



ISO/TC 197
Hydrogen technologies

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Secretariat: SCC (Canada)

Comment Compilation CD 19881

Document type: Summary of voting

Date of document: 2015-11-19

Expected action: INFO

Background: Here are the comments that were submitted with the CD 19881 Ballot (see N 724 for the Ballot results).

Committee URL: <http://isotc.iso.org/livelink/livelink/open/tc197>

Template for comments and secretariat observations

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MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
SE	1.	General		ge	The title includes "Land Vehicle", the scope does not indicate which vehicles are covered referring only to "vehicle", while detailed requirements apply to "land vehicles", "UN GTR for fuel cell vehicles" and "industrial trucks". Are the service requirements for Category A appropriate to all other land vehicle applications, e.g. trains, construction equipment, farming equipment, forestry equipment, mining equipment.	Consider extending the scope and service requirements for unspecified "land vehicle" types so that they can be set appropriately for each application, with the values currently indicated adopted as a minimum. Possibly with a simple formula for calculating key figures such as number of filling cycles.	
SE	2.	General		te	Leak test gas/mixtures must be defined for hydrogen service.	Use a gas or gas mixture which has leak characteristics equivalent to hydrogen	
SE	3.	General		GE	Define "manufacturer"	Vehicle or Container	
SE	4.	General		TE	-	Use either MPa or KPa throughout	
GB	5.	Introduction		te	This is missing and needs to be added	Add Introduction	
GB	6.	1		te	This needs to be amended to define what is included/excluded and give the limits on operating conditions. As drafted it is unclear.	Expand to include different cylinder types covered, temperature limits etc.	
GB	7.	1	3 rd para.	ed	"reasonable" does not give sufficient weight to the statement and is unverifiable	Change to "..with acceptable levels of ..."	
GB	8.	1	a)	te	It is stated that cylinders are to be permanently mounted. Can they be removed or substituted?	Clarify.	
GB	9.	1	Last 4 paras.	te	This text is not necessary.	Remove.	
SE	10.	2	United Nations	ed	Reference document more accurately		
SE	11.	3		ed	Pressure definitions scattered around	Focus all pressure definitions under 3.20	
GB	12.	3.01		te	This is not in keeping with ISO rules. Standards should specify technical requirements.	Remove.	
IT	13. -	3.05		Te	"Container Category": it would be very useful, at this document development stage, to include an explanation of this categorization	It is recommended to include an explanatory note or an Informative Annex giving the rationale of the different categories. This is important because the required tests are partially different for the 3	

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						categories	
GB	14.	3.05		te	Why do we need 3 different categories of container?	Add clarification.	
SE	15.	3.05 & 5.1.2		ed	-	Remove duplicated text	
GB	16.	3.06		te	These definitions are not in keeping with those typically found in the TC58 standards. e.g. ISO 10439, ISO 10286	Amend to bring in line with usual definitions.	
GB	17.	3.06	c) d)	ed	Unnecessary text.	Remove “and”	
SE	18.	3.07		ed	Incorrect Table reference		
GB	19.	3.08		te	There are standard methods for describing how cylinders are to be rendered unserviceable in TC58 standards.	Amend in line with method given in ISO 10439.	
SE	20.	3.14 & 3.20.02		ed	Use either fuelling or fill consistently	Use either fuelling or fill consistently	
GB	21.	3.15		ed	Poor English	Change to “...temperature which the container will be subjected to in ...”	
GB	22.	3.23		te	ISO 19078 applies to CNG cylinders, the pressures and stresses in these containers will be different to those in the containers described here. Are these rejection criteria still applicable?	Verify criteria are appropriate.	
GB	23.	4		ed	Blank clause.	Remove and renumber subsequent clauses.	
SE	24.	5.01.1		ge	-	Add reference to UN GTR	
GB	25.	5.01.1	note	te	Is this appropriate for a technical standard? Is it feasible for a manufacturer to be able to certify against “all” regulation?	Remove note.	
GB	26.	5.01.2	4 th para	te	Text confusing, what is meant by “but type”. Also, regulatory compliance is not appropriate for standards.	Amend text.	
SE	27.	5.02.1	note	ge	Why allow other pressures as this defeats one purpose of a standard, and has safety implications linked to the refilling interface requirements	Delete “Note”	

