

Specification for

Wrought aluminium and aluminium alloys for general engineering purposes (supplementary series) —

**5454 Bar, extruded round tube and
sections**

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
- 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 Federation High Conductivity Copper Group
- 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 Department
- Ministry of Defence, Navy Department*
- 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 department 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:

- ALARS (Association of Light Alloy Refiners and Smelters)
- Institute of Sheet Metal Engineering
- Lloyd's Register of Shipping
- London Transport Board
- National Association of Drop Forgers and Stampers
- National Federation of Vehicle Trades
- Rolled Thread Screw Association
- Small Rivet Association
- Welding Institute.

This British Standard, having been approved by the Non-ferrous Metals Industry Standards Committee, and published under the authority of the Executive Board on 31 December 1969

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Foreword

This standard makes reference to the following British Standards:

BS 18, *Methods for tensile testing of metals — Part 1: Non-ferrous metals*.

BS 1499, *Sampling non-ferrous metals*.

BS 1728, *Methods for the analysis of aluminium and aluminium alloys*.

BS 3660, *Glossary of terms used in the wrought aluminium industry*.

BS 4229, *Sizes of ferrous and non-ferrous bars — Part 1: Non-ferrous bars*.

This British Standard specification for bar, extruded round tube and sections is one of a series of supplementary specifications for wrought aluminium and aluminium alloys, the preparation of which has been authorized by the Non-ferrous Metals Industry Standards Committee. In reflection of the decision of the Government that British industry should effect a complete change to the metric system by 1971, this specification is expressed in metric terms. For the convenience of users however equivalent properties have been cited in tonf/in² units.

Aluminium and aluminium alloy materials intended for general engineering use are the subject of specification in BS 1470–BS 1475 whilst those intended for specialized use or which are of limited interest, are published in the supplementary engineering series. The latter series will be kept under frequent review, and if changed circumstances appear to warrant such, from time to time particular material specifications may be transferred from the supplementary to the general engineering series.

As a major step towards alignment of aluminium and aluminium alloy compositions on an international basis, a substantial number of countries have agreed to adopt a 4-digit classification for alloy composition designation. This system is administered by the Aluminum Association Inc., who issue the “Registration Record of International Alloy Designations and Chemical Composition Limits for Wrought Aluminum Alloys”.

By amendment, it has been decided to introduce this system into the British Standards concerned with these types of material in place of the material designations formerly used. The details of the system are given in Appendix B.

The temper designations and associated mechanical property requirements remain unaltered for the present and therefore may not necessarily align precisely with those in the standards of other countries.

The designation 5454 therefore replaces the former designation NE 51 (nearest ISO equivalent AlMg3 Mn). Minor compositional changes have been made.

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 16 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.

Scope

This British Standard relates to bar, extruded round tube and sections.

1 General requirements

1.1 General

The bars, extruded round tube and sections shall comply with the general requirements set out in the following clauses and with the appropriate requirements specified in Section 2.

1.2 Definitions

For the purposes of this British Standard, the following definitions apply:

purchaser

the party, whether user, retailer, wholesaler, or corporate body, or their agent(s) as appropriate, responsible for ordering the material standardized

bar¹⁾

a round, rectangular or polygonal solid section supplied in straight lengths. The term is applied to materials of not less than 6 mm diameter or minor dimension

extruded round tube¹⁾

a circular hollow extrusion of uniform wall thickness not subjected to cold drawing

hollow section¹⁾

an extruded shape other than round, the cross-section of which completely encloses a void or voids, and which is not subjected to cold drawing

regular section

a solid drawn or extruded section, not otherwise covered by the definition of bar, which can be conveniently divided into approximate rectangles with measurable dimensions, e.g., angles, channels, tees, etc. The ratio of maximum to minimum thickness of such regular sections does not exceed 4 : 1.

1.3 Freedom from defects

The material shall be free from defects prejudicial to its use.

1.4 Chemical composition

The chemical composition shall comply with the requirements specified in 2.1.

1.5 Condition

The material shall be supplied in one of the following conditions as specified by the purchaser and cited in 2.2.

M — As manufactured. Material which acquires some temper from shaping processes in which there is no special control over thermal treatment or amount of strain hardening.

O — Annealed. Material which is fully annealed to obtain the lowest strength condition.

1.6 Sizes and tolerances

1.6.1 Standard sizes. Material may be manufactured in the standard sizes for round, square and hexagonal bar given in BS 4229-1²⁾. Details of standard sizes and thicknesses are given in Appendix A.

¹⁾ Extracted from BS 3660 "Glossary of terms used in the wrought aluminium industry".

²⁾ BS 4229, "Sizes of non-ferrous and ferrous bars", Part 1, "Non-ferrous bars".

1.6.2 Tolerances on round bar, hexagonal bar, regular sections, extruded round tube and hollow sections. The dimensional tolerances shall comply with the following tables.

Table 1 — Tolerances on diameter and length of round bar intended for use on automatic lathes.

Table 2 — Tolerances on width across flats of hexagonal bar for nuts and bolts.

Table 3 — Tolerances on length.

Table 4 — Tolerances on width and diameter of bars and regular sections.

Table 5 — Tolerances on thickness of bars and regular sections.

Table 6 — Tolerances on the open ends of channels and I-beams.

Table 7 — Angular tolerances for extruded sections.

Table 8 — Normal radii for corners of square, rectangular and regular sections.

