

Australian Standard™

**Carbon and carbon-manganese steel—
Cold finished bars**



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Australian Standard™

Carbon and carbon-manganese steel— Cold finished bars

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee MT-001, Iron and Steel, to supersede AS 1443—1994, Carbon steels and carbon-manganese steels—Cold-finished bars. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian rather than an Australian/New Zealand Standard.

The objective of this Standard is to specify requirements for cold-finished carbon steel and carbon-manganese steel bars, manufactured from hot-rolled bars and semifinished products, for general engineering purposes.

The objective of this revision is to revise the specifications and quality requirements for suppliers and purchasers of carbon and carbon manganese steels that are manufactured as cold finished bars.

To reflect changes in steel-making technology and to meet industry requirements, the steel grades have been revised and grade prefix letters 'M' and 'U' introduced to indicate steel quality.

Steel grades with specified mechanical properties have been revised so that they align with other grades in this Standard. A table of mechanical properties of steels in the machined condition has been added.

Dimensional tolerances have been completely revised so that they align more closely with overseas Standards and industry practice.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard

Carbon and carbon-manganese steel—Cold finished bars

1 SCOPE

This Standard specifies requirements for cold-finished carbon steel and carbon-manganese steel bars manufactured from hot-rolled bars and semifinished products (see AS 1442), for general engineering purposes. The Standard applies to steel supplied to specified chemical composition only or to specified chemical composition and mechanical properties. It permits the addition of elements, such as boron, and micro-alloying elements for the achievement of special properties.

NOTES:

- 1 Advice and recommendations on information that should be supplied by the purchaser at the time of enquiry and order are given in Appendix A.
- 2 Alternative means for determining compliance with this Standard are given in Appendix B.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS

- | | |
|--------|--|
| 1171 | Non-destructive testing—Magnetic particle testing of ferromagnetic products, components and structures |
| 1199 | Sampling procedures and tables for inspection by attributes |
| 1199.0 | Part 0: Introduction to the ISO 2859 attributes sampling system |
| 1199.1 | Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection. |
| 1391 | Method for tensile testing of metals |
| 1442 | Carbon steels and carbon-manganese steels—Hot-rolled and semifinished products |
| 1654 | ISO system of limits and fits |
| 1654.1 | Part 1: Bases of tolerances, deviations and fits |
| 1654.2 | Part 2: Tables of standard tolerances grades and limit deviations for holes and shafts |
| 1733 | Methods for the determination of grain size in metals |
| 2062 | Non-destructive testing—Penetrant testing of products and components |
| 2338 | Preferred dimensions of wrought metal products |
| 2706 | Numerical values—Rounding and interpretation of limiting values |
| 4177 | Caravan and light trailer towing components |
| 4177.2 | Part 2: 50 mm towballs |

AS/NZS

- | | |
|--------|--|
| 1050 | Methods for analysis of iron and steel |
| 1050.1 | Part 1: Sampling of iron and steel for chemical analysis |

AS/NZS ISO

- 9001 Quality management systems—Requirements
- 9004 Quality management systems—Guidelines for performance improvements
- HB 18 Guidelines for third-party certification and accreditation
- HB 18.28 Guide 28: General rules for a model third-party certification scheme for products
- ISO
- 2566 Steel—Conversion of elongation values
- 2566-1 Part 1: Carbon and low alloy steels

3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

3.1 Bar

Finished product of solid section which may be rectangular, square, round or hexagonal in cross-section.

3.2 Bar conditions**3.2.1 Bright bars**

Bars produced by cold drawing, cold rolling, turning and polishing or precision grinding, and which have a smooth surface free from scale and harmful imperfections.

3.2.2 Cold-sized bars

Bars which are sized by cold drawing or cold rolling to provide closer dimensional tolerances than occur for hot-rolled bars, but which may contain some surface imperfections.

3.2.3 Peeled bars

Bars which are finished by rough machining.

3.3 Bar shapes**3.3.1 Flat bars (flats)**

Bars of rectangular cross-section, 1.5 mm or greater in thickness and less than 600 mm in width, supplied in straight lengths or coils and having edges of controlled contour.

3.3.2 Hexagonal bars (hexagons)

Bars of regular hexagonal cross-section supplied in straight lengths or coils.

3.3.3 Round bars (rounds)

Bars of circular cross-section supplied in straight lengths or coils.

3.3.4 Square bars (squares)

Bars of square cross-section supplied in straight lengths or coils.

3.4 Fully killed steel

Steel deoxidized with a strong deoxidizing agent such as silicon or aluminium in order to reduce the oxygen content to prevent a reaction between carbon and oxygen during solidification.

3.5 Merchant quality steel

Product having wider carbon and manganese ranges than those of specified carbon steels (see Table 2). It is not subject to product analysis tolerances, grain size requirements or modification with special additions.

3.6 Test batch

Finished steel of the same size, produced from the same cast and from the same heat-treatment batch.

3.7 Test piece

A prepared piece for testing, made from a test specimen.

3.8 Test sample

A portion of material or product, or a group of items selected from a test batch by a sampling procedure.

3.9 Test specimen

A portion or a single item taken from the test sample for the purpose of applying a particular test.

4 DESIGNATION

4.1 General

The steel designation shall comprise the number of this Australian Standard, i.e. AS 1443, followed by a diagonal slash and additional characters in accordance with Clauses 4.2 and 4.3. Additional designations for austenitic grain size are given in Clause 4.4.

