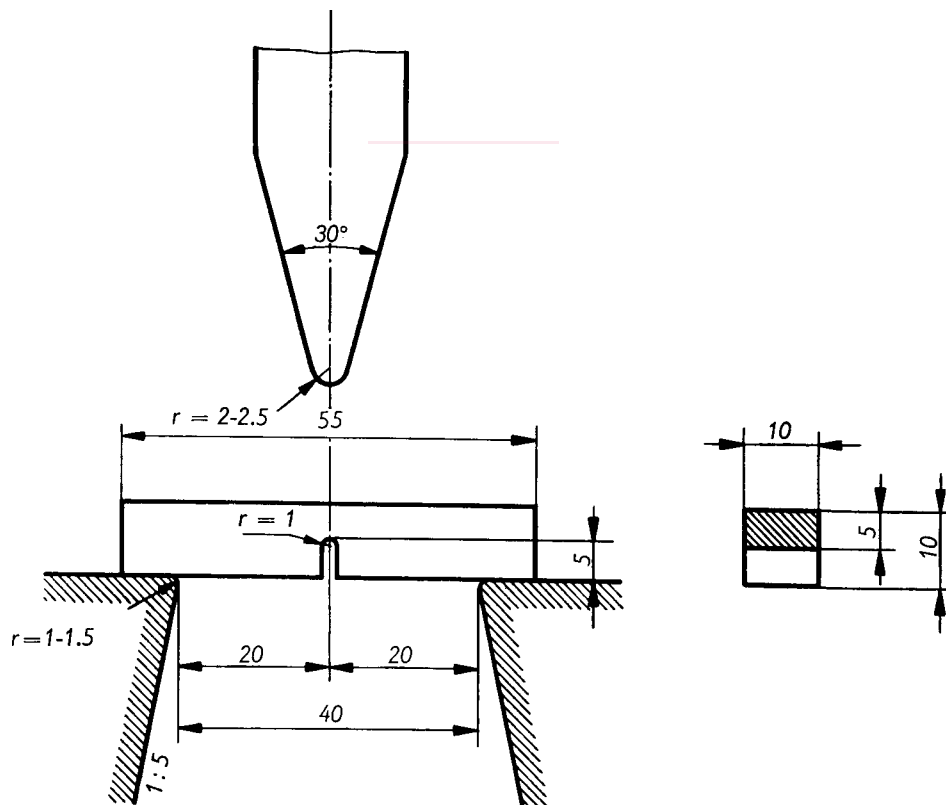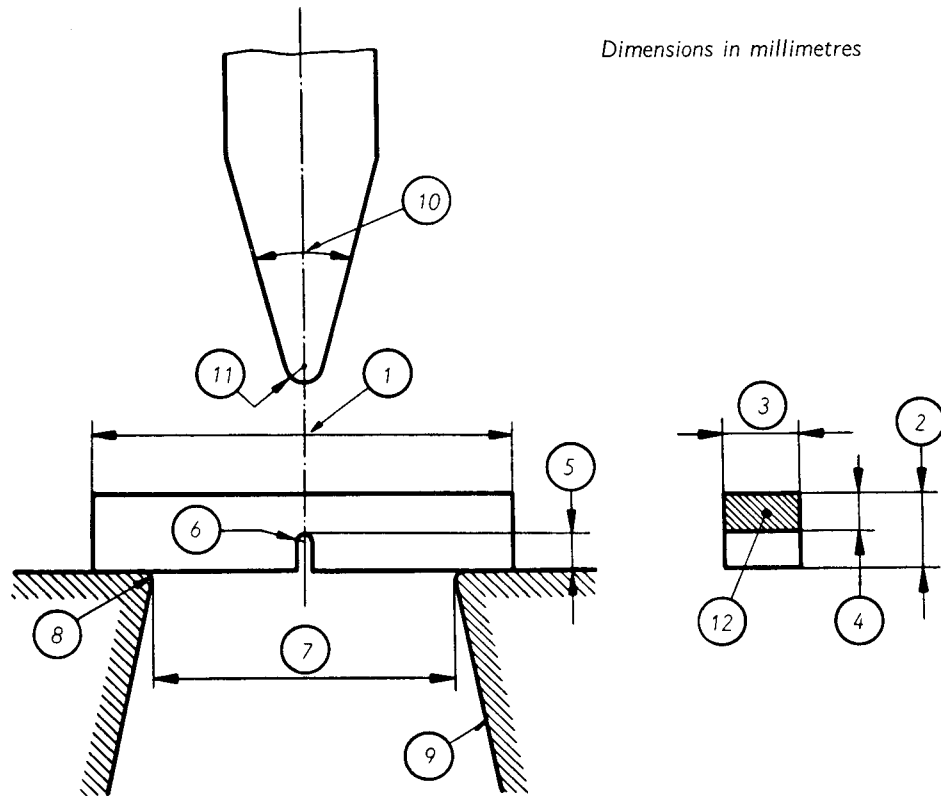*Dimensions in millimetres*

