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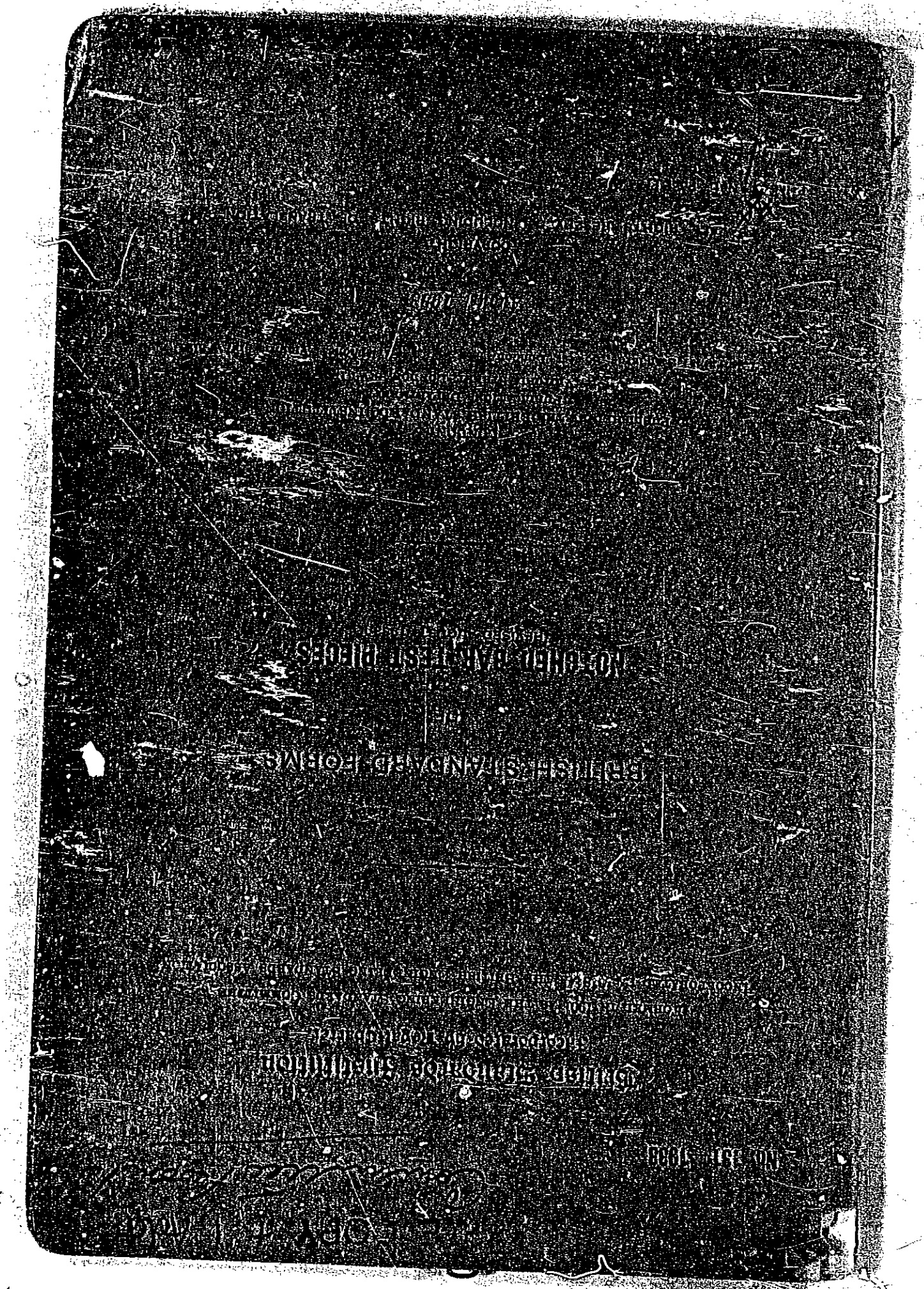

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This Publication, having been approved by the Mechanical Industry Committee and endorsed by the Chairman of the Engineering Divisional Council, was published by the authority of the General Council as a British Standard on 21st August, 1933.

NOTE.

In order to keep abreast of progress in the Industries concerned, the British Standard Specifications are subjected to periodical review.

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BRITISH STANDARD FORMS

OF

NOTCHED BAR TEST PIECES.

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BRITISH STANDARD FORMS

OF

NOTCHED BAR TEST PIECES.

(REVISED AUGUST, 1933.)

INTRODUCTORY REMARKS.

In view of the large use of Notched Bar Tests, and the diversity in the dimensions of the test pieces at present used, it has been considered desirable that the test should be standardised, and this Report gives the Standard dimensions of the test pieces and the form of notch recommended, as well as a number of other particulars.