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GB	28.	5.03	b)	te	What is the rationale for the three values? What determines which is to be used?	Clarify.	
GB	29.	5.04.1		te	These are ranges. It is unlikely that a settled temperature would be at 85°C. If the permitted temperature range is -40°C to 85°C it is unreasonable to assume that settled temperatures at extremes are achievable.	Clarify.	
GB	30.	5.04.3		te	The clause suggests that temperatures can go above 85°C. Specific limits of time and temperature need to be defined.	Define limits.	
AR	31.	5.05		Te	Gas composition subclause can be read as follows: “Containers made to this International Standard are designed to be used with hydrogen fuel complying with ISO 14687-2, or SAE J2719” However, the containers covered by this standard can also be used for road transportation vehicles other than FCV using (Type I Grade A) hydrogen gas for example ICE road vehicles with hydrogen fuel. If this is true, the following normative document should be cited and referenced: ISO 14687-1, Hydrogen fuel — Product specification — Part 1: All applications except proton exchange membrane (PEM) fuel cell for road vehicles	Add an appropriated text paragraph under subclause 5.5 and the reference indicated below within the normative references. “Containers made to this International Standard can also be used for hydrogen road vehicles with hydrogen fuel (Type I Grade A) complying with ISO 14687-1” ISO 14687-1, Hydrogen fuel — Product specification — Part 1: All applications except proton exchange membrane (PEM) fuel cell for road vehicles	
SE	32.	5.07		ge	-	Add reference to UN GTR	
GB	33. 2	5.07	2 nd para	te	Is it appropriate to include regulations?	Change to “The vehicle manufacturer or system integrator shall be responsible for the protection of the container valves, pressure relief devices and connections. If this.....”	
AR	34.	7.02		Te	Material suitability for hydrogen service and proper material selection criteria can be found in ANNEX C of ISO/TR 15916 However, there's not any reference to ISO/TR	Add the following paragraph to the existing note: “Material suitability for hydrogen service and proper material selection criteria can be found in ANNEX C	

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					15916.	of ISO/TR 15916”	
AR	35.	7.02		Te	Guidance for the safe use of hydrogen in its gaseous and liquid forms can be found in ISO/TR 15916. However, there's not any reference to the safety ISO document: ISO/TR 15916	Add a second Note with the following text: “Guidance for the safe use of hydrogen in its gaseous and liquid forms can be found in ISO/TR 15916.”	
GB	36.	7.02		te	This is a performance based standard, therefore appropriate criteria and test methods need to be specified.	Add test methods and required criteria	
FR1	37.	7.03.1		Te	At the meeting in summer 2014, France asked for an explicit reference to justify the choice of disposal of material 6082. Without explicit scientific reference, I propose to replace the sentence: "Excess silicon 6xxx series aluminum alloys with yield strengths above 250 MPa (e.g. 6351 and 6082) shall not be used in fuel containers or liners."	By the sentence "Excess silicon 6xxx series aluminum alloys with yield strengths above 250 MPa (e.g. 6351 and 6082) should not be used in fuel containers or liners."	
JP6	38.	7.03.1		te	On chrome-molybdenum steel which have a maximum tensile strength beyond 900MPa, the acceleration limits of fatigue crack growth don't exist. In this case, it is impossible to apply design by analysis to cylinder design. In case of less than 900MPa, the acceleration limits exist. and it is possible to apply design by analysis. The above is spreading among the material specialists globally.	The sentence shall be changed as below. 'Steels shall have a maximum tensile strength of 900MPa for chrome-molybdenum steel.' instead of 'Steels shall have a maximum tensile strength of 950MPa for chrome-molybdenum steel.'	
GB	39. 2	7.03.1	3 rd para.	te	The recognised limits for lead and bismuth in other cylinder standards and regulations is 0.003%.	Change “0.010” to “0.003”.	
GB	40. 3	7.03.1	3 rd para.	te	The restricted alloys are not clear.	Change to “Aluminium alloys 6351 and 6082 shall not be used.”	
SE	41.	7.03.1	Last para	ge	There are various Aluminium Associations	Correctly reference “The Aluminium Association”	
GB	42.	7.03.2		te	Ensure requirements are in line with those of ISO	Bring in line with ISO 9809.	

