

Ballot Information

Reference	ISO/DIS 15399	Committee	ISO/TC 197
Edition number	1		
English title	Gaseous hydrogen - Cylinders and tubes for stationary storage		
French title	Hydrogène gazeux - Bouteilles et tubes pour stockage stationnaire		
Start date	2012-09-27	End date	2013-01-27
Opened by ISO/CS on	2012-09-27 00:16:55	Closed by ISO/CS on	
Status	Pending		
Voting stage	Enquiry	Version number	1
Note	Extension of vote until 2013-01-27		

Result of voting

P-Members voting: 9 in favour out of 14 = 64 % (requirement \geq 66.66%)

(P-Members having abstained are not counted in this vote.)

Member bodies voting: 6 negative votes out of 16 = 38 % (requirement \leq 25%)

Disapproved

Votes by members					
Country	Member	Status	Approval	Disapproval	Abstention
Argentina	IRAM	P-Member		X *	
Australia	SA	O-Member			X
Austria	ASI	O-Member		X *	
Brazil	ABNT	P-Member			X
Canada	SCC	Secretariat		X *	
China	SAC	P-Member	X *		
Denmark	DS	P-Member			X
Egypt	EOS	P-Member	X		
France	AFNOR	P-Member	X *		
Gabon	ANTT				X
Germany	DIN	P-Member	X		
India	BIS	P-Member	X		
Italy	UNI	P-Member		X *	
Japan	JISC	P-Member		X *	
Korea, Republic of	KATS	P-Member	X		
Malaysia	DSM				X
Netherlands	NEN	P-Member			X
Norway	SN	P-Member	X		
Russian Federation	GOST R	P-Member	X		
Spain	AENOR	P-Member			X
Sweden	SIS	P-Member			X
Switzerland	SNV	O-Member			X
Turkey	TSE	O-Member	X		
United Kingdom	BSI	P-Member		X *	
United States	ANSI	P-Member	X *		
P-Member TOTALS Total of P-Members voting: 14			9	5	5
TOTALS			10	6	9
(*) A comment file was submitted with this vote					

Comments from Voters		
Argentina	IRAM	P-Member
Austria	ASI	O-Member
Canada	SCC	Secretariat
China	SAC	P-Member
France	AFNOR	P-Member
Italy	UNI	P-Member
Japan	JISC	P-Member
United Kingdom	BSI	P-Member
United States	ANSI	P-Member

Template for comments and secretariat observations

Date:2013-02-04

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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
AT				ge	This draft standard is very difficult to understand and is written in a way that manufacturers can hardly use and work with it. An ISO standard shall be easy to understand and practicable. Not all CD comments were discussed in WG15 and some of those addressed and agreed were not adopted in the DIS version.	The DIS shall be referred back to WG15 to treat all comments adequately. 2 nd DIS is proposed.	
FR			Table 1	te	Ratio 2,25. What if the proof that this safety ratio is sufficient or not?	Please clarify (for some types 1, 2, 3 and 4)	
FR			Table 3 11.3.8	te	“High strain rate impact” and “Bonfire”. Does not understand why it is applicable for types 1 and 2	Please delete the symbol in the corresponding columns	0
GB				Ge	The Italian Member body submitted this comment regarding ISO/CD 15399 : Italy submitted a negative vote mainly due to the fact that more evidence shall be shared inside the WG about the proposed methodology for fatigue evaluation (see Annex A.2 and Annex A.7). WG15 experts must have the possibility to fully understand the background of the experimental method and evaluate data to validate the proposed approach included in the draft CD. Fatigue performance in hydrogen and related experimental methods are the key point of this new ISO standard.	The UK agrees with this comment and endorses it	
GB				Ge	The United States Member Body submitted this comment regarding ISO/CD 15399 : The U.S. supports the development of this document but cannot approve the current draft until technical concerns with regard to the determination of material suitability for hydrogen service (as noted in comments below) are addressed. Additionally, we also request that the task group consider that the document will likely be used by various manufacturers in different manners and therefore build “flexibility” into the document to facilitate economic use of the document over a range of production volumes (and batch sizes).	The UK agrees with this comment and endorses it.	

