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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 876

SPECIAL METHOD OF MECHANICAL TESTING TO DETERMINE THE CODING FOR DEEP PENETRATION ELECTRODES

1st EDITION

November 1968

For each individual country the only valid standard is the national standard of that country.

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 876, *Special method of mechanical testing to determine the coding for deep penetration electrodes,* was drawn up by Technical Committee ISO/TC 44, *Welding,* the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question by the Technical Committee began in 1961 and led, in 1963, to the adoption of a Draft ISO Recommendation.

In October 1966, this Draft ISO Recommendation (No. 1040) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Argentina	Greece	Romania
Australia	India	South Africa, Rep. of
Belgium	Ireland	Spain
Brazil	Israel	Sweden
Canada	Japan	Switzerland
Czechoslovakia	Korea, Rep. of	Turkey
Denmark	Netherlands	U.A.R.
Finland	New Zealand	United Kingdom
France	Norway	U.S.S.R.
Germany	Portugal	Yugoslavia

One Member Body opposed the approval of the Draft :

U.S.A.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1968, to accept it as an ISO RECOMMENDATION.

FOREWORD

This ISO Recommendation is one of a series which also includes the following :

ISO/R 635, *Code of symbols for covered electrodes for arc welding of mild steels and low alloy high tensile steels;*

ISO/R 615, *Methods for determining the mechanical properties of the weld metal deposited by electrodes 3.15 mm or more in diameter;*

ISO/R 632, *Methods of test for determining whether an electrode is a deep penetration electrode.*

ISO Recommendation R 876 November 1968

SPECIAL METHOD OF MECHANICAL TESTING TO DETERMINE THE CODING FOR DEEP PENETRATION ELECTRODES

INTRODUCTION

Owing to the special applications of deep penetration electrodes, the method of depositing the weld metal differs from that in normal welding practice. Tests on welded joints are therefore necessary. The results obtained will not be comparable with those of all-weld tests with normal penetration electrodes, but they will nevertheless allow symbols to be allotted to the different types of deep penetration electrodes in accordance with ISO Recommendation R 635, *Code of symbols for covered electrodes for arc welding of mild steels and low alloy high tensile steels.*

1. SCOPE

This ISO Recommendation describes a special method of mechanical testing to determine the coding for deep penetration electrodes. The method consists of taking, from a welded assembly, tensile test pieces and V-notch test pieces for impact testing.

Because high tensile strength, deep penetration electrodes are very seldom made or used, it would have needlessly complicated ISO Recommendation R 635 to take such electrodes into account. Accordingly, only one type of steel has been specified for the parent metal.

2. TEST ASSEMBLY – QUALITY AND DIMENSIONS

The test assembly for mechanical testing should consist of two plates each of minimum dimensions 150 mm × 400 mm (see Fig. 1). The thickness should be 12 mm in order to ensure that impact test pieces can be machined out, and the gap *e* between the edges should be not more than 1.5 mm. The parent metal should be a mild steel, killed or semi-killed, with a tensile strength between 42 and 50 kgf/mm^2 in the as-rolled condition, and should meet the following requirements for chemical composition :

Carbon	$\leqslant$ 0.18 %
Sulphur	$\leqslant$ 0.04 %
Phosphorus	$\leqslant$ 0.04 %

3. WELDING PROCEDURE

Electrodes of 4 or 5 mm diameter should be used for welding.

The type of current (a.c. or d.c.) and, for a.c., the values of the open circuit voltage which are to be adopted should be in agreement with the recommendations of the electrode manufacturer. The handling conditions, current value and welding speed used should make adequate interpenetration of the two runs possible. Each side should be welded in the flat position.

There should be no cooling interval between the deposition of individual electrodes on any one side of the joint. Between the completion of the deposition of the full run on one side of the joint and the beginning of the other run on the reverse side of the joint, the test assembly should be allowed to cool in still air to a temperature not exceeding 100 °C.

4. INSPECTION

Any suitable non-destructive examination of the welded test assembly which is thought to be necessary to check the soundness of the weld before sectioning and machining, in order to avoid retesting, is permitted.