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					9809.		
GB	43.	7.03.4	title	ed	Further clarification	Change to "...for aluminium alloys."	
GB	44.	7.03.5	title	ed	Further clarification	Change to "...for aluminium alloys."	
SE	45.	7.05		te	-	Define grades of fibre that are or are not permitted.	
GB	46. 2	7.06	2 nd para.	te	What is the justification of having a glass transition temperature of at least 20°C above the maximum container temperature. Why 20°C?	Add explanation/justification.	
SE	47.	7.07	3 rd para	te	Vague definition of temperature requirement	Clarify, e.g. change to at -50 C, or at x degree steps down to and including -50 C, or at -50 C or colder	
GB	48. 2	7.08		te	Why is the limit on lead and bismuth content removed? It is assumed that this applies to aluminium alloy bosses, therefore the same limits should apply to both the boss and the container.	Delete "(with the exception that the lead and bismuth restriction does not apply)".	
GB	49.	8.03.1	1 st para.	te	Why is B not included?	Change to "The stress analysis is applicable to all categories."	
GB	50. 2	8.03.1	2 nd para.	te	To whom have the analyses been demonstrated?	Clarify who verifies and validates the accuracy of the analysis.	
GB	51.	8.03.2		te	What is the rationale for the values of stress ratio's used?	Add explanation/justification.	
GB	52.	8.03.3		te	Further explanation is required.	Add explanation/justification.	
GB	53. 5	8.03.3	1 st para.	te	Why/how are these alternatives equivalent?	Add explanation/justification.	
GB	54.	8.03.4	a) & b)	te	This is unclear and needs further clarification.	Add examples, such as in case b) non-load sharing protective layer.	
GB	55. 2	9		ed	Better English.	Move 2 nd line to become 1 st line. Begin the clause "All threads shall..."	

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GB	56. 3	9		te	Unclear text. Does this mean that steel containers can only have tapered threads or aluminium alloy containers cannot have taper threads?	Clarify requirement.	
US 1	57.	9.03.8		te	The fire test was developed based on temperature levels and durations for passenger cars per scope of GTR#13. While the fire test in 9.3.8 may serve as a minimum, the temperature duration (and possibly the level) of the localized exposure may, in fact, be longer (or higher) for a heavy duty vehicles, particularly vehicles with loads or cargo such as garbage trucks or box trucks.	<i>Recommendation:</i> 1) In the near-term, add an advisory to the fire test that the application should be considered and adjustments to increase the temperature level or duration should be considered. 2) In the long-term, consider the situation further as part of the DIS document development.	
GB	58.	10.01 , 10.2		te	It is not the role of an ISO standard to specify conformity assessment, this is the role of national regulations.	Remove.	
GB	59.	10.03		te	This section needs to be amended. Standards must specify what should be done, but not who does it. This is the duty or regulations.	Amend as necessary.	
GB	60. 3	11.01		te	The un-acceptable defects need to be specified.	Add specific requirements.	
SE	61.	11.03	3 rd para	te	Vague definition of specifications.		
GB	62.	11.03	3 rd para.	te	What is the basis for -50°C? -40°C is referred to elsewhere in the standard.	Verify correct value.	
GB	63. 2	11.04		te	Other methods may be used.	Change to "...continuous filament windings or equivalent method."	
GB	64. 2	11.05		te	Other methods may be used.	Change to "...continuous filament windings or equivalent method."	
CA	65.	11.10.02		ge	Consider adding a time limit requirement for a batch. Low volume production has a potential for 200 units spanning more than a year without changes to the manufacturing processes.	Add line "In no case shall a "batch" be permitted to exceed one 12 month period."	