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					We trust that our comments will be considered, and we look forward to the next draft revision.		
GB				Ed	Stationary storage needs to be clearly defined	Add definition to Standard	
GB				Ge	Replace filament with fibre throughout document Filament is part of a fibre		
IT							
JP1							
US 1							
GB		All		Ge	<p>Work regarding this draft standard has been rushed through the drafting stages (e.g. From ISO/CD 15399 to ISO/DIS 15399) with insufficient consideration given to the significant technical concerns raised by the ISO/TC 197/WG 15 Experts. Too much emphasis has been placed on meeting the time constraints of the drafting programme. It was the position of the ISO/TC 197/WG 15 UK Experts that even for ISO/CD 15399 the draft was not ready to progress to the DIS stage (it should have been circulated for comment as a second CD). There was a real concern that the draft was progressing with insufficient regard being given to the technical opinions of the ISO/TC 197/WG 15 Experts. The ISO/TC 197/WG 15 Convenor ignored those technical concerns and moved ahead simply to be able to meet programme deadlines.</p> <p>As circulated for vote, ISO/DIS 15399 must be sent back to ISO/TC 197/WG 15 for further in depth development and for subsequent circulation as a second DIS or even as a second CD.</p> <p>In addition the technical justifications and rationale promised after the CD comment request (No vote was asked for) have not been received.</p> <p>Further, many of the detailed comments that have previously been submitted (e.g. following the circulation of ISO/CD 15399) have not been properly</p>		

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					<p>considered and decisions regarding their inclusion deliberately put off for review at a future date in order to keep the drafting of ISO 15399 in line with the drafting programme. This has been done at the expense of completing the technical drafting work and properly resolving the important technical issued raised by the ISO/TC 197/WG 15 Experts.</p> <p>In the UK, two full day meetings have been held in order to discuss and agree the UK comments to be submitted. ISO/DIS 15399 proved so difficult to read and understand that it was only possible to provide detailed comments up to including Clause 7.2. UK Experts were not prepared to put even more time aside to complete their detailed comments (which may have taken at least two further full days). As a consequence, detailed UK comments are provided up to and including clause 7.2.</p> <p>In addition, there is some overlap in requirements between ISO 11515 and ISO/DIS 15399 and so consideration should be given to harmonizing the common areas. This could be done by referring to the relevant requirements already existing in ISO 11515 in ISO 15399 and only including the specific additional requirements for stationary storage cylinders in ISO 15399.</p> <p>A great deal of work on the draft is required before it is ready for submission to FDIS vote</p>		
IT		General			<p>Italy submitted a negative vote mainly due to the fact that more evidence shall be shared inside the WG about the proposed methodology for fatigue evaluation (see Annex A.2 and Annex A.7).</p> <p>Statistically representative experimental data at a laboratory and full scale level need to be presented to the WG in order to understand the background and validate the proposed approach.</p>		
		Introduction		ge		In the introduction, please indicate that the pressure vessels for stationary storage are covered by specific regulation, e.g. PED in Europe, ASME code in North America	