5. TEST PIECES

The welded test assembly should be sectioned and machined to provide the following :

(*a*) 2 tensile test pieces (see clause 5.1);

(*b*) 3 V-notch impact test pieces (see clause 5.2).

5.1 **Tensile test pieces** (see Figures 1, 2 and 3)

From the welded test assembly two sections for the tensile test pieces should be prepared by machining (see Fig. 2). The thickness of the weld should be reduced to that of the plate by machining.

If slight undercutting is present, it should be removed by further machining. The machining should be carried out over such an area that it does not influence the place of fracture in the tensile test pieces. No more than 10 % of the original plate thickness should be machined from either surface. The tensile strength should be calculated from the resulting cross-sectional area.

NOTE. – Owing to the effect of the shape of the tensile test pieces, the tensile strength on the reduced section may be as much as 10 % in excess of the value obtained on a normal parallel-sided test piece and hence the tensile test results will only be of value for comparative and symbolization purposes.

The tensile test pieces should have the shape indicated and should not be subjected to any mechanical or thermal treatment. The temperature at the time of testing should be 20 ± 2 °C for temperate climates and 27 ± 2 °C for tropical climates.

The value reported for the tensile strength should be the average of the values obtained for the two test pieces, divided by 1.1.

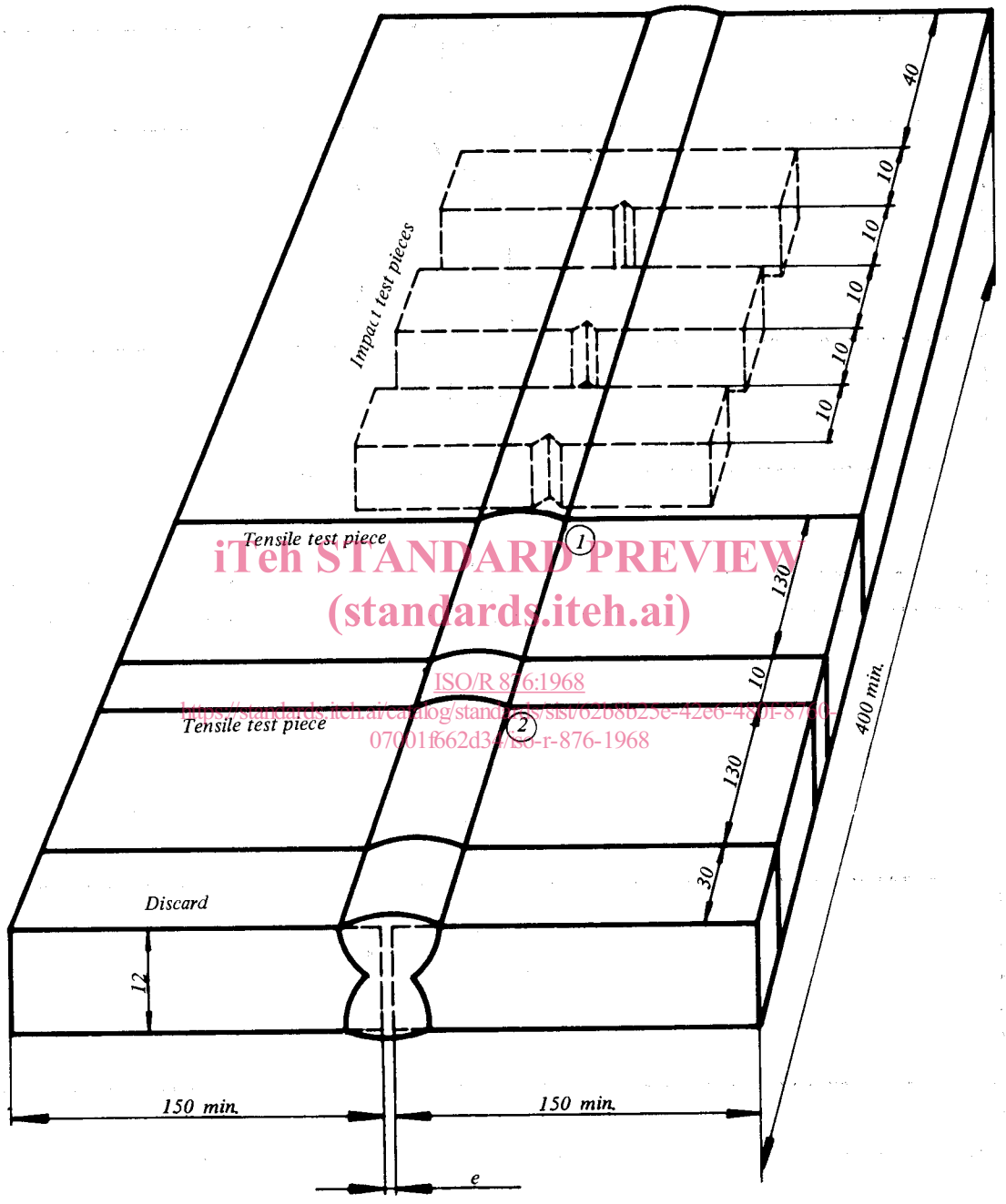
No fusion defects in the weld should be allowed. Such defects will be revealed by visual inspection of the cross-section of the tensile test pieces after fracture.

