

**Sub-Committee of Experts on the
Transport of Dangerous Goods**
(Twentieth session, 3-12 December 2001,
agenda item 2)

**NOTE ON THE PROGRESS MADE ON THE WORK CARRIED OUT
BY THE TECHNICAL COMMITTEE ISO/TC 58 GAS CYLINDERS**

**Transmitted by the International Organization for Standardization (ISO)
(prepared by Mr. Palne Mogensen, Chairman of ISO/TC 58)**

A progress report on the work of technical committee ISO/TC 58 was distributed to the UN Sub-Committee of Experts on the Transport of Dangerous Goods in **July 2001** (Doc. UN/CETDG/19/INF.39). This note is an update of that document taking into account the progress made since that time. **Please note that 4 International Standards and 4 Technical Reports have reached the publication stage since then.**

1 ISO/TC 58, common matters

1.1 Business plan

The business draft for TC 58 was approved with some minor quantitative changes in the Business Environment section at the recent TC 58 plenary meeting in Stockholm 2001-10-4/5. The business plan is an important document, which guides the direction of the work in TC 58 and its subcommittees. It should be a living document updated at intervals. Input from interested parties is always welcome.

1.2 New chairman for TC 58

From January 2002, UK(BSI) will take over the secretariat of TC 58. UK is already holding the secretariat of TC 58/SC 3 and also CEN/TC 23 *Gas cylinders*. Dr. Chris Jubb, BOC, is nominated as chairman of TC 58. He has a long and profound experience of gas cylinder standardization and is already holding the chair of the corresponding CEN technical committee CEN/TC 23.

2 Design standards for steel gas cylinders

2.1 Welded steel pressure drums

The scope of TC 58 now also covers pressure drums, the design and testing of which will be handled by TC 58/SC 3. The corresponding CEN work on welded steel pressure drums (at the enquiry stage) will be considered with the aim to produce a parallel ISO/CEN standard :

ISO/AWI 21172 Gas cylinders – Welded steel gas drums with up to 3000 l capacity for the transport of gases – Design and construction.

2.2 Welded steel cylinders

The majority of gas cylinders in the world are of welded design, notably cylinders for LPG (liquefied petroleum gases) and acetylene. An important International Standard in this area is: ISO 4706:1989 *Refillable welded steel gas cylinders*, which is now under periodical review. The revised standard will be split up into two parts, one covering low pressure and the other high pressure cylinders. The split is proposed to occur at 90 bar test pressure and part 1 is to be given priority. It has also been decided to propose new work items for two similar standards for welded stainless steel cylinders. It has been decided not to exclude LPG from the above standards.

A dedicated standard for LPG cylinders has been adopted from CEN/TC 286 and is presently prepared for enquiry. **ISO/DIS 22991 *Gas cylinders – Transportable refillable welded steel cylinders for liquefied petroleum gas (LPG) – Design and construction.***

3 Design standards for other types of cylinders

3.1 Aluminium cylinders

Two work items on aluminium cylinders are presently in progress. The last item below will be issued as a technical report, set up much in the same way as the corresponding document for high strength steels:

ISO/WD 20703 *Gas cylinders – Refillable welded aluminium alloy gas cylinders – Design, construction and testing;*

ISO/AWI TR 20704 *Gas cylinders – Test methods on fracture performance for high strength aluminium.*

3.2 Gas cylinders of other metallic materials

A proposal for a dedicated nickel cylinder standard didn't get the necessary support as a new work item. Recently it was indicated that a design standard with a broader scope, encompassing some other more or less exotic materials as well, might receive sufficient support to go ahead. A new work item proposal along those lines is underway:

ISO/NWIP 22490 *Gas cylinders – Refillable seamless cylinders of ?materials? – Design, construction and testing.*

3.3 Gas cylinders of composite materials

The composite cylinder standardization project consists of three parts as follows. The first two have been sent out for FDIS voting (closing in the later part of Jan. 2002) and the third has been issued for a second enquiry due to the significant technical changes made on the first DIS:

ISO/FDIS 11119-1 *Gas cylinders of composite construction -- Specification and test methods - Part 1: Hoop wrapped composite gas cylinders;*