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FR		Introduction	First paragraph	ed	"Requirements covering pressure.....are <u>required</u> to maintain or improve on the level of safety of this application".	Please adjust the english	
GB		Introduction		Te	Impossible for manufacturer to specify every element of the service environment and conditions and to be responsible for them.	This section should be replaced by similar words to existing pressure vessel standards e.g. ISO/DIS 11515	
GB		Introduction	f)	Te	The requirements included here are not included in scope (which deals with design manufacture and test). This indent introduces in service parameters which are outside the scope of the draft.	Delete indent f)	
GB		Introduction	g)	Te	How is ...safe service conditions... defined. These requirements should be included in the standard not left to the manufacturer to define	Draft and include a definition to detail what safe service conditions are or delete the wording	
GB		Introduction	Second a) and b)	Ed	Improved clarity	There are two a) and b) in this clause. Delete the second a) and b) and add h) and i)	
SAC		1 Scope	Paragraph1	te	The design, manufacture and test requirements specified in this standard are mainly based on the related requirements for vehicle fuel tanks. However, some design and test requirements for vehicle fuel tanks are not appropriate for stationary cylinders and tubes because the service conditions are different. For example, compared to vehicle fuel tanks, stationary pressure vessels may have higher pressure cycles and is almost impossible to experience various chemical exposures.	State different experimental requirements for vehicle fuel tanks and stationary pressure vessels, respectively.	
GB		2			Review normative references so they are in line with the Chris Jubb paper (add ISO number here)		
US 1		2		te	Since compliance with the ASME Boiler and Pressure Vessel Code is a requirement for the majority of US jurisdictions, and since the draft does not accept ASME as one of the methods to comply with this standard, this standard is of little or no use in the USA. To be useful to the USA, the vessel construction has to include alternate practices. This standard should reference the ASME Boiler and Pressure Vessel Code, Section VIII, Division 3, which explicitly covers pressure vessels for hydrogen service, including hoop wrapped composite vessels. Special requirements for vessels in hydrogen	Add normative references to ISO 16528-1 and -2 for Types 1 and 2 vessels, for which ASME Boiler and Pressure Vessel Code, Section VIII, Division 3 is registered, and accept compliance with ISO 16528 and one means of complying with this standard.	

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					service are provided in Article KD-10.		
JP4		A-2	Hydrogen sensitivity tests	Te	The "hydrogen sensitivity test", both of method 1 and method 2 are not appropriate methods for determining the design fatigue life of a pressure vessel in hydrogen service. The application of these tests to hydrogen sensitivity must be justified with experimental evidence. A different result (Fhs) is expected in method 1 and method 2. And the test specimen and the test method on method 2 should be mentioned.	We should research and discuss the test method more with evidence.	
FR		3.9		ed	"cycle depth"	Should be replaced by 3.8	
FR		3.9	Second line	te	Why a ratio of 20 %	Please give a rationale for 20 %	
GB		3.9		Ed	Improved clarity	There are two 3.9. Re-number correctly	
GB		3.9		Te	Cycle depth. Definition is unclear as written. Pressure increase from what to what? In addition, there is no mention of cycle depth in the text at all.	Delete definition	
GB		3.9 (second)		Te	Definition is unclear. In addition, there is no mention of deep pressure cycle in the text at all. .	Delete definition	
GB		3.10		Te	Design Change cannot be easily defined in single sentence.	Delete clause	
FR		3.14	Note	ed	"Permeation through Described in A.15 is not considered leakage"	"as a" should be added between "considered" and "leakage"	
FR		3.16	Second line	te	"Burst pressure of at least 5 %". Is it the minimum, normal or maximum burst pressure?	Please clarify	
FR		3.16	Second line	te	"Nominal burst pressure". What is the nominal burst pressure?	Indicate the definition of the nominal burst pressure	
GB		3.18		Te	Note confuses the definition	Delete	
GB		3.19		Te	Definition does not reference temperature, which surely	Better definition to include relationship with	

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					is necessary to calculate the max developed pressure In most cylinder standards design pressure = test pressure, which also adds to confusion	maximum allowable temperature	
GB		3.22 3.23 3.26		Ed	As drafted definitions for pressure cycle life, shallow pressure cycle life, deep pressure cycle life make reading the standard very confusing. Delete definitions and write requirements directly in into the text where they are needed rather than using names (where the reader has to remember the requirements)	Re-draft text to be clearer and easier to read and comply with by the reader	
FR		3.26	Second line	te	See comment 3.9		
GB		3.28		Te	Definition cannot be inclusive	Delete	
GB		4		Te	General comment. The relationship between the different pressures are unclear In addition, the service pressure requirements need to be added	Relationship between Design Test Pressure and MAWP and Minimum MAWP needs to defined. Service pressure requirements are to be added	
GB		4.1		Te	Information is already included in the definitions Relationship between service pressure and maximum allowable pressure is missing	Delete wording but add pressure range to the scope. In addition, the relationship between service pressure and maximum allowable pressure needs to be included	
FR		4.2	Third paragraph	te	Why shall the specified value for the minimum allowable temperature not exceed – 25°C?	Replace “- 25°C” by “- 20°C”	
FR		4.3	Second line	te	12 000 cycles. Is it shallow or deep cycles	Please clarify	
GB		4.3		Te	What is the relationship between pressure cycle life and design life. There are no requirements in the text as drafted	Add requirements to define the relationship between pressure cycle life and design life	
GB		4.3		Te	Cycle life has changed from 15 000 cycles (which we are told was agreed by consensus in the WG) but 12 000 cycles now included in the daft	Re-draft requirement to be in line with the agreements reached in the WG	
FR		4.4	First paragraph	te	“In this case, the shallow pressure...cycle life”. Does it mean that the shallow pressure cycle life will be 12 000 x 3 ?	Please clarify	