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SE	66.	11.11		TE	"Satisfactory results" is vague	The results shall meet all applicable requirements, or similar.	
GB	67.	12.01	a)	te	There is no specific requirement within the standard for the manufacturer to specify limits.	If this is a requirement, then this needs to be specifically stated.	
GB	68.	12.01	Table 2	te	Why are there no entries in 2 nd column?	Add values or delete column.	
IT	69. -	12.02		Te	For Type I cylinders "Proof pressure test" has to be included as alternative to Volumetric Expansion Method. This alternative is a valid and internationally recognized method. A possible reference is clause 11.2 of ISO 9809-1	To include for Type I cylinders "Proof Pressure test". A reference for text is of clause 11.2.1 ISO 9809-1	
GB	70. 3	12.02		te	Why is a CGA document cited and not an ISO standard?	Add suitable ISO reference or specify procedure.	
GB	71. 3	12.02		te	30s is considered to be insufficient time and particularly for large containers.	Give consideration to a longer period, e.g. 1minute for "portable" containers and 2 minutes for large containers.	
IT	72. 2	12.03		Te	For Type I cylinders it is considered an alternative method a leak test as e.g. per clause 11.4 of ISO 9809-1	Add a Note: for Type I cylinders leak test according to clause 11.4 of is considered an alternative method	
CA	73.	12.03		ge	Leakage and permeation are already defined in Clause 3.12 for leakage and Clause 3.19 for permeation and the final line in the clause ("Any gas detected beyond...") already provides a quantitative cause for rejection. Additional language specifying a compliance requirement for permeation is not necessary.	"Permeation through the wall in compliance with Clause 19.3.11 shall not be considered to be leakage."	
SE	74.	12.03		TE	Leak test gas/mixtures must be defined for hydrogen service.	Use a gas or gas mixture which has leak characteristics equivalent to hydrogen	
SE	75.	12.03		TE	-	Add reference to applicable permeation test	
GB	76.	12.03		te	The hazards associated with the release of gas must also be highlighted.	Add suitable warning.	
CA	77.	13.03		ge	Requirements should apply to all cylinder types,	"The coating on all defective containers may be stripped, using a method that does not affect the	

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					not limited to composite containers.	integrity of composite containers, and re-coated.	
GB	78.	13.04.2.2		te	1 in 10 is too few.	Increase the frequency.	
GB	79.	13.04.2.3		te	How would it be possible to test containers that may already have been installed? Is it practical to recall and test cylinders?	Reconsider requirements.	
GB	80.	13.05.1		te	For better clarity, the test criteria should appear after the test procedure.	Re-arrange order of text.	
SE	81.	13.05.2.1		TE	-	Define cycle rate	
GB	82. 1	13.05.2.1	b)	te	Poor English	Change to “..MPa and at least...”	
GB	83. 3	13.05.2.1	b)	te	What determines the appropriate value?	Clarify.	
GB	84. 2	13.05.2.3		te	Every 10 th batch is too few.	Increase frequency.	
GB	85.	14.01		te	The text for this section could be improved if that from ISO 7866 or 9809 is used.	Replace with text based on, for example, section 6.4 Failure to meet test requirements in ISO 7866.	
SE	86.	14.02		TE	Vaguely worded	Containers with leaks not meeting the requirements of Clause 12.3....	
SE	87.	14.03		TE	Vaguely worded	Rejected containers not meeting the requirements of Clause 12.2....	
GB	88.	15		te	Is this relevant to this standard?	Consider removing this clause.	
GB	89. 2	15		te	ISO 19882 is not listed in the normative references.	Add if required.	
GB	90. 3	15		ed	Clause 19.3.8 is the wrong reference.	Change to 19.3.9	
SE	91.	15	Note	GE	i) “demonstrated” in accordance with what? ii) Container or vehicle manufacturer?	Clarify requirements	
GB	92.	16		ed	Wrong reference for Annex.	Change “B” to “C”.	
SE	93.	17.01.1		GE	-	Label position should be agreed with vehicle manufacturer to assist reading when installed in the vehicle	

