Australian Standard®

HIGH TENSILE CARBON-MANGANESE STEEL CYLINDERS FOR COMPRESSED GASES— SEAMLESS— 0.1 kg to 500 kg

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PREFACE

This standard was prepared by the Association's Committee on Gas Cylinders. It supersedes AS B113—1960, High Tensile Carbon-manganese Steel Cylinders for the Storage and Transport of Permanent Gases and High Pressure Liquefiable Gases.

Changes introduced in this standard include the following:

(a) Requirements are now expressed in SI units.

(b) Hydrostatic and pulsation type tests are included.

(c) The impact test has been omitted as it was considered to be not relevant for the thicknesses involved and the conditions of use in Australia.

The hydrostatic and pulsation type tests may be waived where the design is that already used for a cylinder accepted as complying with AS B113. For cylinders of a new design, as judged by the Inspecting Authority, all the type testing requirements are to apply.

The term 'new design' is not yet defined, but the following features are considered to be relevant and may be adopted for such a definition by the Inspecting Authorities.

(i) Manufacture in a different factory.

(ii) Manufacture by a different process.

(iii) Manufacture from steel of different nominal chemical compositions.

(iv) A different heat treatment.

(v) A base profile or base thickness change relative to the cylinder diameter and calculated minimum wall thickness.

(vi) A length increase of the cylinder of more than 50 percent (cylinders with an L/D ratio less than 3 must not be used as reference cylinders for any new design with an L/D ratio greater than 3).

(vii) A diameter change of more than 5 percent.

(viii) An increase in hydraulic test pressure that requires a change in design wall thickness.

Notwithstanding (viii) above, it is considered that where a gas cylinder is to be used in a lower pressure duty than that for which design approval has been given, it is not to be deemed as being of new design.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
HIGH TENSILE CARBON-MANGANESE STEEL CYLINDERS FOR COMPRESSED GASES— SEAMLESS—0.1 kg to 500 kg

1 SCOPE. This standard specifies requirements for the steel, design, manufacture, testing, and marking of seamless gas cylinders manufactured from high tensile carbon-manganese steel, of water capacity not less than 0.1 kg and not greater than 500 kg.

NOTE: Appendix A lists the suggested minimum information that should be supplied by the purchaser when ordering gas cylinders covered by this standard.

2 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 1050	Methods for the Analysis of Iron and Steel
AS 1213	Iron and Steel—Methods of Sampling
AS 1391	Methods for Tensile Testing of Metals
AS 2030.1	SAA Gas Cylinders Code, Part 1—Cylinders for Compressed Gases Other than Acetylene
AS 2337	Gas Cylinder Test Stations
AS 2505.1	Methods for Bend and Related Testing of Metals, Part 1—Sheet, Strip and Plate
AS K1	Methods for the Sampling and Analysis of Iron and Steel
BS 5045	Transportable Gas Containers Part 1—Seamless Steel Containers
ISO 2566/1	Steel—Conversion of Elongation Values, Part 1—Carbon and Low Alloy Steels

3 DEFINITIONS. For the purpose of this standard, the definitions given in AS 2030.1 and the following definition apply:

Inspector—a person, acceptable to the Inspecting Authority, who ensures and certifies that all the inspections specified herein have been carried out and that the cylinders comply with all the requirements of this standard.

4 STEEL.

4.1 Steelmaking process. The steel shall be made by the open hearth, basic oxygen, or an electric furnace process. The steelmaker should supply to the cylinder manufacturer a certificate showing the process of steel manufacture.

NOTES:

1. The 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), electroslag-refining (ESR) or vacuum degassing is permitted.

4.2 Chemical analysis. A chemical analysis of the steel from each ladle shall be made to determine the proportions of the specified elements. The method of sampling shall be in accordance with AS 1213, and the analysis procedures shall be not less accurate than the procedures specified in AS 1050 and AS K1, as appropriate.

The chemical analysis of the steel shall comply with Table 1, and the steelmaker should supply to the cylinder manufacturer a certificate showing the chemical analysis of elements listed in Table 1.

TABLE 1

CHEMICAL ANALYSIS

Element	Analysis, percent	
	Min.	Max.
Carbon	—	0.55
Manganese	1.30	1.75
Silicon	0.15	0.30
Sulphur	—	0.050
Phosphorus	—	0.050

4.3 Identification. Steel sections shall be individually identified for record purposes.

4.4 Steelmaker's inspection facilities. Facilities for inspection of the steel at the steelmaker's works shall be afforded to the representative of the cylinder manufacturer.

5 DESIGN.

5.1 Minimum thickness. The minimum thickness of steel shall be not less than the greater of those calculated from the following equations:

$$t = 2.5\left(\frac{D_i}{T}\right)^{1/2} \quad \text{and} \quad t = \frac{P\,D_h}{2f + P_h}$$

where

t = minimum finished thickness of the steel, in millimetres

D = external diameter of cylinder, in millimetres

D_i = nominal internal diameter of cylinder, in millimetres

P_h = test pressure (see AS 2030.1), in megapascals

f = maximum permissible stress in steel at the hydrostatic test pressure, in megapascals. For calculation purposes, this is to be taken as 384 MPa

T = specified minimum tensile strength of the steel, in megapascals.

NOTE: T refers to minimum tensile strength verified by tests in Clause 8, i.e. following heat treatment.

5.2 Valve protection and neck thread. Valve openings shall incorporate valve protection where required by AS 2030.1, and in accordance with AS 2030.1.