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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

**ISO RECOMMENDATION
R 698**

FILLER RODS FOR BRAZE WELDING

METHODS OF TEST FOR DETERMINING
THE CONVENTIONAL BOND STRENGTH
ON STEEL, CAST IRON AND OTHER METALS

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 698 *Filler rods for braze welding — Methods of test for determining the conventional bond strength on steel, cast iron and other metals*, 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 1957 and led, in 1961, to the adoption of a Draft ISO Recommendation.

In October 1965, this Draft ISO Recommendation (No. 845) 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 :

Australia	Ireland	Spain
Austria	Israel	Sweden
Brazil	Italy	Switzerland
Canada	Japan	U. A. R.
Chile	Netherlands	United Kingdom
Denmark	New Zealand	U. S. S. R.
France	Portugal	Yugoslavia
India	Romania	

Four Member Bodies opposed the approval of the Draft :

Belgium
Germany
South Africa, Rep. of
U. S. A.

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

FILLER RODS FOR BRAZE WELDING

METHODS OF TEST FOR DETERMINING
THE CONVENTIONAL BOND STRENGTH
ON STEEL, CAST IRON AND OTHER METALS

FOREWORD

This ISO Recommendation is a companion to ISO Recommendation R 688, *Filler rods for braze welding – Methods of test for determining the characteristics of the deposited metal.*

1. SCOPE

This ISO Recommendation describes tests for filler rods for braze welding to determine the conventional bond strength on

- steel
- cast iron
- other metals and alloys.

The conventional bond strength of a braze welding filler metal on a parent metal is determined by means of a tensile test in which the stress is applied to the normal cross-sectional area of the test piece.

2. DETERMINATION OF CONVENTIONAL BOND STRENGTH ON STEEL

2.1 Assembly

2.1.1 *Type of assembly and choice of parent metal*

2.1.1.1 In order to determine the conventional bond strength of braze welding filler metals on steel, a single Vee butt joint assembly without a gap, as shown in Figure 1, should be braze welded.

2.1.1.2 The plates should be of mild steel. The faces of the bevel, which should be smooth, as well as the immediately surrounding areas (over a width of 10 to 15 mm) should be cleaned of oxide and other surface contamination and degreased before assembly.

2.1.2 *Operating conditions*

2.1.2.1 The thickness of the plates and the operating conditions should be chosen as follows, depending on the diameter of the filler rod : *

* Care should be taken to ensure a level joint assembly.

TABLE 1

Diameter of filler rod in millimetres	2	2.5	3.15	4	5	6.3
Thickness (e) of plates in millimetres	5	5	8	10	10	10
Acetylene consumption of blowpipe in litres per hour *	150	150	200	250	315	315
Number of runs	2 to 3					

2.1.2.2 The assembly should be made by the leftward method, welding upward, the plates being in a slightly inclined position (approximately 30°). As the straightening of the plates after welding is forbidden, precautions should be taken to keep the assembly as flat as possible.

The blowpipe should be fed with correctly purified acetylene and with oxygen having a minimum purity of 98%. The flame should be neutral,** unless otherwise recommended by the manufacturer of the filler rod. The nature of the flame, whether neutral or oxidizing, should be stated in the test report.

2.1.2.3 If a cleaning flux is necessary, the flux appropriate to the filler rod being tested should be applied.

2.2 Tensile tests

2.2.1 Preparation of tensile test pieces

2.2.1.1 Six test pieces should be taken as shown in Figure 2.

2.2.1.2 After removal of the excess metal by machining from the two faces, the rectangular tensile test pieces should be machined as shown in Figure 3. The edges are machined rectilinear, parallel and rounded to a radius not exceeding 2 mm.

2.2.2 Tensile test requirements

The tests should be made at ambient temperature, unless otherwise specified. ***

* The operator should ensure that the acetylene consumption of his blowpipe corresponds as closely as possible to that indicated in Table 1 above.

** A flame is said to be neutral when the ratio of oxygen to acetylene is nearly equal to 1.

*** In accordance with ISO Recommendation R 82, *Tensile testing of steel*.

2.3 Expression of results

Wherever the break occurs, the conventional bond strength, expressed in kilogrammes-force per square millimetre, should be obtained by dividing the total breaking load, expressed in kilogrammes-force, by the initial cross-sectional area of the test piece, expressed in square millimetres. The position of the break should be stated in the test report.

3. DETERMINATION OF CONVENTIONAL BOND STRENGTH ON CAST IRON

3.1 Assembly

3.1.1 Type of assembly and choice of parent metal

3.1.1.1 In order to determine the conventional bond strength of braze welding filler metals on cast iron, a double Vee butt joint assembly with a gap made between bevelled grey cast iron bars, as shown in Figure 4, should be braze welded.

3.1.1.2 The bars should be of grey cast iron having a tensile strength of about 26 kgf/mm².

3.1.1.3 The faces of the bevel as well as the immediately surrounding areas (over a width of 10 to 15 mm) should be carefully machined or filed, but not ground, and then degreased before assembly.

3.1.2 Operating conditions

3.1.2.1 The operating conditions should be chosen as follows :

TABLE 2

Diameter of filler rod in millimetres	> 3.15
Acetylene consumption of blowpipe in litres per hour *	250 to 315, according to diameter of filler rod
Number of runs	see clause 3.1.3

3.1.2.2 The assembly should be made by the leftward method, the bars being horizontal.

The blowpipe should be fed with correctly purified acetylene and with oxygen having a minimum purity of 98%. The flame should be neutral, ** unless otherwise recommended by the manufacturer of the filler rod. The nature of the flame, whether neutral or oxidizing, should be stated in the test report.

* The operator should ensure that the acetylene consumption of his blowpipe corresponds as closely as possible to that indicated in Table 2 above.

** A flame is said to be neutral when the ratio of oxygen to acetylene is nearly equal to 1.

3.1.2.3 If a cleaning flux is necessary, the flux appropriate to the filler rod being tested should be applied.

3.1.3 *Operating procedure*

The operating procedure should be as follows :

- a root run should be made;
- the assembly should be turned over and a root run should be made on the opposite side;
- each face of the bevels should be "battered";
- one bevel should be filled to half its depth;
- after turning over, the second bevel should be filled completely by one or two runs;
- after turning over again, the first bevel should be completely filled.

3.2 Tensile tests

3.2.1 *Preparation of tensile test pieces*

3.2.1.1 Three test pieces should be taken.

3.2.1.2 The tensile test pieces should be machined as shown in Figure 5.

3.2.2 *Tensile test requirements*

The tests should be made at ambient temperature, unless otherwise specified. *

3.3 Expression of results

Wherever the break occurs, the conventional bond strength, expressed in kilogrammes-force per square millimetre, should be obtained by dividing the total breaking load, expressed in kilogrammes-force, by the initial cross-sectional area of the test piece, expressed in square millimetres. The position of the break should be stated in the test report.

* In accordance with ISO Recommendation R 82, *Tensile testing of steel*.