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GB	94. 1	17.01.1		te	For greater clarity.	Change to “For composite containers, markings may be.....”	
CA	95.	17.01.2		ge	The use of manufacturer approved mounting should be a requirement for integrators and users. Improper container mounting, i.e. one that doesn't consider container expansion, can pose a safety hazard to the public.	Add line “The statement “Mounting Shall Be In Accordance With The Container Manufacturer's Instructions”	
CA	96.	17.01.2		ed	Consider restructuring clause with sub-clause (a) containing mandatory information and sub-clause (b) containing the statement about non-mandatory information. (c) through (g) should then be revised to (v) through (ix) Statement “marking in accordance with government regulations, including at a minimum:” is confusing since the entire clause is a requirement. There is no point in nesting minimum marking requirements in a clause for mandatory marking requirements.	Revise section as follows: “Each container complying with this International Standard shall be marked as follows: (a) Mandatory information: i. name and contact... . . ix. The statement “Container Service Life...” (b) Non-mandatory information can be added...”	
GB	97.	17.02		te	This needs to be moved to end of section to be in the correct chronological order.	Move to appropriate position,	
GB	98. 1	17.02		te	Poor English.	Change to “Prior to despatch from the manufacturer, every container...”	
GB	99.	18		te	Quality assurance requirements are not appropriate for an ISO standard.	Remove.	
GB	100.2	18.02	b)	ed	Incorrect text.	Change to “...quality system. As a minimum...”	
GB	101.3	19.01		te	Incorrect term.	Replace “Independent inspection or test agency” with “Inspector” and add a definition for inspector in 3.	
GB	102.	19.01	Table 3	te	Extreme temperature cycling test is not relevant to type 1 cylinders.	Remove requirement.	
GB	103.	19.01	Table 3	te	Accelerated stress rupture test is not relevant to	Remove requirement.	

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					type 1 cylinders.		
GB	104.	19.01	Table 3	ed	Clause reference 19.3.3 incorrect.	Change to 19.3.4	
GB	105.	19.01	Table 3	ed	Clause reference 19.3.4 incorrect.	Change to 19.3.5	
GB	106.	19.01	Table 3	ed	Clause reference 19.3.5 incorrect.	Change to 19.3.6	
GB	107.	19.01	Table 3	ed	Clause reference 19.3.6 incorrect.	Change to 19.3.7	
GB	108.	19.01	Table 3	ed	Clause reference 19.3.7 incorrect.	Change to 19.3.8	
GB	109.	19.01	Table 3	ed	Clause reference 19.3.8 incorrect.	Change to 19.3.9	
GB	110.	19.01	Table 3	ed	Clause reference 19.3.9 incorrect.	Change to 19.3.10	
GB	111.	19.01	Table 3	ed	Clause reference 19.3.10 incorrect.	Change to 19.3.11	
GB	112.	19.01	Table 3	ed	Clause reference 19.3.11 incorrect.	Change to 19.3.12	
GB	113.	19.01	Table 3	ed	Clause reference 19.3.12 incorrect.	Change to 19.3.13	
GB	114.	19.01	Table 3	ed	Clause reference 19.3.13 incorrect.	Change to 19.3.14	
GB	115.	19.01	Table 3	ed	Clause reference 19.3.14 incorrect.	Change to 19.3.15	
GB	116.	19.01	Table 4	te	What is the justification for having reduced testing for category B containers? Category B should be removed.	Remove.	
JP1	117.	19.02	Table 4	ed	Test requirements for Category B containers Category B containers are Type 4 designs of 70 MPa nominal working pressure. (see Clause 5.1.2 Category) So the columns for Type 1, 2 and 3 in Table 4 are unnecessary.	The columns for Type 1, 2 and 3 in Table 4 shall be deleted.	
JP2	118.	19.02	Table 4	te	19.5.5 Permeation test This test is included in Clause '19.5.6 Container test for expected on-road performance'. So the independent permeation test is unnecessary.	The column for Clause '19.5.5' in Table 4 shall be deleted.	
CA	119.	19.03		ed	Consider renaming section. Section 19.2 indicates Category B containers are to use Table 4 using procedures in Clauses 19.3 and 19.5. Clause 19.3 is titled Category A and C: design qualification		