The test piece should be fractured by a single blow of a falling tup or pendulum or revolving flywheel. The work expended in fracture is measured by the difference of the striking energy before and after impact.

In pendulum machines the pendulum should be supported on knife edges or ball bearings. The centres of gravity of the pendulum and test piece and the point of impact should be in the middle plane of oscillation of the pendulum. The centre of percussion of the pendulum should be at or slightly above the point of impact.

The results in some materials depend on the striking velocity which should not in any case be less than 3 metres per second.

The weight of the anvil block and its foundation should be at least 40 times the weight of the tup or pendulum.

Various machines are in use for making notched bar tests. It does not appear that the results are materially different when tests are made with the Standard types of test pieces in these different machines, provided they are properly constructed, calibrated and used, and that the striking velocity is not substantially different.

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The following table contains data of some of these machines:

Type of Machine.	Striking Energy. kg.m.	Striking Velocity. m. per second.
Charpy, pendulum	30	5.3
Izod, pendulum	16.6	3.5
Frémont, falling tup	20 or 60	8.85
Amsler, pendulum	30	4.95
Guillery, rotary flywheel	60	8.85

Form of Notch:—Various forms of notch have been adopted by different engineers, and the work of fracture is different according to the type of notch used. It is certain that the indication of brittleness, marked by a low value of the work of fracture, is more definite the smaller the angle of the notch and the radius of curvature at the bottom of the notch. After much investigation it has been decided that the Standard notch shall be a Vee notch of 45° angle with a quarter millimetre radius at the bottom of the notch.

Standard forms of test piece and notch are given in Plates 1 to 4 and 7 to 9.

Size of Test Piece:—Test pieces of 15 mm. × 15 mm. × 80 mm. and 30 mm. × 30 mm. × 160 mm. have been used by various engineers. Considering the cases in which the notched bar test is most likely to be useful, and the difficulty of obtaining test pieces of so large a size, it has been decided that a smaller test piece is more practical.

A trustworthy relation between the work of fracture in test pieces of different size has not been found, but there is evidence that it is probably different in different materials.

Through a wide range of steels the round test pieces (see Figs. 17 to 23) have been found to give results identical with the standard square test pieces (see Figs. 1, 4 and 5). Accordingly in suitable cases in which the purchaser and contractor agree to do so, the round test pieces may be used instead of the standard square test piece.

For the present it is recommended that the results of tests should be expressed in kilogrammetres, and that only results on test pieces of identical dimensions should be compared.*

*NOTE.—One kg.m. = 7.233 ft. lbs.
One ft. lb. = 0.138 kg.m.

Units employed:—It is recommended that all dimensions should be expressed in metric units: the dimensions of the test piece in millimetres, the striking velocity, which should be stated, in metres per second, and the work of fracture in kilogrammetres.

Number of Tests:—At least three tests should be made and the average result taken.

RECOMMENDATIONS.

Dimensions of British Standard Notched Bar Test Pieces.

1. The British Standard Notched Bar Test Piece shall be 10 mm. × 10 mm. in cross section.

Where this size of test piece cannot be obtained from the material, the subsidiary Standard Test Pieces having cross sections of 10 mm. × 5 mm. and 5 mm. × 5 mm. respectively shall be employed.

The form and depth of notch shall be as shewn in Figures 10 and 11 (Plate 4).

The Standard dimensions for the Test Pieces are shewn in Figures 1 to 9 (Plates 1—3).

The angles and radii of the supports and strikers shall be as shewn in Figures 12 and 12a (Plate 4).

The British Standard Round Test Pieces shewn in Figs. 17 to 23 may be used in suitable cases as alternatives to the British Standard notched Bar Test Piece of 10 mm. × 10 mm cross section Figs. 4 and 5 for tests made in the Izod Machine.

Adaptation of the 30 kg.m. Charpy Testing Machine for testing the Subsidiary Standard 10 mm. × 5 mm. and 5 mm. × 5 mm. Beam Type Test Pieces.

2. The boss provided for the Tensile Impact Test should be machined or ground away at each side to about 18 mm. thickness in order to allow the free passage of the pendulum between the supports when these are moved inwards to give a span of 20 mm. and a screwed plug of mild steel of the form shewn in Fig. 26 (Plate 11) and equal in weight to the metal removed, should be fitted into the boss in order to compensate for the metal removed.

New Grips for Izod Machine for testing the Subsidiary Standard 10 mm. × 5 mm. and 5 mm. × 5 mm. Test Pieces.

3. New grips, shewn in Figs. 14 and 16, should be made for the Izod Testing Machine in order to adapt the machine for testing the Subsidiary Standard 10 mm. × 5 mm. and 5 mm. × 5 mm. Test

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