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GB		4.4		Te	Where does the 3 x factor come from? In the example in 4.5 the factor appears to be 2 x.	It is the UK view that the reason given for rejection by the Secretariat are not acceptable and the decision has been based on no credible evidence. Proper rationale to be given as to why the UK comment has not been properly addressed	
FR		4.5		te	Examples are not very clear	Please clarify	
GB		4.5		Te	What is the technical justification of Pressure Intensity Factor. Where does the cube function come from. The examples are using different pressures.	It is the UK view that no justification for rejection has been seen and the requirements are still unclear as drafted. Also the Italian, US and Serbia (SP) comments have not been discussed and further justification has not been received for discussion.	
JP1		4.5	Pressure cycle life	Te	The cube law is a method used to predict the fatigue life of metal materials that are subject to load changes. However the cube law may not be applied for Type 3 vessel with autofrettage processing or Type 4 vessel with a plastic liner. Especially, 1) The single-axis stress on a test specimen and the multi-axis stresses on the actual vessel must have different S-N curves. 2) In the case of Type 2 and Type 3 with autofrettage processing (in other words, with the stress ratio R ranging from -1 to 1), the cube law may not be the safest.	We should research and discuss it more with evidence.	
GB		4.6		Te	What is the justification for 50 years How is it proposed to monitor the cycle life over the life of the cylinder	It is the UK view that no justification for rejection has been seen and the requirements are still unclear as drafted. Service life cannot be considered separately from the pressure cycle life. In addition, the Italian comment has not been discussed and further justification has not been received for discussion..	
GB		5.1		Te	Last paragraph is not exhaustive	Last paragraph should consist of examples. The UK proposal was agreed but the text in ISO/DIS 15399 has not been changed	

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GB		5.1		Te	It is unreasonable for the manufacturer to know the intended use of his cylinder throughout its life. How would such information be specified by the manufacturer and how will it be conveyed to the user except by putting it on the cylinder itself	Requirements should be re-drafted in order to include that the manufacturer can control and not those he cannot	
FR		6	First paragraph	te	Is it mandatory to use a PRD for types 3 and 4	Please clarify	
GB		7.2		Te	7.2 f) and g) would be better included in Annex D as they are outside the scope of this standard UK words from previous comment?	Amalgamate 7.2 and 7.3 Remove (f) and (g) from 7.2	
FR		7.5	First sentence	te	"On file"	Please replace "On file" by "shall make available on request"	
FR		8.6	Second paragraph	te	"The glass transition temperature shall be at least 15°C above the maximum allowable temperature"	Please replace "above the maximum allowable temperature" by "above the minimum allowable temperature"	
FR		9.1	First paragraph	te	"a stress analysis". The method is not given.	Please indicate the method	
FR		9.1	Second paragraph	te	"suitable analysis". What is a suitable analysis	Please clarify	
FR		9.2.1	First paragraph		"The minimum actual burst pressure....the values given in Table 1"	Make a reference to the burst values obtained during type test (see comments in 12.2.3)	
FR		9.2.1.a) & b)	First line	te	a): "Is considered a fundamental" b): "Is not considered as a fundamental" How do we know that it is fundamental or not?	Please clarify	
JP2		9.2.2 9.3 11.3.2	Type 2 vessel liner burst pressure Test pressure Hydrostatic burst pressure	Te	Confirmation about liner burst pressure ratio on Type 2 vessel 9.2.2 Liner burst pressure → 1.125 times the MAWP. 9.3 Test pressure → 1.25 times the MAWP. 11.3.2 (1 st paragraph) liner burst pressure → 1.25 times the MAWP.	Need to check which is correct, 1.125 or 1.25.	
FR		9.2.3	First paragraph Second line	te	"Not cause the liner to buckle or crease". How to verify this requirement?	Please clarify	

