

CONFIRMED
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Summary and application of copper and copper alloy tubes for ships' pipework systems

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- BNF Metals Technology Centre
- British Non-ferrous Metals Federation
- British Ship Research Association
- British Shipbuilders
- British Steel Industry
- Department of Transport (Marine Directorate)
- General Council of British Shipping

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Foreword

This revision of BS MA 60, which was based on a proposal from the British Ship Research Association, has been prepared under the direction of the Shipbuilding and Marine Standards Committee. It supersedes BS MA 60:1974 which is withdrawn.

In present day shipbuilding, the use of copper tubes is usually confined to piping services in ships' accommodation areas or for instrumentation and control systems in the machinery spaces. Copper alloy tubes are predominantly used on sea-water services where the useful life of copper tubes is limited because of the material's susceptibility to impingement attack arising from high water velocities and excessive turbulence.

The metric revision of BS 2871 "*Copper and copper alloys. Tubes*" has been published in three Parts as follows:

- *Part 1: Copper tubes for water, gas and sanitation;*
- *Part 2: Tubes for general purposes;*
- *Part 3: Tubes for heat exchangers.*

of which Parts 1 and 2 are relevant to this marine application standard.

The size range of tubes covered by this standard has been extended above the limit of 508 mm outside diameter, given in BS 2871-2, to a maximum of 1 820 mm outside diameter and aligns with the size range of flanges specified in BS 4504-2. The outside diameters of these larger bore copper alloy tubes correspond to the outside diameters of similar sized carbon steel tubes specified in marine standard BS MA 49.

Because of slight differences in outside diameters occurring in BS 2871-1 and BS 2871-2, the following system of classification has been adopted in this standard:

- group A consists of copper tube sizes from BS 2871-1 that are mainly intended for connection by means of capillary or compression couplings;
- group B consists of copper and copper alloy tube sizes from BS 2871-2 for connection by means of couplings or flanges, as required by the purchaser.

Reference should be made to BS 1306 for design, manufacture and installation of copper and copper alloy pipework and to regulatory body rules.

NOTE Users of this standard should note that while observing the requirements of the standard, they should at the same time ensure compliance with such statutory requirements, rules and regulations as may be applicable to the individual ship concerned.

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 and ii, pages 1 to 8, 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.

1 Scope

This British Standard summarizes a series of copper and copper alloy tubes intended for use with pipe couplings or flanges for ships' piping systems. It applies to tube materials, temper conditions, pressure and temperature limitations and size ranges based on BS 2871-1 and 2871-2. Tests that are to be used by tube manufacturers are described. Reference to appropriate coupling and flange standards is also made.

Minimum thicknesses of copper and copper alloy tubes are given in Table 5.

This standard does not apply to tubes intended for use in cryogenic services, or in heat exchangers, which are subject to special tolerances on tube thickness and outside diameter (see BS 2871-3).

NOTE 1 For the purpose of this standard, the term "tube" has been used in accordance with international agreement. No difference is intended in meaning between "tube" and "pipe", although idiomatic use prefers sometimes one and sometimes the other.

NOTE 2 Information to be supplied by the purchaser is included as Appendix A.

NOTE 3 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Classification

NOTE Copper and copper alloy tubes have a wide range of applications for shipboard piping services, but can be generally divided into two main groups.

For the purpose of this standard, copper and copper alloy tubes shall be classified as follows.

2.1 group A. This group consists of copper tubes in accordance with Table X or Table Y of BS 2871-1:1971 for use mainly on ships' domestic water services in accommodation areas or for other low pressure duties such as air vent pipes.

2.2 group B. This group consists of copper and copper alloy tubes in accordance with BS 2871-2 and tubes rolled from plate for use on ships' general piping systems in machinery spaces and other engineering and ship services.

3 Method of manufacture

3.1 Tubes up to and including 508 mm outside diameter shall be solid drawn seamless in accordance with BS 2871-1 and BS 2871-2. Tubes of larger diameter not covered by BS 2871-1 and BS 2871-2 shall be either:

- a) seamless; or
- b) fabricated from plate, cut and rolled in shape, methods of welding and seams being in accordance with BS MA 18.

3.2 Where necessary, tubes shall be suitably heat treated to obtain the required temper condition (see clause 5).

4 Materials and applications

NOTE The designations used in this clause are those of BS 2871-2.

4.1 Phosphorus deoxidized non-arsenical copper, C 106

This material shall be used where ease of fabrication is important.

NOTE This is the designation of copper normally used for engineering, plumbing and heating.

4.2 Aluminium brass, CZ 110

This material shall be used for tubes for ships' condensers, auxiliary plant, pipework, and ships' heating coil installations, where permitted.

NOTE This designation has a high resistance against sea water impingement attack and forms good self-healing protective films in sea or estuarine waters reasonably clean and free from abrasive solids in suspension.

Table 1 — Temper conditions and hardness

Material	Designation	Form of supply	Temper condition	Vickers hardness (HV)
Copper	C 106	Coils	0 ^a	60 max.
		Straight lengths	½H ^b	75 to 100
Aluminium brass	CZ 110	Straight lengths	TA ^c	85 to 110
90/10 Copper-nickel-iron	CN 102	Coils	0 ^a	100 max.
		Straight lengths	0 ^a	100 max.
70/30 Copper-nickel-iron	CN 107	Straight lengths	0 ^a	110 max.
Aluminium-nickel-silicon brass	CZ 127	Straight lengths	WP ^d	140 max.
^a Annealed condition (0). ^b Half-hard condition (½H) produced by cold drawing. ^c Temper annealed condition (TA). Tubes heat treated over their length to an intermediate temper. ^d Solution heat treated and precipitation treated (WP).				