ISO/FDIS 11119-2 *Gas cylinders of composite construction -- Specification and test methods -- Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners;*

ISO/DIS 11119-3.2 *Gas cylinders of composite construction -- Specification and test methods -- Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-metallic and non-load-sharing metal liners.*

A proposal to issue a technical report on general safety issues with regard to composite cylinders was well received and has been accepted as a work item in SC 3:

ISO/AWI TR 22454 *Gas cylinders of composite construction– Factors of safety for composite cylinders.*

3.4 Gas cylinders for hydrogen fuelled automotive vehicles

The five parts below of this dedicated standard for hydrogen fuelled automotive vehicles were all accepted in the CD vote and are presently prepared to go out for enquiry:

ISO/DIS 15869-1 *Gaseous hydrogen and hydrogen blends – Land vehicle fuel tanks – Part 1: General requirements;*

- ISO/DIS 15869-2 *Gaseous hydrogen and hydrogen blends – Land vehicle fuel tanks – Part 2: Particular requirements for metal tanks;*
- ISO/DIS 15869-3 *Gaseous hydrogen and hydrogen blends – Land vehicle fuel tanks – Part 3: Particular requirements for hoop wrapped composite tanks with a metal liner;*
- ISO/DIS 15869-4 *Gaseous hydrogen and hydrogen blends – Land vehicle fuel tanks – Part 4: Particular requirements for fully wrapped composite tanks with a metal liner;*
- ISO/DIS 15869-5 *Gaseous hydrogen and hydrogen blends – Land vehicle fuel tanks – Part 5: Particular requirements for fully wrapped composite tanks with a non-metallic liner.*

ISO 15869 is developed in a joint effort with ISO/TC 197 *Hydrogen technologies* (responsible for the project administration) and ISO/TC 22 *Road vehicles* as partners.

4 Additional work in progress

4.1 Compatibility between gases and materials

The compatibility of cylinder and valve materials with the contained gases is important for the safety of workers and the public. Standards covering metallic and non-metallic materials and the assessment of materials for oxygen compatibility have been published. The following project deals with testing for compatibility of metallic materials with hydrogen. The scope of the project is presently limited to steels A revised document is under preparation to go out for enquiry early next year: **ISO/DIS 11114-4 *Gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 2: Hydrogen compatibility.***

4.2 Cylinder markings

For cylinders in international traffic it is of paramount importance that they carry uniform, complete and legible markings, leaving no room for mistakes. A conflict occurred between the marking provisions in the latest issue of the Orange Book (12th ed.) and the ongoing work on an ISO standard for stamp marking. This work has now been modified and adopted to the model regulations and at the same time providing the additional information needed by cylinder operators. The following document will soon be sent out for a second formal vote: **ISO/FDIS 13769 *Gas cylinders – Stamp marking.***

It should be noted that RID/ADR has adopted the UN-CETDG provisions for cylinder marking and that CEN/TC 23 will take on board the ISO 13769 if it is accepted in the FDIS vote.

4.3 Terminology

The International Standard ISO 10286 *Terminology*, is presently under revision with regard to definitions of various states of gases (compressed, liquefied, dissolved, etc.) and pressures (working, settled, operating, etc.) in order to harmonise with other regulations such as the UN Orange Book, ADR, etc. **A DIS is in preparation to be sent out for enquiry late in 2001.**

4.4 On-going work within subcommittee ISO/TC 58/SC 2 *Gas cylinders - Cylinder fittings*

A number of important gas cylinder valve standards are approaching the final stages of development. As seen in the list below, they cover specifications and testing of valves in very specialised applications as well as the common cylinder valves.