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FR		9.3	Note	te	Please delete the “note” and modify as indicated	After “MAWP pressure”, please add “and in accordance with the applicable regulation (e.g. PED: 1.43).	
FR		9.4	Second paragraph	ed	To modify as follows	“The manufacturer shall demonstrate that defects larger than the specified maximum size are detectable by ultrasonic testing. “	
FR		9.5	Second paragraph	ed	To separate the second paragraph in two ones.	Please start the third paragraph with: “For all type of fibres” and continue with “steel liners shall be protected against corrosion prior to wrapping” (which is the end of the second paragraph).	
FR		9.6		te	“The gloss loss” is not listed in paragraph 3 “Terms and definitions”	Add “Gloss loss” in the paragraph 3 “Terms and definitions”	
FR		10.1	Fourth paragraph	te	What about resin curing? Is it acceptable or not? If so, what is the maximum acceptable temperature to apply?	Please clarify	
FR		10.7	Second paragraph	ed	“Provide guidance”. The validity must be proven	Please replace the sentence “The manufacturer shall provide guidance on...” by “The manufacturer shall prove the validity by suitable testing on...”	
FR		11.2.1	First paragraph	te	“Shall be at least 14 %”. Is too high for high strength steel	12 % is proposed	
SAC		11.3.1 Use of subscale units	Paragraph 1	te	It should be considered that how to ensure the performance of subscale units equal to full scale pressure vessels. For example, fatigue resistance of subscale units is not equal to that of full scale pressure vessels. Furthermore, some qualification tests are still difficultly conducted on the large subscale units (450 L), such as ambient temperature pressure cycling and hydrogen gas cycling.		
FR		11.3.3	Third paragraph	te	What is the validity?	Please specify the validity and the requirements for sub-scale units. For example, it is specified for test in paragraph 11.3.6	
FR		11.3.9	First paragraph	te	“For all designs”. Is it for all designs of for all types?	Please specify	
JP3		11.3.15	Water soak test	Te	Included in Table 3 without any definition. A17 has a different description.	Define or delete.	

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FR		12.1 b)		te	"ISO 11119-4". This standard is not yet published		
FR		12.2.1	Second paragraph	te	"Batch test". The batch size must be indicated. This is not in the definition	Please indicate the batch size (e.g. refer to 12.2.2 b)	
FR		12.2.2 b)		ed		Delete the square brackets [30]	
FR		12.2.2 g)		te	When does this period start? For example, at the end of production of the first cylinder?	Please clarify	
FR		12.2.3	First paragraph	te		After "Table 1", please add "and shall not less than 90 % of the actual mean burst during type test ."	
FR		13 a)		te	"H ₂ ONLY". Why H ₂ only? If suitable for H ₂ , suitable for many other gases	Please remove a)	
JP5		A.7.4	Alternative pressure cycling conditions 1 st & 2 nd Para.	Te	K _{sh} is not defined.	Isn't this supposed to read F _{hs} , which is defined under A.7.2?	
JP10		A.9	Bonfire test	Te	Purpose and requirement for the orifice plate is not clear.	Please explain about purpose and requirement (e.g. flow rate) for the orifice plate.	
JP6		A.9	Bonfire test	Te	The bonfire test is described in a confusing manner because the procedure is not written in a sequential manner. Change the order of the specific explanations.	Change the sequence of specific descriptions: Current: A.9.1 General→A.9.2 Set-up→A.9.3 Pressure venting apparatus→A.9.4 Fire source→A.9.5 Test procedure→A.9.6 Acceptable results Change to: A.9.1 General→A.9.2 Pressure venting apparatus→A.9.3 Fire source→A.9.4 Set-up→A.9.5 Test procedure→A.9.6 Acceptable results	
JP7		A.9	Bonfire test	Te	It is acceptable to be report relationship of the time and the pressure after PRD activates as a factor Is it necessary to assemble an orifice plate to PRD or to place and orifice plate to downstream line from PRD?	The orifice plate is unnecessary.	

