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ALUMINIUM AND ALUMINIUM ALLOY SECTIONS

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BRITISH STANDARD SPECIFICATION

ALUMINIUM AND ALUMINIUM ALLOY SECTIONS

B.S. 1161 : 1951

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THIS BRITISH STANDARD, having been approved by the Non-ferrous Metals Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 15th February, 1951.

First published March, 1944
First revision February, 1951

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 1700, indexed and cross-indexed for reference, together with an abstract of each standard, will be found in the Institution's Yearbook, price 5s. post free.

This standard requires reference to the following British Standard:—

B.S. 1476, 'Wrought aluminium and aluminium alloys. Bars, rods and sections.'

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or edition.

NFE/21

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:—

*Admiralty
*Aluminium Development Association
Association of Bronze and Brass Founders
Association of Consulting Engineers Incorporated
*Association of Non-ferrous Metal Stockists
Brass and Copper Tube Association
Brass Wire Association
British Bronze and Brass Ingot Manufacturers' Association
*British Electrical and Allied Manufacturers' Association
*British Non-ferrous Metals Research Association
Cable Makers' Association
Cold Rolled Brass and Copper Association
Copper Development Association
Crown Agents for the Colonies
General Post Office
High Conductivity Copper Association
Institute of British Foundrymen
Institute of Metals
*Institution of Mechanical Engineers (Automobile Division)
Institution of Mining and Metallurgy
*Institution of Structural Engineers
Lead Sheet and Pipe Manufacturers' Federation
Light Metal Founders' Association
London Metal Exchange
Manufactured Copper Association
*Ministry of Supply
National Brassfoundry Association
Nickel Silver Association
Office of the High Commissioner for India
Sheet Makers' Conference
Society of British Aircraft Constructors
Tin Research Institute
*Wrought Light Alloys Association
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 Railways, The Railway Executive
Institution of Civil Engineers
Institution of Mechanical Engineers
Institution of Naval Architects
Lloyds Register of Shipping
Ministry of Works
North-East Coast Institution of Engineers and Shipbuilders
Railway Carriage and Wagon Builders' Financiers' Parliamentary Association
Royal Aeronautical Society
Ship and Boat Builders' National Federation
Society of Motor Manufacturers and Traders

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BRITISH STANDARD SPECIFICATION FOR

ALUMINIUM AND ALUMINIUM ALLOY SECTIONS

FOR GENERAL ENGINEERING PURPOSES

FOREWORD

This British Standard was originally issued in 1944 as the first of a series intended to cover those light aluminium alloy sections that had become standardized by usage in the various branches of engineering. The present revision includes additional sizes of the types of aluminium alloy sections that were covered in the earlier edition, and the standard now applies also to sections made from pure aluminium. All these sections are available for incorporation in designs, but attention is drawn to the fact that not all manufacturers may be able to supply the whole range of sizes, though many manufacturers are in a position to supply most of the sizes listed. Sections larger than those shown in the tables can be supplied by arrangement between the supplier and the purchaser; it should not be assumed that the sizes listed are the largest available.

The descriptive nomenclature used for the sections is largely that which has become established for the steel sections used for corresponding purposes, and the tables give corresponding information to that provided in the British Standards for steel sections.

It has not been found practicable to include metric sizes of sections in this edition. Metric equivalents of the figures in the tables are being calculated, however, with a view to their being published separately.

SPECIFICATION

SCOPE

1. This British Standard gives the dimensions, geometrical proportions and weight per foot run of the following range of aluminium and aluminium alloy sections:—

Equal angle sections	from ¾ × ¾ in. to 9 × 9 in.
Unequal angle sections	from 1½ × 1 in. to 12 × 6 in.
Channel sections	from 3 × 1½ in. to 12 × 4 in.
I sections	from 3 × 1½ in. to 12 × 6 in.
Tee sections	from 1 × 1 in. to 9 × 9 in.

For certain sections, more than one thickness has been standardized.

The standard does not include information on the use of these sections, or such factors as are more appropriate to Codes of Practice and similar documents.

GENERAL

2. *a.* British Standard aluminium and aluminium alloy sections for general engineering purposes shall conform to the sizes given in the following tables :—

Table 1	Equal angle sections
Table 2	Unequal angle sections
Table 3	Channel sections
Table 4	I sections
Table 5	Tee sections

The values for weight per foot given in these tables have been based on a specific gravity of 2·8, and conversion factors for the various alloys are given in the appendix.

b. The properties of the sections given in the tables are based upon all the corners being square, but, at the discretion of the supplier, a rounded corner of small radius may be allowed in order to facilitate production. On sections up to and including 3/16 in. thick, the radius shall be not more than 1/32 in., and on sections thicker than 3/16 in. the radius shall be not more than 1/16 in.

