

Specification for

Copper and copper alloys —

Plate

Co-operating organizations

The Non-ferrous Metals Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments, and scientific and industrial organizations:

- Aluminium Federation
- Association of Bronze and Brass Founders
- Association of Consulting Engineers, Incorporated
- Board of Trade
- British Bronze and Brass Ingot Manufacturers' Association
- British Electrical and Allied Manufacturers' Association*
- British Lead Manufacturers' Association
- British Non-ferrous Metals Federation*
- British Non-ferrous Metals Research Association*
- Copper Development Association*
- Crown Agents for Oversea Governments and Administrations
- Electric Cable Makers' Confederation*
- Institute of British Foundrymen
- Institute of Metals
- Institution of Mechanical Engineers (Automobile Division)
- Institution of Mining and Metallurgy
- Institution of Production Engineers
- Institution of Structural Engineers
- Lead Development Association
- Light Metal Founders' Association
- London Metal Exchange
- Magnesium Industry Council
- Ministry of Defence (Army Dept)*
- Ministry of Defence (Navy Dept)
- National Brassfoundry Association
- Non-ferrous Metal Stockists*
- Post Office*
- Royal Institute of British Architects
- Society of British Aerospace Companies
- Society of Motor Manufacturers and Traders Ltd.*
- Tin Research Institute
- Zinc Development Association
- Individual manufacturers

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- British Clock and Watch Manufacturers' Association
- Electronic Engineering Association
- Institute of Sheet Metal Engineering
- National Physical Laboratory (Ministry of Technology)
- Spring Research Association
- Telephone Manufacturers Technical Development Committee
- Individual manufacturers

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Foreword

This standard makes reference to the following British Standards and to those listed in Appendix C.

BS 18, *Methods for tensile testing of metals*.

BS 1957, *Presentation of numerical values (fineness of expression; rounding of numbers)*.

BS 2870 to BS 2874 inclusive, *Specifications for copper and copper alloys*.

This British Standard is the first revision in metric terms of one of a series of schedules for copper and copper alloy in various wrought forms, the preparation of which was authorized by the Non-ferrous Metals Industry Standards Committee. Others in the series are:

BS 2871, *Copper and copper alloys. Tubes*.

BS 2872, *Copper and copper alloys. Forging stock and forgings*.

BS 2873, *Copper and copper alloys. Wire*.

BS 2874, *Copper and copper alloys. Rods and sections*.

BS 2875, *Copper and copper alloys. Plate*.

In preparing the metric standard only materials for general engineering purposes have been included and all references to electrical properties have been deleted. Where materials included in this standard are required with specified electrical properties the appropriate references have been quoted in Appendix C.

In the case of materials CZ108, CN104 and CN106 the demand has dropped to a point where inclusion is no longer warranted and they have, therefore, been withdrawn. Alloys not covered by this standard which are available in other product forms have been included in Appendix A.

Attention is drawn to the fact that existing individual standards (listed in Appendix C) will not be revised in metric terms but will be retained in imperial units during the transition period from imperial to metric units. It is anticipated that these individual standards will be progressively withdrawn, so that by not later than 1975, all these standards will have been withdrawn.

In this revised specification, metric units of the *Système International d'Unités* (SI) have been used, with the exception of values for tensile strength and proof stress, for which the hbar has been used ($1 \text{ hbar} = 10 \text{ MN/m}^2$). These have been adopted by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). It is expected that they will become the generally accepted metric units throughout the world and their adoption in the United Kingdom at the present time will thus avoid the necessity for two separate changes, first from traditional imperial units to metric technical units, and then later to SI units. In the case of tensile strengths and proof stresses, conversion factors and direct comparisons between the three sets of units have been included in Appendix B.

Particular attention has been paid to the recommendations issued by the International Organization for Standardization in respect of chemical compositions. Where the technical committee has agreed to accept the ISO recommendations the appropriate requirements have been written in, and in the case of alloys which comply with, or fall within, ISO recommended ranges, the comparable ISO designation has been included.

Some reduction in size of this standard has been achieved by tabulation of chemical composition and mechanical properties instead of setting out each individual alloy on separate pages as in the previous issue.

All tables of tolerances have been reviewed, and revised values in accordance with the latest agreed practice have been inserted.

Throughout this standard, and the others in the series, a unified system of symbols has been used to designate the alloys and suffix letters have been used to indicate the temper or condition of heat treatment in which the materials are available.

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 18, 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.

0 Scope

Section 1 of this British Standard specifies requirements for wrought copper and copper alloy plate for general purposes over 10.0 mm thick.

Section 2 gives special requirements for particular applications of certain materials included in the schedule.

1 General requirements

1.1 General

The plate shall comply with the general requirements set out below and with the requirements of Table 7 – Table 12.

