

Specification for

Bronze welding by gas

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Committees responsible for this British Standard

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- BNF Metals Technology Centre
- British Association for Brazing and Soldering
- British Non-ferrous Metals Federation
- Electrical, Electronic, Telecommunications and Plumbing Union
- Electricity Supply Industry in England and Wales
- Heating and Ventilating Contractors' Association
- Institute of Refrigeration
- Joint Industry Board for Plumbing Mechanical Engineering Services in England and Wales
- Society of British Aerospace Companies Limited
- Welding Institute
- Coopted member

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Foreword

This British Standard has been prepared under the direction of the Welding Standards Policy Committee and supersedes BS 1724:1959 which is now withdrawn.

In some applications, certain of the tests described in this standard may necessitate a routine sampling procedure; such a procedure should be agreed between purchaser and manufacturer at the time of ordering. Attention is drawn to BS 2635 which covers the drafting of specifications based on limiting the number of defectives permitted in small samples.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General requirements

1 Scope

This British Standard specifies requirements for bronze welding by any of the following combinations of gases:

- a) oxy-acetylene;
- b) oxy-hydrogen;
- c) oxy-propane.

The parent metals covered are:

- 1) copper¹⁾;
- 2) carbon steel;
- 3) galvanized carbon steel;
- 4) cast iron;
- 5) malleable iron;
- 6) combination of any two of 1) to 5).

Section 1 covers general requirements and section 2 covers specific requirements for individual applications.

NOTE The titles of publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the definitions given in BS 499-1 apply. For convenience the following definitions from BS 499 are given below.

2.1

braze welding

the joining of metals using a technique similar to fusion welding and a filler metal with a lower melting point than the parent metal, but neither using capillary action as in brazing nor intentionally melting the parent metal

NOTE In general the melting point of the filler metal is above 850 °C.

2.2

bronze welding

a form of braze welding in which copper-rich filler metal is used

NOTE The meaning attached to this term is quite arbitrary, since bronze is not used. Bronze welding, unlike brazing, does not depend upon capillary action. It uses a gas welding technique and the bonding of the joint results from wetting the unmelted surfaces and inter-diffusion of the filler metal and the parent metal.

2.3

parent metal

metal to be joined or surfaced by welding, braze welding or brazing

2.4

filler metal

metal added during welding, braze welding, brazing or surfacing

2.5

flux

material used during welding, brazing or braze welding to clean the surfaces of the joint chemically, to prevent atmospheric oxidation and to reduce impurities. In arc welding, many other substances, which perform special functions, are added

3 Basic requirements

3.1 Parts to be joined

The parts shall be thoroughly clean, all surface scale, dirt, grease, paint, rust or other surface contamination being carefully removed.

NOTE Appendix A gives recommendations for joint design and preparation but others may be used.

3.2 Preheating

Where preheating of the parts is required, it shall be carried out in such a way that the parent metal is not over-heated, which would cause excessive surface oxidation of the parent metal or volatilization of the constituents of the filler metal when this is applied.

3.3 Flame adjustment

The flame shall be adjusted to a slightly oxidizing condition.

NOTE This requirement is necessary to minimize volatilization of the zinc in the filler metal and to minimize porosity in the resultant joint.

3.4 Flux removal

The removal of flux residues is always desirable, especially if the type of flux used may promote subsequent corrosion, and when it is required subsequently to paint or electroplate the work the flux residues shall be completely removed.

NOTE 1 Guidance on removal of flux residues is given in Appendix B.

NOTE 2 Fluxes contain irritant or toxic chemicals and should therefore be treated with appropriate caution. Irritant fumes can also be emitted on heating; these fumes should not be inhaled.

4 Operator approval

For the purposes of this standard a bronze welder shall be considered to be approved if he has either:

- a) completed tests detailed in clause 5 a), b) where relevant, c) and d); or
- b) obtained approval in accordance with BS 1723-4 for an appropriate process.

¹⁾ The process defined in clause 2 can be applied satisfactorily to certain copper alloys but, because special considerations arise with some other types of copper alloys, the scope of this specification has been limited to the coppers specified in 7.1.

5 Examination of bronze welded joints

The examination of bronze welded joints shall be by one or more of the following methods:

- a) visual examination;
- b) non-destructive physical tests on completed work;
- c) macro-examination of polished sections on prepared samples;
- d) destructive tests on prepared samples.

NOTE 1 The purchaser or his representative should specify which of these are to be carried out.

NOTE 2 By agreement with the contractor, joints from finished work may be subjected to c) and d).

NOTE 3 The sampling procedure and number of tests should be the subject of agreement between the purchaser, or his representative, and the contractor.

6 Test procedures

6.1 General

The methods of test shall be in accordance with BS 1723-3.

6.2 Visual examination

Visual examination shall, in all cases, be based on the completed joint, and shall include the heat affected zone. The weld shall be examined for regularity of shape and size of deposit, for cleanliness of the filler metal and for evidence of porosity. Isolated blowholes or a concentration of pinholes in the weld metal shall be regarded as grounds for rejection, but isolated pinholes shall not be so regarded.

6.3 Non-destructive physical tests on completed work

Non-destructive physical tests on completed work include hydraulic or air pressure tests on complete assemblies and shall comply with the British Standard or other specification covering the performance required of the finished article.

6.4 Macro-examination of polished sections

Test specimens for macro-examination of polished sections shall be obtained from sample welds made by operators who are being tested for their ability to satisfy the requirements of this standard.

A section or sections shall be cut through the joint and shall be suitably prepared and polished. The joint shall show satisfactory penetration, adhesion and freedom from porosity in all sections examined.

6.5 Destructive tests on sample welds

6.5.1 General

The weld shall comply with BS 1723-3 or with 6.5.2, 6.5.3 or 6.5.4 as appropriate.

6.5.2 Destructive tests for butt joint in sheet and plate

When tested in accordance with C.1, failure of the test piece shall occur clear of the weld and weld junctions, or if failure occurs in the weld or weld junctions at a value not less than 90 % of the tensile strength of the annealed parent metal.

6.5.3 Destructive tests for cruciform test specimen

When tested in accordance with C.2, failure shall occur clear of the weld or weld junctions, or if it occurs in the weld or weld junctions, at a value not less than 80 % of the tensile strength of the annealed parent metal.

6.5.4 Destructive test for flattening copper tube

When tested in accordance with C.3, the flattened copper weld shall show no cracking of the weld metal or lifting from the pipe wall, evidence of slight cracking at the doubled portions of the test piece shall not be a cause of rejection.