DIMENSIONS AND TOLERANCES

3. The dimensions of the sections shall be in accordance with Tables 1 to 5, and the tolerances for regular sections shall comply with the following tables :—

Table 6. Tolerances on overall widths and widths across flats for regular sections.
Table 7. Tolerances on thickness for regular sections.

For purposes of tolerances, a section shall be divided into a series of equivalent rectangles ; an angle, for example, being divided into two rectangles. For the purpose of determining the 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 thickness of each leg of the angle shall be toleranced as if that leg were a rectangle of the same overall dimension.

Concavity and convexity, twist and straightness. All sections shall be supplied in a straightened condition and shall be reasonably free from twist. Special tolerances for straightness, twist, or surface flatness shall be the subject of agreement between the supplier and the purchaser.

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Angular tolerance. The tolerance on angles of any section up to a maximum of 20 ft. in length, where the thickness of metal is not less than 5/16 in. and the overall dimension is not less than 3 in., shall be plus or minus 2°. Tolerances on angles of other sections shall be agreed between the supplier and the purchaser.

The tolerances in Tables 6 and 7 are not appropriate to sections for which specially close tolerances are required. Additional manufacturing operations are necessary where specially close tolerances are required, and such tolerances shall be agreed between the supplier and the purchaser.

Length. The sections may be ordered in lengths up to the following:—

Section	Sizes	Normal maximum length*
	in.	ft.
Equal angle sections	Up to and including 2 × 2	20
	Above 2 × 2	30
Unequal angle sections	Up to and including 2½ × 2	20
	Above 2½ × 2	30
Channel sections	All sizes	30
I sections	All sizes	30
Tee sections	1½ × 1½ × ¼ to 2 × 2 × ¼	20
	All other sizes	30

* The sections given in this standard can be supplied either in specified cut lengths or in random lengths, in accordance with the purchaser's requirements.

The lengths shown in the column headed 'Normal maximum length' represent the greatest that could be readily and generally available, either as random lengths or as specified cut lengths.

For special purposes and by arrangement between the supplier and the purchaser lengths up to approximately twice the normal maximum length can be obtained.

Length requirements should be clearly stated on the order.

MATERIAL

4. The aluminium or aluminium alloy of which the sections are to be made shall be specified by the purchaser.

NOTE. The appendix includes some general information about aluminium alloys.

APPENDIX

MECHANICAL PROPERTIES OF ALUMINIUM ALLOYS

The sections specified in this British Standard may be produced in any of the wrought materials specified in B.S. 1476, 'Wrought aluminium and aluminium alloys. Bars, rods and sections.' A summary of the mechanical properties of these materials is given below, but B.S. 1476 should be consulted for full details of chemical composition, mechanical properties and inspection and testing procedure for the material.

B.S. 1476 forms part of a comprehensive series of British Standards for aluminium and aluminium alloys, and the following system of nomenclature has been adopted throughout the series:—

a. Form of material.

E = Bars, rods and sections (B.S. 1476)
S = Sheet (up to and including 0·252 in. thick) and strip (up to and including 0·192 in. thick) (B.S. 1470)
C = Clad sheet and strip (B.S. 1470)
P = Plates (B.S. 1477)
PC = Clad plates (B.S. 1477)
T = Tubes (B.S. 1471)
F = Forgings (B.S. 1472)
R = Wire for rivets (B.S. 1473)
W = Welding wire (B.S. 1474)
G = Wire for general purposes (B.S. 1475)

b. Heat treatment. In the case of the aluminium alloys, the following prefix symbols have been adopted throughout:—

N = Non-heat-treatable alloys
H = Heat-treatable alloys

Thus the letters 'NE' indicate non-heat-treatable alloys in the form of bars, rods or sections. The letters 'HS' refer to heat-treatable alloys in the form of sheet and strip.

c. Condition. Suffix letters have been used to indicate the temper, or condition of heat treatment in which the materials are available. The symbols are as follows for aluminium and the non-heat-treatable alloys:—

O Material in the annealed condition.

¼H, ½H, ¾H, H — The various harder tempers in the case of sheet and strip, plates, tubes and wire.

M Material in the 'as manufactured' condition, e.g. as rolled, as extruded, straightened and/or drawn to size, or as forged in the case of forgings.

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