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					tests. This may cause some confusion.		
GB	120.	19.03.10.2		te	The requirement to actually burst the cylinder is not stated, though this is part of the test.	Add suitable text.	
CA	121.	19.03.10.3		ed	Clause references incorrect clause as the burst test. Burst test is Clause 19.3.6	"...when tested in accordance with the hydrostatic burst test in Clause 19.3.6."	
CA	122.	19.03.11.2		ed	Remove "pneumatically" – redundant language considering nitrogen, helium, and hydrogen are explicitly specified.	"A container shall be pneumatically pressurized to nominal working pressure with..."	
GB	123.	19.03.12		ed	For greater clarity, move text from 19.3.12.2 3 rd para. to start of clause.	Start the clause "This test shall only be required on Type 4 containers".	
SE	124.	19.03.12.2			EC Regulation requirement on which the requirement is based is 6.0NmL/hr/L water capacity at 15C	Change temp from ambient to 15 C for harmonisation.	
GB	125.	19.03.12.2	2 nd para.	te	The statement regarding permeation is not relevant.	Delete.	
CA	126.	19.03.12.3		ed	Note references incorrect clause for permeation test. Permeation test is Clause 19.3.12	Replace 19.3.11 with 19.3.12	
GB	127.	19.03.12.3	1 st para.	te	Define Ncc	Add definition.	
GB	128.	19.03.13		ed	For greater clarity, move text from 19.3.13.2 1 st para. to start of clause.	Start the clause "This test shall only be required on Type 4 containers".	
DE/ 04	129.	19.03.14		te	Low ambient temperature cycling missing as critical part of container service conditions.	The first 500 cycles shall be conducted at ambient temperature, followed by a static hold at 115 percent of nominal working pressure at 55 °C for a minimum of 30 hours. The second 500 cycles shall be conducted with the container at an ambient temperature of -30°C (250 cycles) and at 50 °C (250 cycles) .	
GB	130.	19.03.14.2		ge	Cycling with hydrogen is a specialised process. Are such facilities readily available?		
DE/ 04	131.	19.03.2.2		ed	Include real numbers of cycles required to be performed	Cycle the pressure in the container between 2 (±1) MPa to at least 125 percent of nominal working pressure at a rate not greater than 10 cycles per minute for the following number of cycles:	

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MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
						i) Category A containers: Number of cycles equivalent to 1500 times the service life of the container in years. ii) Category B containers: Number of cycles equivalent to 22,000 cycles iii) Category C containers: Number of cycles equivalent to 2250 times the service life of the container in years.	
GB	132.	19.03.2.2	a)	ed	Poor English	Change to "...MPa and at least..."	
DE/ 04	133.	19.03.3		ed	Wrong numbering, should be 19.3.2.3		
JP3	134.	19.03.3		ed	Acceptable results Clause number '19.3.3' is error in writing.	'19.3.3' shall be changed to '19.3.2.3'. And also '19.3.X.X' after that shall be changed to correct numbers.	
GB	135.	19.03.3	Note:	te	A maximum temperature should be specified.	Add max. temp. e.g. 50°C	
SE	136.	19.03.4.2.3		TE	-	Use either MPa or KPa throughout	
CA	137.	19.03.4.2.4, 19.3.6.2,		ed	Consider choosing either kPa or MPa as the pressure notation for the document to keep units consistent. Sections containing kPa are listed in the Clause/Subclause column.		
CA	138.	19.03.4.2.5		ed	Clause references incorrect clause as the burst test. Burst test is Clause 19.3.6	"...when tested in accordance with the hydrostatic burst test in Clause 19.3.6."	
GB	139.1	19.03.4.2.5		te	Is the reduction to 180% in line with other standards?	Confirm requirement.	
DE/ 04	140.	19.03.5.2		te	Remove requirement of container stabilization @ zero pressure.	The extreme temperature cycle test shall be performed in accordance with the following procedure: a) Stabilize the container at zero pressure and 85°C degrees or higher. b) Hydraulically pressure cycle between 2 (± 1) MPa and at least 125 percent of nominal working	

