ISO/TC 197
Hydrogen technologies

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N707 DTR 19880-1 Compiled vote comments

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Date of document: 2015-10-13

Expected action: INFO

Background: Here are the comments that were submitted with the DTR 19880-1 vote (see N706 for the vote results).

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

Template for comments and secretariat observations

Date: 2015-09-21	Document: **ISO/DTR 19880-1 (ISO/TC 197 N 703 (PVE/3/8_15_0083))**	Project: **65003**

MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
US 1		Title		ed	ISO/TC 197 had agreed to use the U.S. spelling of fueling	Change "fuelling" to "fueling" in title (cover and page 1)	
DK1				GE	ISO19800-1 is a stepping stone in the right direction in order to ensure a safe and acceptable performance of a hydrogen fueling station for end users and operators. There are still a lot of improvements that needs to be addressed in the standard as a more clear definition of use of safety mitigations and their impact on safety distance to the station.		
GB1		1	Para 1	Ge	The referenced standard for an example fuelling protocol, SAE J2601, is not suitable for motorcycles or other small capacity vehicles either.	Include small capacity vehicles on the list of applications covered – however, it should be highlighted that the reason is the example fuelling protocol referred to, which has a limit on the range of hydrogen storage system capacities, rather than any other sections of the document.	
NL1		1		TE	The scope is not yet aligned with vehicle specifications.	The scope should be aligned with the vehicle specifications.	
CA1	10	1	1	Ge	The document as written only contemplates hydrogen delivered by pipeline, or trucked in compressed and/or liquid hydrogen, when other forms of delivery, such as metal hydride hydrogen storage trailers, could feasibly be used as well.	In general, include awareness in the document that metal hydride storage systems could be used at various stages throughout the gaseous hydrogen fuelling station, potentially as a gaseous hydrogen buffer and/or hydrogen supply. Specific recommendations also follow.	

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CA2	19	1	1	Ge	The document as written only contemplates gaseous hydrogen buffer storage, when other forms of buffers, such as metal hydride hydrogen storage systems, could feasibly be used as well.	In general, include awareness in the document that metal hydride storage systems could be used at various stages throughout the gaseous hydrogen fuelling station, potentially as a gaseous hydrogen buffer and/or hydrogen supply. Specific recommendations also follow.	
CN1		1	Paragraph 1	ge	Add fuel cell tram application	"But this document can be used as guidance for feuling buses, fork-lift truck and tram applications"	
GB2		1	Figure 1.1	Ge	Sub-heading on right hand side is misleading, as could imply that “Hydrogen supply” is not part of the station.	Have overall heading of “Hydrogen fueling station” and two sub headings for “hydrogen supply” and “hydrogen storage and process equipment” It may also add value to refer in the subheadings to the Chapters covering these sections, Chapters 6 and Chapters 7&8 respectively.	
CN2		1	Figure 1-1	ge	What is the purpose of "accumulator"? It was suggested to add a term "accumulator" definition in Clause 3		
US 2		2		ed	Correct title of reference	ISO 17268, *Gaseous hydrogen land vehicle refuelling connection devices*	
CA3	1	2	n/a	Te	Add ISO 16111 as a normative reference for a safety standard to cover use of metal hydride storage systems in hydrogen fueling stations	Add ISO 16111, Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride To normative references.	
NL2		3		TE	Definitions of pressure are not clear.	Definitions of pressure related definitions should be aligned with vehicle related definitions.	

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SE1		3		ge	The term PSE is used a few times in the standard, but it is not included in Terms and definitions, nor in the Nomenclature table on page 14.	Add a definition of PSE. .	
CN3		3.29		te	Design pressure is different from the maximum allowable working pressure (MAWP). The definition in 3.29 is for design pressure, which is the basis for the set point of PRD and wall thickness calculation. MAWP is calculated in accordance with the effective thickness in GB 150 “pressure vessel”. MAWP is equal to or larger than the design pressure.	Change maximum allowable working pressure to design pressure., and add a definition of MAWP	
GB3		3.41		ge	Definition of risk is not consistent with other ISO standards	Please give a reference to by ISO/IEC Guide 73:2002 (2002) as “combination of the probability of an event and its consequence”, and change the definition respectively.	
GB4		3.52		Ge	Only word “incident” is used. What about “accident”?	Include a definition of incident that says that in this document it is used to cover both incidents, (in some cases defined as damage to equipment) and accidents (harm to people)	
GB5		3.52		Ed	There is no mention of other terms used for “safety distance”, for instance “separation” distance.	Please move / duplicate text from 4.9 para 2 at the end of paragraph of 3.52: The term ‘safety distance’ may also be referred to as “safe distance,” “separation distance,” or “setback distance.”	
CN4		3.56		ed	"24,0 g/L" and "40.2 g/L" do not have a unified format	24.0 g/L	
NL3		4		TE	The safety approach based on bow-tie analysis is not yet leading.	The safety approach based on bow-tie analysis should be leading.	