FIGURE. — Charpy impact test (U-notch)

3. TEST PIECES

3.1 The test piece is machined all over and is 55 mm long and of square section with 10 mm sides. In the centre of the length there is a U-notch (key-hole notch), 5 mm deep (unless otherwise specified), rounded off at the base with a radius of 1 mm.

3.2 The plane of symmetry of the notch is perpendicular to the longitudinal axis of the test piece.

3.3 The following tolerances on the above dimensions are permitted:

TABLE 1. — Tolerances on specified dimensions

Designation	Nominal dimension	Machining tolerance	
		Values	ISA Symbols
Length	55 mm	± 0.60 mm	j 15
Thickness	10 mm	± 0.11 mm	j 13
Width	10 mm	± 0.11 mm	j 13
Depth of notch	5 mm	± 0.09 mm	j 13
Root radius of notch	1 mm	± 0.07 mm	j 13
Radius of curvature of supports	1 mm		
Taper of supports	1 : 5		
Angle at tip of hammer	30°	± 1°	
Distance of notch from ends of test piece	27.5 mm	± 0.42 mm	j 15
Angle between plane of symmetry of notch and longitudinal axis of test piece	90°	± 2°	

3.4 The notch may be made by any machining method. The notch should be carefully prepared so that no grooves appear at the base of the notch.

4. TESTING MACHINE

4.1 The testing machine is constructed and installed steady and rigid.

4.1.1 The following conditions should be satisfied:

TABLE 2. — Characteristics of testing machine

Designation	Metric units
Distance between supports	40 $^{+\ 0.5\ mm}_{-\ 0\ \ \ mm}$
Radius of curvature of supports	1 to 1.5 mm
Taper of supports	1 : 5
Angle at tip of hammer	30°
Radius of curvature of hammer	2 to 2.5 mm
Speed of hammer at the instant of striking	4.5 to 7 m/s

4.1.2 The plane of swing of the hammer is vertical. The machine is constructed so that the loss of energy (such as from translation, rotation or vibration) in the machine framework during a test is negligible.

4.1.3 The centre of percussion is at the point of impact of the hammer.

4.1.4 The accuracy of the graduation of the scale of the machine is $\pm$ 0.5 per cent of the maximum striking energy of the machine.

4.2 For a standard test the striking energy of the testing machine is 30 $\pm$ 1 kgf·m. The impact strength obtained under these conditions, using the 5 mm deep U-notch, is denoted by KCU.

4.3 Testing machines with different striking energies are permitted in which case the value KCU is supplemented by an index.

4.4 The use of U- (key-hole) notches other than the 5 mm deep notch is also denoted by an index.

Example: KCU 10/3 indicates the use of a striking energy of 10 kgf·m and a 3 mm deep notch;

KCU 30/3 indicates the use of normal striking energy and a 3 mm deep notch.

5. TEST REQUIREMENTS

5.1 The test piece should lie squarely against the supports with the plane of symmetry of the notch within 0.5 mm of the plane midway between them. It should be struck by the hammer in the plane of symmetry of the notch and on the side opposite the notch.

5.2 The temperature of the test piece at the moment of breaking should not differ from the specified temperature by more than $\pm$ 2 °C, unless some other tolerance is agreed. If the temperature of testing is not specified, it is taken as 20 °C in temperate climates and 27 °C in tropical climates, subject in each case to the above tolerance. In all cases the temperature of test is to be recorded.

5.3 If, during the test, the test piece is not completely broken, the impact value obtained is indefinite. The test report should state that the test piece was unbroken by x kgf·m/cm².

NOTE

There is no general process for converting the impact values, obtained by one method of test, into those which would be obtained by another method of test.