5.2 **V-notch impact test pieces** (see Figures 1 and 4)

From the welded test assembly, three impact test pieces should be prepared in conformity with ISO Recommendation R 148, *Beam impact test (V-notch) for steel* (see Fig. 4). The location of the impact test pieces in the welded test assembly is indicated in Figure 1, the axis of the notch being perpendicular to the surface of the plate. Neither the impact test pieces nor the part of the welded test assembly from which they are sectioned should be subjected to any mechanical or thermal treatment. The temperature at the time of testing should be 20 ± 2 °C for temperate climates and 27 ± 2 °C for tropical climates.

The value reported for the absorbed energy should be the average of the values obtained from the three impact tests.

Dimensions in millimetres



Gap e between plates before welding ⩽ 1.5 mm

FIG. 1 – **Location of test pieces in welded test assembly**

Dimensions in millimetres

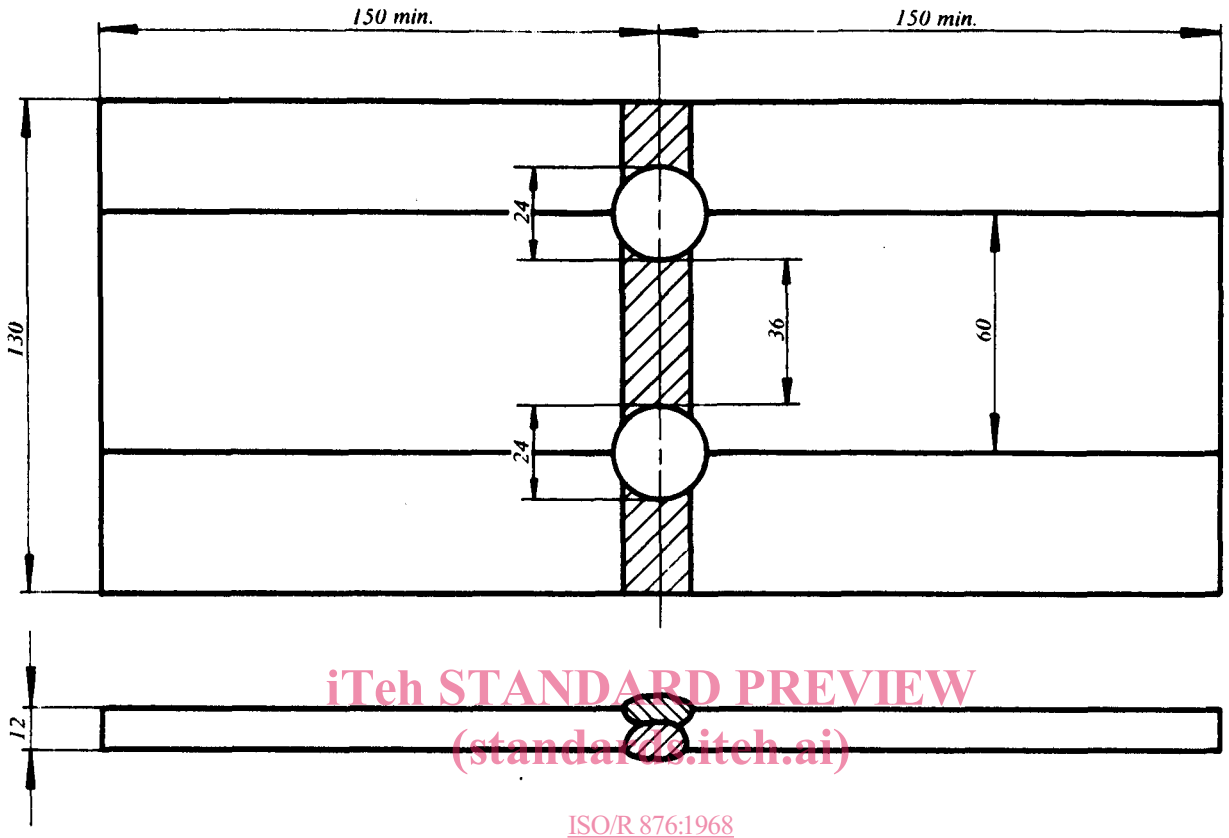


FIG. 2 – Tensile test piece of reduced section

Dimensions in millimetres

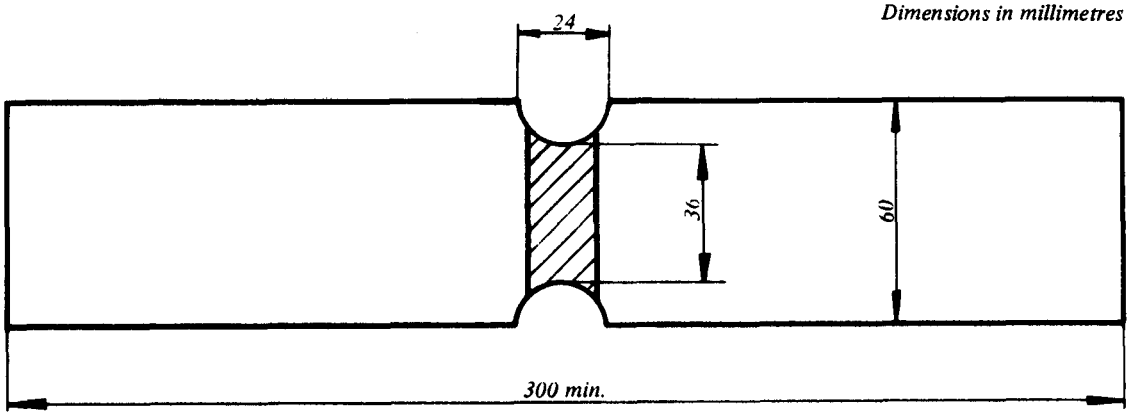


FIG. 3 – Shape of tensile test piece

Dimensions in millimetres

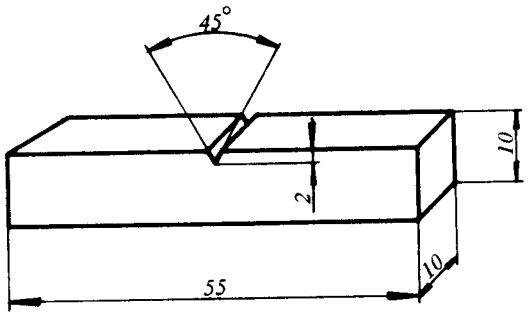


FIG. 4 – **Dimensions of V-notch impact test piece**

NOTE. – The test piece should be machined and the test carried out in conformity with ISO Recommendation R 148, *Beam impact test (V-notch) for steel.*

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