4.2 Steels supplied to chemical composition only

The designation of steel supplied to a specified chemical composition shall be in accordance with the following designations:

- (a) A prefix letter, if applicable, as follows:
 - (i) M: Merchant quality steel.
 - (ii) U: Unspecified deoxidation.
 - (iii) X: Major deviation in chemical composition of any grade from the corresponding AISI-SAE grade.

NOTE: Information on AISI-SAE grades is given in the relevant steel products manual of the Iron and Steel Society of AIME which is located at 410 Commonwealth Drive, Warrendale, PA 15086-7512, USA.

- (b) A four-digit series designation, as follows, wherein the first two digits of the number indicate the type of steel and the last two digits indicate the approximate mean of the specified carbon range:
 - (i) 10XX: Plain carbon steels.
 - (ii) 11XX: Sulfurized free-cutting carbon steels.
 - (iii) 12XX: Phosphorized and sulfurized free-cutting carbon steels.
 - (iv) 13XX: Carbon-manganese steels.

NOTE: The double 'X' has no significance other than to indicate the position for digits to be added.

Modification symbols should be added to the series designation as follows:

- (i) For lead-bearing steels, the letter 'L' is used to indicate that the steel contains lead, and is placed between the second and third characters of the four-digit series designation.
- (ii) For aluminium-killed steels, the letter 'A' is placed between the second and third characters of the four-digit series designation.
- (iii) For boron-treated steels, the letter 'B' is placed between the second and third characters of the four-digit series designation.
- (iv) For micro-alloyed steels, the letter 'M' is placed between the second and third characters of the four-digit series designation.

Examples of designation: AS 1443/12L14, AS 1443/10A10, AS 1443/10B22, AS 1443/10M40, AS 1443/X1038.

4.3 Steels supplied to chemical composition and mechanical properties

The designation of steels supplied to chemical composition and mechanical properties shall consist of the following:

- (a) The prefix letters 'D' or 'T', if applicable.
NOTE: These designations normally apply to drawn or turned products, respectively.
- (b) The number 3, 4, 5, 6, 11, 12, 13 or 14, to indicate the steel grade.

Examples of designation: AS 1443/D3, AS 1443/T5.

4.4 Austenitic grain size

The following designations consisting of suffix letters 'CG' or 'FG' indicate the austenitic grain size of the steel as defined in AS 1733:

- (a) CG: Coarse.
- (b) FG: Fine.

Example of designation: AS 1443/1030FG.

NOTE: The absence of these suffix letters indicates that the steel may be coarse-grained or fine-grained at the supplier's option.

5 CONDITION OF STEEL ON DELIVERY

5.1 General

Steel shall be supplied in one of the following conditions:

- (a) Bright bars
Cold-drawn, cold-rolled, turned and polished, cold-drawn and precision ground or turned and precision ground.
- (b) Cold-sized bars
Cold-drawn or cold-rolled.
- (c) Peeled bars
Rough machined.

In addition, stress relieving or normalizing heat treatments may be specified.

5.2 Steel supplied to chemical composition

Steel supplied to chemical composition shall comply with the requirements of Tables 1, 2, 3 or 4.

5.3 Steels supplied to chemical composition and mechanical properties

Steels supplied in either the cold-drawn or cold-rolled condition and which have not received a subsequent heat treatment shall comply with the chemical composition and mechanical properties specified in Table 5 and Table 6. Steels in all other conditions shall comply with the chemical composition and mechanical properties specified in Table 7.

6 MATERIALS

6.1 Chemical composition

6.1.1 General

The method of sampling for chemical analysis shall be in accordance with AS/NZS 1050.1. Chemical composition shall be determined by any procedures which are not less accurate than those given in AS/NZS 1050.1.

6.1.2 Cast analysis

Wherever possible a chemical analysis of the steel from each cast shall be made to determine the proportions of the specified elements. In cases where it is impracticable to obtain samples from liquid steel, analysis of test samples taken in accordance with the requirements of AS/NZS 1050.1 may be reported as cast analysis.

The reported cast analysis of the steel shall conform to the requirements of Tables 1, 2, 3 and 4 for the appropriate grade.

6.1.3 Residual elements

For steels complying with this Standard, residual elements are acceptable to the following limits:

- (a) Chromium: 0.30% max.
- (b) Copper: 0.35% max.
- (c) Molybdenum: 0.10% max.
- (d) Nickel: 0.35% max.

NOTE: The amount of residual elements may affect subsequent processes, especially those involving cold working, welding and heat treatment.

6.1.4 Product analysis

For grades of steel excluding those designated 'U' or 'M', with prior hot-rolled cross-sectional areas up to and including 0.06 m², the results of individual determinations carried out on the product shall be within the product analysis tolerance limits specified in Table 5. Where several determinations of a single element, excluding lead, are carried out on products from any one cast, the spread of individual results shall not extend both above and below the range specified in Tables 1, 3 and 4.

6.2 Tensile test requirements

When tested in accordance with Clause 9, steels requiring tensile testing shall meet the relevant requirements of Tables 6 and 7.

7 FREEDOM FROM DEFECTS

7.1 General

The steel shall be free from internal and surface defects that would render it unsuitable for its particular application.