The following document is at the enquiry (DIS) stage:

- ISO/DIS 407 *Small medical gas cylinders -- Pin-index yoke-type valve connections* (revision of ISO 407:1991);
- ISO/DIS 5145 *Cylinder valve outlets for gases and gas mixtures – Selection and dimensioning* (revision of ISO 5145: 1990);

The following documents are at the Committee Draft (CD) stage:

- ISO/CD 15996 *Gas cylinders – Residual pressure valves – General requirements and type testing.*

The following documents are at Working Draft (WD) stage:

- ISO/AWI 15995 *Manually operated liquefied petroleum gas valves -- Specifications and testing* (adoption of prEN 131 53 is proposed);
- ISO/NP 10156 *Gas cylinders – Procedure for the determination of the oxipotential of oxidizing gases and gas mixtures with Part 2 dealing with toxic and corrosive gases* (revision of ISO 10156:1996);
- ISO/NP 10298 *Determination of toxicity of a gas or a gas mixture* (revision of ISO10298:1995);
- ISO/NP 13338 *Determination of tissue corrosiveness of a gas or a gas mixture* (revision of ISO 13338:1995).

4.5 On-going work within subcommittee ISO/TC 58/SC 3 Gas cylinders - Cylinder design

A fundamental and remarkable work on basic steel cylinder performance has now been finished. Thanks to an unusual collaboration between different cylinder makers, a huge pool of test data has been collected and brought into a uniform format. This data bank should be of great value to cylinder makers, etc. Four ISO Technical Reports of type 3 reflect various aspects of the data and are now under publication:

- ISO/TR 12391-1 *Gas cylinders – Refillable seamless steel – Performance tests Part 1: Philosophy, background and conclusions;*
- ISO/TR 12391-2 *Gas cylinders – Refillable seamless steel – Performance tests Part 2: Fracture performance tests – Monotonic burst tests;*
- ISO/TR 12391-3 *Gas cylinders – Refillable seamless steel – Performance tests Part 3: Fracture performance tests – Cyclical burst tests;*
- ISO/TR 12391-4 *Gas cylinders – Refillable seamless steel – Performance tests Part 4: Flawed cycle tests.*

The following specialised standard from 1990 is now under revision:

- ISO/AWI 3500:1990 *Seamless steel CO2 cylinders for fixed fire-fighting installations on ships.*

A new standard proposal for small refillable seamless steel cylinders failed to get enough support, apparently because of failure in the registration of votes. It will be circulated again and this time also with a broader scope:

- ISO/NWI 20697 *Gas cylinders – Refillable, transportable seamless, normalized carbon steel cylinders of water capacity up to 0,5 litre for compressed, liquefied and dissolved gases and up to 1 litre for carbon dioxide – Design and construction.*

4.6 On-going work within subcommittee ISO/TC 58/SC 4 Gas cylinders - Operational requirements for gas cylinders

An effort is being undertaken to find operational standards that are candidates for consolidation into common standards covering more than one cylinder type. So far it has been recommended to consolidate the two **inspection at time of fill** standards for compressed and liquefied gas cylinders respectively (ISO 10463 and 11113), both under revision, into one common standard:

ISO/NP xxxxx *Gas cylinders for compressed or liquefied gases -- Inspection at time of filling.*

The following document is under publication as a parallel ISO/CEN document:

EN ISO 11623 *Transportable gas cylinders -- Periodic inspection and testing of composite gas cylinders.*

The following document is at the formal voting (FDIS) stage:

ISO/FDIS 10691 *Gas cylinders – Refillable welded steel cylinders for liquefied petroleum gas (LPG) -- Procedures for checking before under and after filling.*

The following document is at Draft International Standard (DIS) stage:

ISO/DIS 10464.2 *Gas cylinders – Refillable welded steel cylinders for LPG -- Periodic requalification;*

The following documents are at the Committee Draft (CD) stage:

ISO/CD 32 *Gas cylinders for medical use – Marking for identification of content (under revision);*

ISO/CD 6406 *Periodic inspection and testing of seamless steel gas cylinders (under revision);*

ISO/CD 7225 *Gas cylinders – Precautionary labels – Design, content and application (under revision);*

ISO/CD 10460 *Welded carbon steel gas cylinders -- Periodic inspection and testing (under revision);*

ISO/CD 10461 *Seamless aluminium alloy gas cylinders -- Periodic inspection and testing (under revision);*

ISO/CD 10462 *Cylinders for dissolved acetylene -- Periodic inspection and maintenance (under revision);*

