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WROUGHT ALLOY STEELS— AISI-SAE STANDARD HARDENABILITY (H) AND STAINLESS SERIES

[Title allocated by Defence Cataloguing Authority:METAL BARS, SHAPES AND WIRES (Wrought Alloy Steels:AISI-SAE Standard, Stainless and H Series)]

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

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THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Department of Defence

Department of Industry and Commerce

Institute of Steel Service Centres of Australia

Metal Trades Industry Association of Australia

Railways of Australia Committee

Society of Automotive Engineers—Australasia

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AUSTRALIAN STANDARD

WROUGHT ALLOY STEELS – AISI-SAE STANDARD, HARDENABILITY (H) AND STAINLESS SERIES

AS 1444—1981

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PREFACE

This edition of this standard was prepared under the direction of the Association's Committee on Iron and Steel by its subcommittee on carbon and alloy steels, to supersede AS 1444—1974. It applies in particular, to wrought alloy steels of the AISI—SAE series for general engineering purposes, supplied in the form of hot-rolled, bright and cold-sized bars for machining, bars, blooms, billets and slabs for forgings, and as forgings, to specified chemical composition only (standard and stainless series) or to specified chemical composition and subject to end-quench hardenability requirements (H series).

In this edition, the hardenability grade 655 H13 of BS 970, Part 3, has been added as X3312H, a 3.25 percent nickel-chromium steel, since it was more appropriate to include it in this standard than in the revision of AS G18 (see AS 2506). Definitions of bars, billets, blooms and slabs have been based on those adopted by ISO/TC17/SC2, Terminology, Classification and Designation of Steel. Appendix A presents purchasing guidelines, including contractual requirements, previously given in the body of AS 1444, and directs attention to matters requiring consideration at the time of enquiry and/or order. The intention is to avoid misinterpretation or other problems and to ensure a clear understanding of product requirements by both purchaser and supplier.

Apart from grades X1320H, X3312H, X4150, 4615H and 9050, the requirements for the steels specified herein are technically identical with those for the AISI—SAE steels with the same basic identification number, except for the following:

(a) Maximum phosphorus limits lower than 0.040 percent have been increased to this value in all cases.

(b) The maximum sulphur and phosphorus limits for those steels in Tables 2.1, 2.2 and 3.1 which are sometimes made in Australia by the open hearth process have been set at 0.05.

(c) Where a silicon content range of 0.20 percent to 0.35 percent is specified, this range has been increased to 0.10 percent to 0.35 percent.

(d) The specified range for one or more of the principal alloying elements has been widened for steels 5150, 5155, 5160, 9255, 9260 and 9261.

(e) The limits for residual elements mentioned in Clause 1.6.3 differ from American practice.

Information regarding the mechanical properties which can be obtained from a number of grades supplied to chemical composition is contained in the following specifications:

ASTM A 434	Quenched and Tempered Alloy Bars, Hot-rolled or Cold-finished
ASTM A 429	Hot-rolled and Cold-finished Stainless and Heat-resisting Chromium-nickel-manganese Steel Bars
ASTM A 400	Recommended Practice for Selection of Steel Bar Compositions According to Section
ASTM A 314	Stainless and Heat-resisting Steel Billets and Bars for Reforging
U.S. Fed. QQ—S—763C	Steel Bars, Shapes and Forgings, Corrosion-resisting.

Enquiries seeking information regarding the availability of steels of the AISI—SAE series not listed in this standard should be directed to the steel suppliers.

Those requiring information on welding of steel are referred to the steel manufacturer or to the Australian Welding Research Association's Technical Note 1, The Weldability of Steels.

This standard requires reference to the following Australian standards:

AS 1650	Methods for the Analysis of Iron and Steel (Metric Units)
AS 1065	Methods for Ultrasonic Testing of Ferritic Steel Forgings
AS 1171	Methods for Magnetic Particle Testing of Ferromagnetic Products and Components
AS 1213	Methods for the Sampling of Iron, Steel, Permanent Magnet Alloys and Ferro-alloys
AS 1733	Methods for the Determination of Grain Size in Metals
AS 1770	Method for the End-quench Test for Hardenability of Steel (Jominy Test)
AS 2062	Methods for Non-destructive Penetrant Testing of Products and Components
AS 2084	Methods for Eddy Current Testing of Metal Bar and Tubular Products
AS 2338	Preferred Dimensions of Wrought Metal Products
AS K1	Methods for the Sampling and Analysis of Iron and Steel

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Australian Standard

for

WROUGHT ALLOY STEELS—AISI-SAE STANDARD, HARDENABILITY (H) AND STAINLESS SERIES

SECTION 1. SCOPE AND GENERAL REQUIREMENTS

1.1 SCOPE. This standard specifies requirements for wrought alloy steels of the AISI-SAE standard, hardenability (H) and stainless series intended for general engineering purposes. It provides for the supply of hot-rolled and cold-finished (cold-sized or bright) bars for machining, bars, blooms, billets and slabs for forgings, and forgings, as follows:

(a) To specified chemical composition only (standard and stainless steel series, Section 2).