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						<p>pressure for 4 000 cycles. The temperature limits specified in (a) shall be met on the container skin and in the working fluid in the container throughout the cycling.</p> <p>c) Stabilize the container at zero pressure and ambient conditions.</p> <p>d) Stabilize the container at zero pressure and -40°C degrees or lower.</p> <p>e) Hydraulically pressure cycle between 2 (± 1) MPa and at least 80 percent of nominal working pressure for 4 000 cycles. The temperature limits specified in (d) shall be met on the container skin and in the working fluid in the container throughout the cycling.</p>	
CA	141.	19.03.5.3		ed	Clause references incorrect clause as the burst test. Burst test is Clause 19.3.6	"...when tested in accordance with the hydrostatic burst test in Clause 19.3.6."	
GB	142.2	19.03.5.3		te	Is the reduction to 180% in line with other standards?	Confirm requirement.	
GB	143.3	19.03.6.2	2 nd para.	te	To clarify what is required, a diagram should be added.	Add diagram of test arrangement.	
GB	144.1	19.03.6.3	2 nd para.	te	Unnecessary requirement. Remove "at least 225 percent of the nominal working pressure and"	Change to "The minimum required burst pressure shall be in no case less than ..."	
GB	145.1	19.03.7.2	a)	te	The geometry of the flaws need to be defined more precisely.	Define the flaws more specifically. See ISO7866 Annex E as an example.	
GB	146.1	19.03.7.2	b)	ed	Poor English	Change to "...MPa and at least..."	
GB	147.1	19.03.7.2	d)	ed	Poor English	Change to "...MPa and at least..."	
US 2	148.	19.03.9	19.3.9.2.4	te	The minimum test temperature values are extremely low in comparison to some real-world fire events. They well could be measured values for a simple test where the flames are created by clean propane gas, but such fires create low fire demands. The low values place emergency responders at an inappropriate risk. The tanks need to perform well when exposed to vehicle fires involving spilled fuels. They also need to respond	A technical basis needs to be documented for the low values specified in the standard, or the values need to be raised. Care needs to be taken to not extract values from inappropriate sources. (i.e., Extracting the early temperatures during a structural component fire test where the typical test exposure is 1 hour or more.) Current design values for fire more typically approach or exceed 1000°C. Increasing the minimum temperature might require	

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					well to fires inside a garage or tunnel.	changing the fuel specified in the test.	
GB	149.	19.03.9.2.1	1 st para.	te	It is unclear if this test is for specific valve/PRD arrangements and limits the design/approval to particular valves etc.	Clarify.	
GB	150.	19.03.9.2.1	2 nd para.	te	The dangers associated with using hydrogen in the fire test need to be emphasised and highlighted.	Add further warnings, bold text etc.	
SE	151.	19.03.9.2.2	1 st sent	TE	On the dome or cylindrical area?	Please clarify	
GB	152.	19.04	2 nd para.	te	It is not the duty of the inspector to define test requirements, these should be included in the standard.	Add specific requirements.	
GB	153.	19.05		te	The concept of category B containers should be removed and the requirements added to those for categories A and C.	Combine with categories A and C in 19.4.	
DE/04	154.	19.05.1		te	Delete “and Verification Test for Closure Durability)”	Note: Containers subjected to these tests are intended to be integrated into a compressed hydrogen storage system, including all closure devices (such as shut-off valves, check valves, pressure relief devices, etc.) and piping, and are expected to meet the additional test requirements (Verification Test for Expected On-Road Performance [Sequential Pneumatic Tests], Verification Test for Service Terminating Performance in Fire, and Verification Test for Closure Durability) in the UN GTR or SAE J2579.	
JP4	155.	19.05.4	ALL	ed	Container test for performance durability To avoid the descriptions of looking similar, but different test methods, there is the way to describe as quotation from the UN GTR like Clause '19.5.6'. Example; 19.5.6 Container test for expected on-road performance In order for a Category B container to be fully qualified for on-road vehicle usage, a container test shall be conducted at a system level in accordance with the UN GTR, SAE J2579, or	Clause '15.5.4.1 to 15.5.4.9' shall be deleted. And as comprehensive description, the following shall be added. “In order for a Category B container to be fully qualified for on-road vehicle usage, a container test shall be conducted at a system level in accordance with the UN GTR, SAE J2579, or equivalent fuel cell vehicle regulations or standards.”	