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					Isn't the orifice plate unnecessary? Is it enough that PRD activates within 3 min. Is there any requirement for PRD, e.g. flow rate?		
JP8		A.9	Bonfire test	Te	The location of thermocouples shown in the Set-up is not clear. Should be specified clearly. Does the location hold coordinate in case of shorter length vessel than 1m?	Should be specified location of thermocouples more clearly. The location of thermocouples should be mentioned in a table or a drawing in both cases that vessel length is longer and shorter than 1.65m. We should research and discuss about bonfire test. Current: Five thermocouples over a maximum of 1.65m. At least 2 thermocouples within the fire area (1.65m or three times the diameter). At least 3 thermocouples to be located in the remaining area at an equal interval not exceeding 0.5m.	
JP9		A.9	Bonfire test	Te	"Hydrogen shall be released through the pressure venting apparatus..." In this sentence, the meaning of "released" is unclear.	To clarify, change "released" to "vented".	
SAC		A.9 Bonfire test	Paragraph 1	te	Bonfire test is applied to assess the safety performance of vehicle tanks under accidental fire exposure. The test condition is based on actual vehicle fire. So, it does not apply to the evaluation of fire safety of stationary tubes and cylinders.		
IT		A.14	paragraphs c) and d)	Te	Low temperature part of the test should be performed at -50°C because, as specified in 4.2, the minimum allowable temperature can be -50°C.	Substitute -40°C with -50°C in paragraphs c) and d)	
IT		A.19	Paragraph c)	Te	In the last meeting it was agreed that volumetric expansion test was not required for type 1 and type 2. Also it seems there is wrong reference to section 7.6.	Please add a clear sentence in section 12.1 h).	

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IT		Par. 3.3		Te	Batch definition shall be improved.	Wording from ISO FDIS 11515 (sections 3.3 to 3.7) can be used.	
IT		Par. 4.5		Te	It seems that the exponent 3 in the S-N curve is derived from steels in a non embrittling environment. Is it applicable to hydrogen service? Is this approach derived from other standards?		
IT		Annex A.1		Te	Annex A.1 and section 11.2.1 could appear to be in contrast. Could you please clarify? Please confirm that ISO 11114-4 testing is required only for steels with ultimate tensile strength above 950 MPa. Moreover ISO 11114-4 is valid only up to 300 bar.		
IT		Annex A.2 Method 1		Te	Is there any rationale for the choice of 300 mm depth and diameter?		
IT		Annex A.2 Method 1		Te	Please specify in which direction the samples should be taken.		
IT		Annex A.2 Method 1		Te	It could be difficult to obtain a specimens with 19 mm diameter. Should we define a subscale specimen?		
IT		Annex A.2 Method 1		Te	Where should the specimens be taken from?	Machine the specimens from a representative test ring	
IT		Annex A.2 Method 1		Te	Fatigue tests in N2 is known to be frequency independent.	Remove limits of 0.5 Hz.	
IT		Annex A.2 Method 1		Te	What is the rationale behind the choice of number of cycles to failure between 1×10^4 and 3×10^4 ? This could be valid only if hydrogen embrittlement/sensitivity is shown to be independent of the stress levels use to evaluate it. Please clarify.		
IT		Annex A.2 Method 2 2 nd paragraph		Te	The whole section of method 2 is not completely clear. Please consider rewording and/or introduction of formulas that might help understanding. Is the pressure leading to burst in ISO 11114-4 the minimum, the average? Please clarify. How many disk tests should be burst?		