ISO/CD 11372 *Cylinders for dissolved acetylene – Inspection at time of filling (under revision);*

ISO/CD 11622.3 *Filling ratios, filling pressures and provisions for safety devices for gas cylinders;*

ISO/DIS 21007-1 *Gas cylinders – Identification and marking using radio frequency identification technology – Part 1: Reference architecture and terminology;*

ISO/DIS 21007-2 *Gas cylinders – Identification and marking using radio frequency identification technology – Part 2: Framework for data structure.*

ISO/CD 13771 *Gas cylinders -- Filling conditions for liquefied petroleum gas;*

ISO/CD 16148 *Gas cylinders - Acoustic emission methods for cylinder requalification.*

The following documents are at Working Draft (WD) stage:

ISO/NP 11755 *Cylinders in bundles for permanent and liquefied gases (excluding acetylene and LPG) – Inspection at time of filling* (revision of ISO 11755:1996);

ISO/WD 19078 *Gas cylinders - Methods for inspection and requalification of natural gas vehicle (NGV) fuel containers.*

5 Committee administration

5.1 Meetings held and planned

ISO/TC 58 4 and 5 Oct. 2001, Stockholm, Sweden. **Next meeting tentatively in autumn 2003, London, UK.**

ISO/TC 58/SC 2 28 and 29 Nov. 2001, Lyon, France. **Next meeting to be decided in Nov. 2001.**

ISO/TC 58/SC 3 1 to 3 Oct. 2001, Stockholm, Sweden. **4-6 Sept. 2002, South Korea.**

ISO/TC 58/SC 4 23 to 25 Oct. 2001, Clearwater, FL, USA. **Tentatively 8 April 2002, Sydney, Australia.**

5.2 Chairmen and secretaries of the technical committee and subcommittees

TC 58 Mr. P Mogensen, SIS, chairman and Mr. Hans Larsson, SIS, secretary. Nominated for 2002+ Dr. Chris Jubb, BSI, chairman and Mr. Steve Elliott, BSI (BCGA), secretary.

SC 2 Dr. Hervé Barthélémy, AFNOR, chairman and Ms. Nicole Legent, AFNOR, secretary.

SC 3 Dr. John Walters, BSI, chairman and Mr. Peter Slot, BSI, secretary.

SC 4 Mr. Roger Smith, ANSI (CGA), chairman and Ms. Debbie Angerman, ANSI (CGA), secretary.

5.3 Titles of Working Groups

ISO/TC 58/WG 7 Compatibility between gases and materials
(Convener: Dr. H. Barthélémy)

ISO/TC 58/SC 2/WG 4 Valve system and cylinder neck threads
(Convener: Dr. H. Barthélémy)

ISO/TC 58/SC 2/WG 5 Yoke type valve outlets for breathing air for diving
(Convener: Dr. G. Mair)

ISO/TC 58/SC 2/WG 6 Gas cylinder valves -- Specifications and testing
(Convener: Dr. G. Mair)

ISO/TC 58/SC 2/WG 7 Determination of toxicity of gas mixtures
(Convener: Dr. H. Barthélémy)

ISO/TC 58/SC 2/WG 9 Valve connections for gases of high purity
(Convener: Dr. H. Barthélémy)

ISO/TC 58/SC 2/WG 10 Specification and tests for LPG valves
(Convener: Mr. Landini?)

ISO/TC 58/SC 2/WG 11 Allocation of valve outlets
(Convener: Dr. H. Barthélémy)