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GB6		4.1	Para 3	Ge	Not full list of potential hazards	Please change “Fires, deflagrations and detonations” to “Fires, deflagrations, detonations, and blast waves”	
GB7		4.2	Para 4	ge	The use of this instruction is not clear until references are given, and “qualitative criteria” are defined/stated. This use of “risk” is in contradiction with existing definition of risk in existing ISO/IEC Guide 73.	Please delete “Qualitative assessment defines consequence, probability and level of risk by significance levels such as “high”, “medium” and “low”, may combine consequence and probability, and evaluates the resultant level of risk against qualitative criteria.”.	
GB8		4.3	All	Ge	As a general comment, there isn’t much that covers the hazards that are unique to liquid hydrogen and that will also need consideration	Whilst this is acceptable in the TR given to tight timescales for generating this, and the following IS, we would like to see much more detail and clarity on what additional measures require consideration for liquid hydrogen systems in the IS.	
GB9		4.3.1	Para 1	ge	ISO/IEC Guide 73:2002 (2002) defines risk as a “combination of the probability of an event and its consequence”. Then the probability of events could have uncertainty (for example, the probability to die in a fire used as the criterion in some countries as 10E-6, could have, and usually has, uncertainty of orders of magnitude, e.g. from 10E-3 to 10E-9). Statement in this paragraph could mislead and “help” to exclude assessment of uncertainties in the calculation of probability (by the wrong substituting of the term probability by the uncertainty term). Risk is kind of uncertainty (not measurable).	Please change “and uncertainty about these elements (this uncertainty is generally expressed by probability)” to “and the probability of these scenarios”.	

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GB10		4.3.1	Para 3, bullet 7 also Figure 4.1	ge	Typo in term “risk-inform”	Please change “risk-inform” to “risk-informed”	
GB11		4.3.2.3	Para 4	ge	Harm to people is missing.	Please expand “For damage to equipment and property,” to For damage to equipment and property, harm to people,	
GB12		4.3.5.5	Para 1	Ge	Releases from low pressure, vents or liquid sources can also accumulate	Remove “high-pressure”	
JP1	N/A	4.5	2nd sentence in 2nd paragraph	ed, te	It is not preferable that this sentence seems to imply fuelling station has only fully open places and fully confined places and no half open place because the meaning of the word “enclosure” used here is ambiguous with the definition in clause 3.11. And, it is not necessary to mention enclosure restrictively and contradictorily here because the first bullet in 4th paragraph (22nd line from the title of clause 4.5) has the appropriate phrase “particularly in enclosed place” which means “not limited to enclosed place” .	Change the second sentence as follows. If not possible, detection of leaks may instigate forced ventilation to prevent accumulation or may instigate automatic shutdown/isolation.	
GB13		4.5	Para 4	te	The natural ventilation term is usually used for quality of air problem. It is already quite accepted for unscheduled releases of hydrogen to use term “Passive ventilation” to exclude the use of non-applicable models of natural ventilation.	Please change “natural” to “passive”.	

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GB14		4.5.4	Para 2	Te	Mention the possibility of different vented hydrogen characteristics when source is liquid hydrogen, and density of the cold hydrogen vented is much greater, and can be heavier than air.	Add: “Consideration should be given to the temperature of the hydrogen that is vented, and the effect that this can have on the density of the vented gas.”	
CN5		4.6.1	Paragraph 3	ge	there are "natural or forced ventilation" in 4.5 and "passive or active ventilation" in 4.5.3 , and in 4.6.1 it is said " or from the exhaust of natural or active ventilation", it is confused		
GB15		4.7.2	Para 6, bullet point 2	ge	Missing: windows can be used as vents for deflagrations.	Please change “doors in exterior walls;” to “doors and/or suitable pressure relief windows in exterior walls;”.	
SE2		4.7.3		ge	A hydrogen storage tank ~~should always be~~ is always at risk to be exposed to fire conditions. Furthermore, Sweden questions that manually activated valves could replace thermally activated valves. This is a big difference in the level of safety, since it requires the Main Cause of Calamities (a human being) to do the right thing at the right time.	Change the clause to: Hydrogen storage tanks shall be protected from exposure of fire conditions (from inside or outside the storage area or compartment) by thermally activated (non-reclosing) valves to safely vent all the content of the hydrogen storage. The vent system should be designed accordingly, see 8.14.5.	
SE3		4.8		te	Unauthorized access to hydrogen installations should be considered as an event that takes place in the vicinity of the fuelling station.	Add “access control measures” to the list.	