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					Also pressure rise rate is important in disk pressure test according to ISO 11114-4. Please add details.		
IT		Annex A.2 & Annex A.7		Te	Could you please provide a database of experimental tests that clearly support and demonstrate the applicability of this approach at both lab and full scale levels, as agreed at the last meeting?		
CA				te	The only comment on this DIS came from our expert on the WG that has prepared this draft. He thinks that there are too many test methods and test criteria in this DIS that have not been validated for all cylinders covered in this standard. For example, the pressure cycles required for large cylinders will be very costly and it seems that there is no evidence of failures to justify the extra testing, our experts comments will be forwarded to the WG Convener.		0
AR	General				NEGATIVE vote mainly because the standard is difficult to understand and It doesn't seem to be enough experimental data to support the testing methodology. There are also missing rationales and concepts that we don't agree with.		
AR	3.7			Ed	The term overwrap in this clause is written with a hyphen, while the definition in 3.6 does not have one. In ISO 11119 the term is used without hyphen	Remove hyphen and write overwrap, for consistency	
AR	3.13			Ed	The term overwrap in this clause is written with a hyphen, while the definition in 3.6 does not have one. In ISO 11119 the term is used without hyphen	Remove hyphen and write overwrap, for consistency	
AR	3.21			Ed	The term overwrap in this clause is written with a hyphen, while the definition in 3.6 does not have one. In ISO 11119 the term is used without hyphen	Remove hyphen and write overwrap, for consistency	
AR	4.5			Te	The rationale for the formula is still unclear. During the discussion of the CD comments it was stated that		

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					additional justification and explanatory notes would be added for discussion. These statements are reflected in the compilation of comments but they have not been added		
AR	5.2		Te		<p>According to clause 5.2, Pressure vessels shall be designed to contain hydrogen complying with ISO 14687 Part 2.</p> <p>However, it is not clear enough why hydrogen fuel for PEM fuel cell applications for stationary appliances (ISO 14687-3) and gaseous hydrogen fuel for all other applications (ISO 14687-1) are not considered by this standard</p> <p>It is clear that "This requirement implies that the tank materials shall not be source of contamination of the hydrogen stored with regards to the impurities covered by the hydrogen purity specification (Part 2)."</p>	Please clarify this requirement.	
AR	6	1 st Paragraph 4 th line	Te		The time for activation should be equal or less than the maximum specified by the manufacturer. The way it is written activation has to be equal to the specified	Write: "equal or less"	
AR	6		Te		It is not clear why type 1 and 2 cylinders have no specification for pressure relief	Discuss safety devices for type 1 & 2 cylinders	
AR	6	Note	Ed		Correct the paragraph: "within three minute"	Write: "within three minutes"	
AR	6	Note	Te		The assignment of responsibility for implementing the appropriate measures is beyond the Scope of this Standard, as it may be a subject of local regulations.	Discuss appropriate statement to relieve the manufacturer from this responsibility but without assigning it to a particular individual.	
AR	8.2		Te		The text is not clear that welded liners would only be acceptable for type 4 cylinders (non-load sharing)	Clarify.	
AR	8.5		Te		Mixture of the fibres should be allowed	Add ",or any mixture thereof"	
AR	9.4		Te		There is no specification of maximum allowable defect sizes, despite what had been agreed in the Paris meeting and circulated in the CoC	Specify maximum allowable defect sizes, or requirements to be met.	
AR	10.1	2 nd Paragraph	Te		Allowing welded liners for Type 3 cylinders clearly contradicts the Scope. ("composite construction (Types 2, 3 and 4) <u>without</u> any non-seamless load sharing metallic	Replace para. with: Type 3 liners shall be constructed from steel,	

