Singapore Standards Council

SS 99 : 1998 (2011)
(ICS 75.180.99; 77.140.01)

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Specification for welded low carbon steel cylinders for storage and transportation of compressed liquefied gases

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Specification for welded low carbon steel cylinders for storage and transportation of compressed liquefied gases

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This Singapore Standard having been approved by the Mechanical Standards Committee was endorsed by the Standards Council on 30 November 1998.

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The Mechanical Standards Committee appointed by the Standards Council consists of the following members:

		Name	Organisation
Chairman	:	Mr Victor Ho Kwok Weng	*Standards Council*
Deputy Chairman	:	Mr Ng Thin Teng	*Individual Capacity*
Secretary	:	Ms Christina Choong	*Singapore Productivity and Standards Board*
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		Mr Cheng Wee Sik	*Institution of Engineers Singapore*
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		Mr Soh Yoke Lun	*Singapore Confederation of Industries*
		Mr George Sze	*Public Works Department*

The Technical Committee on Storage and Transportation of Compressed Gases including LPG appointed by the Mechanical Standards Committee and responsible for the preparation of this standard consists of representatives from the following organisations:

		Name	Organisation
Chairman	:	Assoc Prof Chau Fook Siong	*Mechanical Standards Committee*
Secretary	:	Mr Loke Seck Kar	*Singapore Productivity and Standards Board*
Members	:	Mr Martinn Ho Yuen Liung	*Ministry of The Environment*
		Mr Lee See Loi	*Institution of Engineers Singapore*
		Mr Leong Shui Hung	*Department of Industrial Safety*
		Mr Low Keng Leong	*Institution of Fire Engineers*
		Mr Tan Guan Joo	*Singapore Confederation of Industries*
		Cpt Thng Ting Mong	*Singapore Civil Defence Force*

The Working Group appointed by the Technical Committee to revise this standard consists of the following members:

		Name	Organisation
Convenor	:	Mr Lee See Loi	*Lee S L Engineering Enterprise*
Members	:	Mr Melvin Lee / Mr Christopher Yeow (till Oct 97)	*Hong Leong Gas Cylinders Pte Ltd*
		Mr Raymond Tan (till Aug 97)	*BP Singapore Pte Ltd*

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Foreword

This Singapore Standard was prepared by the Technical Committee on Storage and Transportation of Compressed Gases including LPG under the direction of the Mechanical Standards Committee.

In the 70's, many of the welded low carbon steel cylinders for the storage and transportation of low pressure liquefiable gases in Singapore were fabricated locally while others were brought into Singapore under parallel import. SS 99 was first prepared in 1974 with the aim to enhance production quality and ensure safety of end users.

Over time, the 1974 edition became obsolete as many of the tests have not been defined precisely in a way that was acceptable to both manufacturers and users. As a result, both had, for quite some time, resorted to adopting a mutually agreed overseas standard.

This new edition is primarily based on ISO 4706 : 1989 (Refillable welded steel gas cylinders) but the scope does not include dissolved gases. The original title of this Singapore Standard is also amended to reflect the changes in the maximum hydrostatic test pressure and water capacity of the cylinders (the two parameters were originally set at "4 MN/m^2" and "from 10 to 500 litres" respectively). Some deviations from ISO 4706 : 1989 were also made to suit local requirements. They are summarised as follows:

(a) Subclause 4.2 of ISO 4706 : 1989 (i.e. the clause on "Chemical composition") was not adopted in full because micro-alloying elements, if present, would not substantially and detrimentally affect the mechanical properties of the cylinders which are to be used at room temperatures.

(b) Subclause 4.3 of ISO 4706 : 1989 (i.e. the clause on "Applicable materials") was not adopted because clauses 4.1 and 4.2 therein were found to have covered the requirements adequately.

(c) In subclause 6.1, the qualification of welding procedures and welders should be agreed upon by the manufacturer and purchaser based on an acceptable national standard and be included in the order. Such has been an industry practice and should form the basis for reference in case of disagreement.

(d) In subclause 6.2, the visual examination of the pressure parts of the cylinders has to be done before and after assembly. This is because the assembly processes may contribute to defects such as deformation, distortion, scratches, etc. which should not be overlooked.

(e) Prototype test is made compulsory for all types of cylinder designs regardless of the type of joints employed. It is to ensure safety. Hence, Annex A of ISO 4706 : 1989 was brought into the main text as Clause 8.

(f) In subclause 9.1.4 "Hydraulic burst test", it is not required to determine when the yield point is reached as stated in ISO 4706 : 1989. Instead, only the burst pressure is needed. In practice, it is simpler to determine the burst pressure than the yield point accurately. Then, the burst pressure "P_b" should be at least twice the test pressure "P_h".

(g) Cylinders with ends convex to pressure are not specified because they are not used in Singapore.

(h) The pressure test in subclause 10.1 has been specified as "Hydrostatic pressure test". The medium is water and the minimum time to hold the test pressure "P_h" is set at 30 seconds. It has been found that 30 seconds is a sufficient time frame for any decrease in hydrostatic pressure to be observed.

(i) The "Gas-tightness test" in ISO 4706 : 1989 is renamed as "Leakage test" in subclause 10.2 of this standard. In the former, the procedures were not specified, hence open to different interpretations. In this Singapore Standard, the leakage detection procedures are laid down clearly.

(j) Annexes A and B are modified from Annex B of ISO 4706 : 1989 to suit local requirements. It should be noted that the entries for the "Specified cast analysis" are omitted since the data are already contained in the steel mill certificates. As explained in item (f) above, the pressure at yield point for the "Burst test" need not be recorded.

In preparing this standard, reference was also made to the following standards:

(a)	AS 2470 : 1995	Steel cylinders for compressed gases - Welded - 11 kg to 150 kg
(b)	ISO 554 : 1976	Standard atmospheres for conditioning and/or testing - Specifications
(c)	ISO 3205 : 1976	Preferred test temperatures
(d)	ISO 4978 : 1983	Flat rolled steel products for welded gas cylinders.
(e)	SS ISO 1000 : 1992	SI units and recommendations for the use of their multiples and of certain other units

Acknowledgement is made for the use of information from the above overseas standards.

Specification for welded low carbon steel cylinders for storage and transportation of compressed liquefied gases

1 Scope

This Singapore Standard gives minimum requirements for certain aspects concerning material, design, construction and workmanship, procedure and test at manufacture of refillable welded steel gas cylinders of a test pressure not greater than 75 bar[a)], and of water capacities from 1 litre up to and including 150 litres for compressed liquefied gases, exposed to ambient temperatures.

NOTE – The titles of the publications referred to in this standard are listed at the end of the standard.

a) 1 bar = 10^5 Pa = 10^5 N/m^2