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					equivalent fuel cell vehicle regulations or standards.		
DE/ 04	156.	19.05.4.3		te	Harmonize requirement for drop test with UN GTR test requirements and options	<p>The orientation of the container being dropped (per requirement of 19.3.7.2(a)) is determined as follows:</p> <p>One or more additional container(s) shall be dropped in each of the orientations described. The drop orientations may be executed with a single container or as many as four containers may be used to accomplish the four drop orientations.</p> <p>If more than one container is used to execute all three drop specifications, then those containers shall undergo pressure cycling according to para. 19.5.2 until either leakage or 22,000 cycles without leakage have occurred. Leakage shall not occur within number of Cycles (5,500, 7,500 or 11,000).</p> <p>The container used for further testing shall be identified as follows:</p> <p>(a) If a single container was subjected to all four drop orientations, then the container being dropped shall undergo further testing as specified;</p> <p>(b) If more than one container is used to execute the four drop orientations, and if all containers reach 22,000 cycles without leakage, then the orientation of the container being dropped per requirement para. 5.1.2.2. is the 45° orientation (iv), and that container shall then undergo further testing as specified;</p> <p>(c) If more than one container is used to execute the four drop orientations and if any container does not reach 22,000 cycles without leakage, then the new container shall be subjected to the drop orientation(s) that resulted in the lowest number of cycles to leakage and then will undergo further testing as specified in paragraph 5.1.2.</p>	
JP5	157.	19.05.5	ALL	te	<p>Permeation test</p> <p>This test is included in Clause '19.5.6 Container test for expected on-road performance'. So the</p>	Clause '19.5.5' shall be deleted.	

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					independent permeation test is unnecessary.		
GB	158.	19.06		te	For clarity, the requirements should be combined with those of 19.4.	Move to 19.4	
AR	159.	20. Bibliography		Te	There's not any reference to the hydrogen safety ISO document: ISO/TR 15916	Add the following bibliographic reference: ISO 15916 – Basic considerations for the safety of hydrogen systems	
GB	160.	Annex A		te	Is this required? If so it is not really adequate and needs further details.	Remove and update 5.1.4 and 10.4	
DE/ 04	161.	D.1.04.1		te	Common re-inspection periods acc. e.g. CG6.4 and FMVSS 304 is 3 years. However, Category C container should then exceed $4 \times 1,125 = 4,500$ cycles w/o leak/rupture		
DE/ 04	162.	D.1.06		te	Common re-inspection periods acc. e.g. CG6.4 and FMVSS 304 is 3 years. However, Category C container should then exceed $4 \times 1,125 = 4,500$ cycles w/o leak/rupture		
SE	163.	D.1.11	Last para	TE	Incorrect testing temperature noted. The figure was derived for 15C not a minimum of 15C.	Change to "...at a 15 C testing temperature."	
IT	164.-	Table 3		Te	Accelerate stress rupture test	Remove * from table as per text 19.3.10 being this test not required for Type I cylinders	

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