(b) To specified chemical composition and subject to end-quench hardenability requirements (H series, Section 3).

NOTE: Guidelines to purchasers on requirements that must be specified by the purchaser and those that must be agreed at the time of enquiry and/or order are given in Appendix A.

1.2 DESIGNATION. The steel shall be given an appropriate grade designation as shown in Sections 2 and 3.

1.3 DEFINITIONS. For the purpose of this standard, the following definitions apply.

1.3.1 Bars—finished products of solid section which may have rectangular, square, round or hexagonal cross-section, defined as follows:

(a) *Flat bars (flats)*—bars of rectangular cross-section, with edges of controlled contour and of thickness greater than or equal to 3 mm, width less than 600 mm, and supplied in straight lengths.

(b) *Round bars (rounds)*—bars of circular cross-section supplied in straight lengths or coils.

(c) *Square bars (squares)*—bars of square cross-section supplied in straight lengths or coils.

(d) *Hexagonal bars (hexagons)*—bars of regular hexagonal cross-section supplied in straight lenths or coils.

(e) *Bright bars*—bars which are produced by cold drawing, machining and polishing, peeling or precision grinding, and which have a smooth surface free from scale and harmful imperfections.

(f) *Cold-sized bars*—bars which are sized by cold drawing or cold rolling to provide closer dimensional tolerances than hot-rolled bars, but which may contain some surface imperfections.

1.3.2 Billet—a semi-finished forged, rolled or continuously-cast product intended for further processing into suitable finished products by forging or re-rolling. The cross-section is usually square or rectangular, with area not greater than 120 mm × 120 mm (or equivalent cross-sectional area), and the width-to-thickness ratio is less than 4:1.

1.3.3 Bloom—a semi-finished forged, rolled or continuously-cast product, intended for re-rolling or forging. The cross-section is square or rectangular, with area generally greater than 120 mm × 120 mm (or equivalent cross-sectional area), and the width-to-thickness ratio is less than 4:1.

1.3.4 Slab—a semi-finished rolled, forged or continually-cast product intended for re-rolling or forging. The cross-section is rectangular, with the thickness more than 50 mm, and the width-to-thickness ratio is equal to or greater than 4:1.

1.4 STEELMAKING PROCESS. The steel shall be made by the open hearth, basic oxygen, or an electric process.

NOTES:

1. A basic oxygen process means the process of making steel in a basic converter blown with commercially pure oxygen.
2. Additional refining by vacuum-arc-remelt (VAR), electro-slag-refining (ESR) or vacuum degassing is permitted.

1.5 CONDITION OF STEEL ON DELIVERY.

1.5.1 General. The steel shall be delivered in one of the conditions as specified in Clauses 1.5.2 to 1.5.4, as appropriate.

1.5.2 Bars, Billets, Blooms and Slabs for Forging. Bars, billets, blooms and slabs for forging shall be supplied as-rolled, as-forged or annealed.

1.5.3 Forgings and Bars. Forgings and bars shall be supplied as-rolled, as-forged or heat-treated.

1.5.4 Cold Finished Bars. Cold finished bars shall be supplied as bright bars or cold-sized bars.

NOTES:

1. Bright bars may be heat treated either before or after any cold work at the option of the manufacturer.
2. Cold-sized bars are subject to some restricitions as to grade, size, length and heat-treated condition; this information should be sought from the supplier.

1.6 CHEMICAL COMPOSITION.

1.6.1 General. The method of sampling for chemical analysis shall be in accordance with AS 1213. Chemical composition shall be determined by any procedures which are not less accurate than AS 1050 or AS K1.

1.6.2 Cast Analysis. A chemical analysis of the steel from each ladle shall be made to determine the proportions of the specified elements. In cases where it is impractical to obtain samples from liquid steel, analysis on test samples taken in accordance with Clause 3.5 of AS 1213 may be reported as cast analysis.

The reported cast analysis of the steel shall conform to the limits given in Section 2 (Tables 2.1 and 2.2) and Section 3 (Table 3.1).