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					components") Type 3 cylinders by definition have metallic load sharing liners and according to the scope these shall be seamless.	aluminium alloys, stainless steels, and shall be seamless. They shall comply with the materials requirements in 8.2, 8.3 or 8.4, as appropriate.	
AR	10.1		Te		There is no specification for Type 4 liners	Add specifications. E.G like the ones specified in ISO FDIS 11119-3	
AR	11.2.2	3 rd para	Te		Scope excludes welded load sharing liners. ISO 11119 part 2 only allows seamless steel, aluminium or SS liners as well.	Remove 3 rd Paragraph	
AR	11.3.10		Te		Impact damage test reference is not shown. It seems as the previous A.15 test has been removed even though it was decided to keep it for small (<450 l) cylinders	Add the reference or description of the test within the Annex A	
AR	12.1	Indent a) last line	Ed		Incorrect reference. Maximum defect size is 9.4 not 9.3	Replace 9.3 by 9.4	
AR	12.2.2	b)	Ed		The quantity of finished pressure vessels which are not subjected to a volumetric expansion production test it is wrongly shown between square brackets [30]	Delete the brackets	
AR	12.2.2	i)	Te		Batch definition for Type 1 & 2 cylinders or liners reflect different considerations than the rest. If the batches are considered the same if produced in different equipment, along up to one year (or one month), in different shifts, and for types 3 & 4 with different materials there is no reason to require same cast for the steel cylinders. They should be treated similarly as in indent h).	Replace i) with: Type 1 or Type 2 pressure vessels may contain different casts of metal providing that controls are in place to assure that consistency of the vessel manufacture and performance will be maintained within the batch. The specified material of construction shall be the same	
AR	13		Te		The cylinders should be marked that they are only suitable for stationary use	Add: "For Stationary use only" preferable right next to H2 only "H ₂ STATIONARY USE ONLY"	
AR	13	j)	Ed		Correct the following paragraph "the _minimum allowable temperature in °C"	Delete the underscore.	
AR	A.2	Method 1	Te		Sample size. Why this specific dimension ? Samples could be hard to be taken from the material depending on the dimension of the material under analysis.		

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AR	A.2	Method 1	Te		Please provide the rationale for using 1×10^4 and 3×10^4 ?		
AR	A.2 Method 2	2 nd paragraph	Te		The section is unclear and could lead to misinterpretations.	Rewording	
	Annex A.2 & Annex A.7		Te		Is this approach validated by statistically valid tests?	Please supply experimental data	
AR	A.6		Te		It had been agreed that type 1 & 2 would only be allowed to rupture in the cylindrical part	See CoC for CD with decisions Decision: Add at the beginning of last sentence : For Types 3 and 4, a leak or rupture..... Add : For Types 1 and 2, rupture shall initiate in the cylindrical portion only.	
AR	A.9		Te		It is still not clear why in a fixed stationary application a bonfire test is necessary, as the installation should have fire extinguishing systems that would prevent fire exposure to the system. It is a different situation than for on-board cylinders that can be involved in car fires and there is no fire extinguishing mechanisms and the cylinders are installed horizontally in the majority of cases.	Remove the test requirement altogether.	
AR	A.9		Te		If the decision is to keep the test, it must be noted that the stationary cylinders are often installed vertically (especially those smaller than 450 litres). The setup of the test is not effective for vertical installation, because the fire would impinge on the cylinders from below and the cylinder would shield the valve and relief devices. A new test should be designed. This design should be carried out by a multidisciplinary task force including manufacturers, test laboratories and system integrators.	Define a vertical installation bonfire test.	
AR	A.9.5		Te		The 3 minute limit is not clearly rationalized. Why is there a different acceptance criteria than for ISO 11439?	Remove 3 rd paragraph	
AR	A.12.1		Te		During the Paris meeting it was decided to be more specific with notch shapes. The current text is the same	Comply with the Paris decision	

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				as in the CD			
AR	A.14	c) d)	Te	The Paris decision to mention the possibility of specifying temperatures lower than -40 °C has not been followed	Comply with the Paris decision		

P:\\ISO_DIS_15399_SAC.doc: Collation successful

P:\\ISO_DIS_15399_AFNOR.doc: Collation successful

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P:\\ISO_DIS_15399_ASI.doc: Collation successful

Collation of files was successful. Number of collated files : 8

SELECTED (number of files): 8 .

FILES IN THIS GROUP(number of files): 8.

PASSED TEST (number of files): 8.

FAILED TEST (number of files): 0.

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