- ISO/TC 58/SC 3/WG 11 Overwrapped cylinders (Convener: Mr. M. Trudgeon)
- ISO/TC 58/SC 3/WG 14 Toughness and acceptance criteria for steels of strength levels 1100 MPa (Convener: Mr. R. Tribolet)
- ISO/TC 58/SC 3/WG 17 Compressed natural gas cylinders for road vehicles (Convener: Mr. C. Webster)
- ISO/TC 58/SC 3/WG 18 Welded aluminium alloy cylinders (Convener: Dr. H. Barthélémy)
- ISO/TC 58/SC 3/WG 19 Test methods on fracture performance for high strength aluminium cylinders (Convener: Mr. L. Birch)
- ISO/TC 58/SC 3/WG 20 Welded steel LPG cylinders (Convener to be decided)
- ISO/TC 58/SC 3/WG 21 Refillable welded steel gas cylinders (Convener: Mr. S. Gentry)
- ISO/TC 58/SC 3/WG 22 Seamless steel CO2 cylinders for fixed fire fighting installations on ships (Convener: E. Scheepers)
- ISO/TC 58/SC 3/WG 23 Welded steel pressure drums (Convener: Mr. M. Riehl-Gerling)
- ISO/TC 58/SC 3/WG 24 Factors of safety for composite cylinders (Convener: Mr. N. Newhouse)
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- ISO/TC 58/SC 4/WG 1 Rejection criteria for metal gas cylinders (Convener: Dr. R. Irani)
- ISO/TC 58/SC 4/WG 2 Retesting of gas cylinders by acoustic emissions (Convener: Dr. H. Barthélémy)
- ISO/TC 58/SC 4/WG 3 Methods for inspection and requalification of NGV fuel containers (Convener: Mr. L. Birch)
- ISO/TC 58/SC 4/WG 4 Requalification of LPG steel cylinders (Convener: Mr. J-M Meslem)

ANNEX A Bibliography

List of published International Standards from technical committee ISO/TC 58

ISO/TC 58 *Gas cylinders*

- ISO 3807-1:2000 Cylinders for acetylene -- Basic requirements -- Part 1: Cylinders without fusible plugs
- ISO 3807-2:2000 Cylinders for acetylene -- Basic requirements -- Part 2: Cylinders with fusible plugs
- ISO 10286:1996 Gas cylinders -- Terminology **(under revision)**
- ISO 11114-1:1997 Transportable gas cylinders -- Compatibility of cylinder and valve materials with gas contents -- Part 1: Metallic materials
(Reprinted: 1999)
- EN ISO 11114-2:2000 Transportable gas cylinders -- Compatibility of cylinder and valve materials with gas contents -- Part 2: Non-metallic materials.
- ISO 11114-3:1997 Transportable gas cylinders -- Compatibility of cylinder and valve materials with gas contents -- Part 3: Autogenous ignition test in oxygen atmosphere
- ISO 14600:2000 Gas cylinders -- International quality conformance system
(reprinted: 2000) -- Basic rules

ISO/TC 58/SC 2 *Gas cylinders - Cylinder fittings*

- ISO 407:1991/ Small medical gas cylinders -- Pin-index yoke-type valve connections
Cor.1:1999 **(under revision)**
- ISO 5145:1990 Cylinder valve outlets for gases and gas mixtures -- Selection and dimensioning **(under revision)**
- ISO/TR 7470:1988 Valve outlets for gas cylinders -- List of provisions, which are either standardized or in use
- ISO 10156:1996 Gases and gas mixtures -- Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets
- ISO 10297:1999 Gas cylinders -- Refillable gas cylinder valves -- Specification and type testing (NB All gases except LPG)
- ISO 10298:1995 Determination of toxicity of a gas or gas mixture
- ISO 10692-1:2001 **Gas cylinders -- Gas cylinder valve connections for use in microelectronic industry -- Part 1: Outlet connections**
- ISO 10692-2:2001 **Gas cylinders -- Gas cylinder valve connections for use in microelectronic industry -- Part 2: Specification and type testing for valve to cylinder connections**
- ISO 10920:1997 Gas cylinders -- 25E taper thread for connection of valves -- Specification
- ISO 11116-1:1999 Gas cylinders -- 17E taper thread for connection of valves to gas cylinders -- Part 1: Specification
- ISO 11116-2:1999 Gas cylinders -- 17E taper thread for connection of valves to gas cylinders -- Part 2: Inspection gauges
- ISO 11117:1998 Gas cylinders -- Valve protection caps and valve guards for industrial and medical gas cylinders -- Design, construction and tests
- ISO 11191:1997 Gas cylinders -- 25E taper thread for connection of valves to gas cylinders -- Inspection gauges