Table 9 — Tolerances on wall thickness of extruded round tube.

Table 10 — Tolerances on outside diameter of extruded round tube.

Table 11 — Tolerances on width or width across flats of hollow sections.

Table 12 — Tolerances on thickness of hollow sections.

Table 13 — Tolerances on straightness for extruded bar, regular sections and extruded round tube.

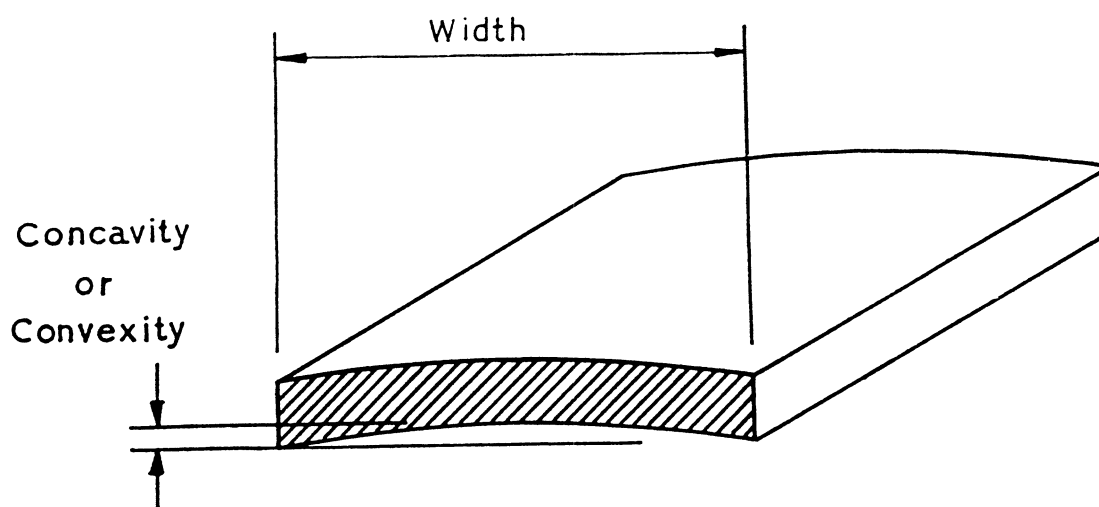
Table 14 — Twist tolerances for extruded solid and hollow sections.

Regular sections shall include square and rectangular bars, angles, T-sections, I-beams, H-sections, Z-sections, and any other normal type of sections which can conveniently be divided into approximate rectangles with measurable dimensions.

For the purposes of tolerances, any such section shall be divided into a series of equivalent rectangles, an angle for example, being divided into two rectangles. For the purposes of determining tolerances on thickness and width, the widths of each such rectangle shall be the same as the major linear dimension of the angle, and the tolerance on thickness of each leg of the angle shall be taken as if that leg were a rectangle of the same overall dimension.

1.6.3 Sections of complicated shape. Complicated sections shall be regarded as those sections which are not covered by the tolerance tables. In such cases, the tolerances shall be agreed between the supplier and the purchaser. The tolerances shall be based, as far as possible, on those for regular sections and for extruded hollow sections.

1.6.4 Tolerances on concavity and convexity. A maximum tolerance on concavity and convexity of 0.05 mm per 10 mm shall apply over the width of the section.



1.7 Selection of test samples

Bars, extruded round tube and sections of the same dimensions, produced in the same way, and of the same composition, shall be grouped into batches as follows:

Diameter or equivalent cross section of material	Batch quantity
mm	kg
Up to and including 9	500
Over 9 up to and including 20	1 000
Over 20 up to and including 50	1 500
Over 50	2 000

One test sample shall be cut from a bar, tube or section selected from each batch. For bars, and for test samples representing bars up to and including 50 mm diameter or minor sectional dimension, the test piece shall be machined coaxially from the test sample. For bars over 50 mm diameter or minor sectional dimension the longitudinal axis of the test piece shall be located at half the distance between the surface and the centre. Before the test samples are cut off, they shall be marked to identify them with the batch they represent. The test samples shall be taken from the material as supplied, and shall not be further annealed or mechanically worked (except for straightening and machining the test piece) before being tested.

1.8 Mechanical tests

The following tests shall be made on test pieces prepared from test samples selected as specified in 1.7.

1.8.1 Tensile test. The tensile test shall be made in accordance with BS 18-1³⁾. It is recommended that non-proportional test pieces should be used for testing products thinner than 12.5 mm. The values obtained shall comply with the requirements specified in 2.2.

1.8.2 0.2 proof stress. The proof stress shall be determined as specified in BS 18-1³⁾. The values obtained shall comply with the requirements specified in 2.2.

1.9 Retests

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

Should the test pieces from both these additional samples pass, the batch represented by the test samples shall be deemed to comply with this standard. Should the test pieces from either of these additional samples fail, the batch represented by the test samples shall be deemed not to comply with this standard.

1.10 Certificate of compliance

The supplier shall certify that the material complies with the requirements of this standard.

1.11 Inspection

If the purchaser wishes to inspect the material at the suppliers' works he shall notify the supplier at the time of placing the order.

1.12 Independent test

Should there be a dispute about the compliance of the material with regard to the composition or the test requirements of this standard, the purchaser and the supplier shall have the right to have tests made by a mutually acceptable testing authority.

³⁾ BS 18, "Methods for tensile testing of metals", Part 1, "Non-ferrous metals".