1.2 Definition

For the purposes of this British Standard the following definition applies:

Plate

flat material over 10.0 mm thick and over 300 mm¹⁾ wide

1.3 Information to be supplied by the purchaser

The purchaser shall state on his enquiry and order the following information:

- 1) The designation of the material required (selected from Table 7 – Table 12).
- 2) The condition of the material (selected from Table 7 – Table 12).
- 3) Whether mechanical or embrittlement tests are required (see 1.8.1 and 1.8.2).
- 4) Whether any special acceptance tests are required.
- 5) Whether a certificate of compliance is required (see 1.12).
- 6) Whether it is the purchaser's intention to inspect the material at the supplier's works (see 1.13).

1.4 Freedom from defects

The material shall be clean, smooth and free from harmful defects.

1.5 Chemical composition

The chemical composition shall comply with the requirements given in Table 7 – Table 12.

1.6 Condition

The material shall be supplied in one of the following conditions as specified by the purchaser and selected from Table 7 – Table 12:

- | | |
|---|--------------------------------------|
| M | As manufactured |
| O | Annealed (soft) |
| H | Hard, i.e. produced by cold rolling. |

1.7 Dimensions and tolerances

1.7.1 Width, length or diameter. The width, length or diameter of hot-rolled plate shall be not less than that specified by the purchaser.

The width, length or diameter of cold-rolled plate shall be as ordered within the tolerances specified in Table 1 and Table 2.

1.7.2 Thickness. The thickness of hot-rolled plate at any point shall not vary from the specified thickness by more than the appropriate tolerance specified in Table 3.

The thickness of cold-rolled plate at any point shall be as ordered within the tolerances specified in Table 4.

¹⁾ Material 300 mm wide and less may be supplied in accordance with this standard but this will normally be cut from wider material.

1.7.3 Weight. The weight shall not exceed that obtained by calculation from the specified dimensions by more than the appropriate tolerance specified in Table 5.

For the purposes of calculating the specified weight the density shall be taken as that given for the appropriate material in Table 6.

1.8 Selection of test samples

1.8.1 Mechanical tests. When tests are specifically called for by the purchaser, test samples shall be taken from the scrap margins of the plates. By special arrangement, separately prepared test samples may be used provided that they are taken from the same cast of metal and treated throughout in a similar manner to the plate they represent. The number of samples to be taken in respect of each order shall be the subject of agreement between the supplier and the purchaser.

The test samples shall not be annealed or mechanically worked (other than being machined to the shape of the test piece) before being tested.

1.8.2 Gassing or hydrogen embrittlement test. Materials C103, C106, C107. When a gassing or hydrogen embrittlement test is required the selection of test samples and the number of tests to be made shall be agreed between the purchaser and the supplier.

1.9 Mechanical test (including preparation of test pieces)

1.9.1 Tensile test. The tensile test shall be made in accordance with BS 18²⁾. The values obtained shall comply with the appropriate requirements given in Table 7 – Table 12.

For thicknesses up to and including 16 mm the tensile test shall be made on a test piece of full thickness of the plate provided that this does not exceed the width. It shall be machined to conform to the dimensions of the appropriate test piece specified in BS 18²⁾ and have a gauge length of 200 mm for copper (C101-C107 inclusive) and $5.65\sqrt{S_0}$ for copper alloys.

For material over 16 mm thick a machined test piece conforming to the dimensions of the British Standard proportional round test piece specified in BS 18²⁾ shall be used.

1.10 Gassing or hydrogen embrittlement test

The gassing or hydrogen embrittlement test shall be made on test pieces of convenient size selected as specified in 1.8 from each surface. The edges of the test piece shall be carefully rounded and smoothed longitudinally. After being exposed to an atmosphere of hydrogen for 30 min at 825 °C to 875 °C and subsequently cooled out of contact with air, the test pieces shall be subjected to a close bend test as described below and examined for cracking. The test piece AB is bent by steadily applying pressure or a succession of blows at right angles to the length AC and flattened close until A assumes the position indicated by D (see Figure 1). The original surface of the plate shall be on the outside of the bend. The test piece shall not crack when subjected to this test.

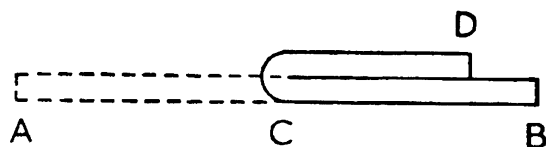


Figure 1 — Test piece

1.11 Retests

Should any one of the test pieces first selected by the purchaser or his representative fail to pass any of the prescribed tests, two further samples from the same batch shall be selected for testing, one of which shall be from the plate from which the original test sample was taken, unless that plate has been withdrawn by the supplier.

²⁾ BS 18, "Methods for tensile testing of metals".