ISO 12209-1:2000	Gas cylinders -- Outlet connections for gas cylinder valves for compressed breathable air-- Part 1: Yoke type connection
ISO 12209-2:2000	Gas cylinders -- Outlet connections for gas cylinder valves for compressed breathable air-- Part 2: Threaded connections
ISO 12209-3:2000	Gas cylinders -- Outlet connections for gas cylinder valves for compressed breathable air-- Part 3: Adapter for 230 bar valves
ISO 13338:1995	Determination of tissue corrosiveness of a gas or gas mixture
ISO 13340:2001	Transportable gas cylinders -- Cylinder valves for non-refillable cylinders -- Specification and type testing
ISO 13341:1997	Transportable gas cylinders -- Fitting of valves to gas cylinders
Cor.1:1998	
ISO 14246:2001	Transportable gas cylinders -- Gas cylinder valves -- Manufacturing tests and inspections
ISO/15245-1:2001	Transportable gas cylinders -- Parallel threads for connection of valves to gas cylinders – Part 1: Specification
ISO/15245-2:2001	Transportable gas cylinders -- Parallel threads for connection of valves to gas cylinders – Part 2: Gauge inspection

ISO/TC 58/SC 3 Gas cylinders - Cylinder design

ISO 3500:1990	Seamless steel CO2 cylinders for fixed fire-fighting installations on ships (under revision)
ISO 4705:1983	Refillable seamless steel gas cylinders (withdrawn)
ISO 4706:1989	Refillable welded steel gas cylinders (under revision)
ISO 7866:1999	Gas cylinders -- Refillable seamless aluminium alloy gas cylinders -- Design, construction and testing
ISO 9809-1:1999	Gas cylinders -- Refillable seamless steel gas cylinders -- Design, construction and testing -- Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa
ISO 9809-2:2000	Gas cylinders -- Refillable seamless steel gas cylinders -- Design, construction and testing -- Part2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1100 MPa
ISO 9809-3:2000	Gas cylinders -- Refillable seamless steel gas cylinders -- Design, construction and testing -- Part 3: Normalized steel cylinders
ISO 11118:1999	Gas cylinders -- Non-refillable metallic gas cylinders -- Specification and test methods
ISO 11120:1999	Gas cylinders -- Refillable seamless steel tubes of water capacity between 150 l and 3000 l -- Design, construction and testing
ISO/TR 13763:1994 (Cor. 1:1996 English only)	Safety and performance criteria for seamless gas cylinders
ISO 11439:2000	Gas cylinders -- High-pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles

ISO/TC 58/SC 4 Gas cylinders - Operational requirements for gas cylinders

ISO 32:1977	Gas cylinders for medical use -- Marking for identification of contents. (under revision)
ISO 448:1981	Gas cylinders for industrial use -- Marking for identification of contents (withdrawn)
ISO 6406:1992	Periodic inspection and testing of seamless steel gas cylinders (under revision)
ISO 7225:1994	Gas cylinders -- Precautionary labels (under revision)

(Reprinted: 1995)

- ISO 10460:1993 Welded carbon steel gas cylinders -- Periodic inspection and testing **(under revision)**
- ISO 10461:1993 Seamless aluminium alloy gas cylinders -- Periodic inspection and testing **(under revision)**
- ISO 10462:1994 Cylinders for dissolved acetylene -- Periodic inspection and maintenance (corrected and reprinted 1995) **(under revision)**
- ISO 10463:1993 Cylinders for permanent gases -- Inspection at time of filling **(under revision)**
- ISO 11113:1995 Cylinders for liquefied gases (excluding acetylene and LPG) -- Inspection at time of filling **(under revision)**
- ISO 11372:1995 Cylinders for dissolved acetylene -- Inspection at time of filling
- ISO 11621:1997 Gas cylinders -- Procedures for change of gas service
- ISO 11625:1998 Gas cylinders -- Safe handling
- ISO 11755:1996 Cylinders in bundles for permanent and liquefied gases (excluding acetylene) -- Inspection at time of filling
- ISO 13770:1997 Aluminium alloy gas cylinders -- Operational requirements for avoidance of neck and shoulder cracks