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GB16		4.8.2	Para 1	te	HSL experimental results showed that mitigation of thermal effects of jet fire by barrier could be unfortunately accompanied by the increased magnitude of pressure effects.	After first sentence in paragraph 1, please add the following sentence: “The design of safety system should take into account that the reduction of fire separation distance by barrier could be accompanied by increase of pressure effects around the barrier”.	
GB17		4.8.2	Para 3	ed		Please change “for against” to “against”.	
NL4		4.9		TE	The way that safety distances are currently described needs improvement.	Safety distances should be based on risk assessments.	
CN7			Table 4-2	ed	The information is this table.	The information in this table	
GB18		4.9.1.2, and elsewhere in document	Para 2	ge	Term “establishment” here is not clear.	Add definition of “establishment” in Terms an Definitions chapter. Alternatively, change “establishment” to “fuelling station”.	
GB19		4.9.3	Para 1	Te	Mention that, as the density of the cold hydrogen vented can be heavier than air, safety distances should take into account the possibility for ground level build-up at distances away from the vent stack.	Add: “The safety distances for vented gas from liquid hydrogen systems should take into consideration the density of the gas.”	
SE4		4.9.3	Last paragraph	te	It is customary to use a safety factor for concentration levels (see for example IEC 60079-10-1 on classified areas, where a factor of 0.5 or 0.25 is used). A suggestion is to use 0.5 in this case.	Change 4 % to 2 %. Change 100 % LFL to 50 % LFL.	
NL5		6		TE	The safety procedures of delivery of LNG (as described in LNG ISO-standards) are also useful for this standard.	The safety procedures of delivery of LNG (as described in LNG ISO-standards) should be used for this standard/looked at.	

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CN8		6.1.1		ge	China has a national standard for hydrogen generator.	Hydrogen generators using water electrolysis process should meet the requirements of ISO 22734-1 or national/regional standards.	
CA4	3	6.2.1	3	Te	It would be appropriate to recognize under the Gaseous Hydrogen Supply clause that storage systems employing hydrogen stored in a metal hydride storage system may be used to deliver hydrogen to the fueling station. In such cases, ISO 16111 could be an appropriate standard to ensure safety of such systems, or other appropriate national/regional standard as applicable.	Add sentence along the lines of: "Gaseous hydrogen may also be delivered on site in transportable gas storage devices containing hydrogen absorbed in a metal hydride storage system. In such cases, ISO 16111 or other appropriate national/regional standards should be used to ensure safety of the metal hydride storage system."	
SE5		6.2.1	7th paragraph	te	The material of the foundation is important to gaseous hydrogen as well as liquid hydrogen (see 6.2.2.3, third paragraph).	Add: The foundation under a tube trailer or MEGC remaining on site should be made of concrete or any other suitable non-combustible material.	
GB20		6.2.2.2	Para 3	Te	No mention of grounding of LH2 deliveries	Add: "Means to ground liquid hydrogen delivery vehicles prior to flexible hose connection should be provided."	
CN9		7.1.2		ed	It is said "leading to a pressure drop greater than that specified in 7.2.1.8", but there is no 7.2.1.8. It may be 7.2.2.8		

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US 3		7.2.1.1	P3	Te	Although, I agree that LDV which do not meet GTR #13 should not fuel at stations, the current statement is a vehicle requirement and should not be part of this station document. Furthermore, it is difficult for the driver/fueler to determine what is allowed or not. I recommend either deleting this section or modifying the text to remove the vehicle requirement.	Delete completely or modify as the following Hydrogen stations should not fuel ~~V~~vehicles which cannot operate in the full range of the limits above (and as per the GTR #13) ~~should not be fueled at hydrogen stations~~ unless the safety of such a fueling can be demonstrated by risk assessment to be appropriate.	
GB21		7.2.2.1	Para 2	Te	Should a station use the SAE J2601: 2010 protocol, does this need separate approval by each vehicle manufacturer or can this be assumed?	Clarify if both SAE J2601: 2010 and SAE J2601: 2014 are appropriate to use.	
US 4		7.2.2.2	P4	Te	The station should not only “be operated” so the fueling protocol limits are not exceed, but take action if they are. J2601 requires termination of fueling within 5 seconds.	During filling the station dispenser should terminate the fueling within 5 seconds if any of ~~be operated such that~~ the following fueling protocol limits are ~~not~~ exceeded	
US 5		7.2.2.4	P4	Te	This section should not be a “note” since for communication fueling, J2601 and J2799 must be used together. It is also critical the station terminate the fueling upon receiving the abort signal, in case there is a problem with the fueling.	~~NOTE~~ The fueling process may ~~integrate~~ connect a vehicle to the fueling station's communication system, such as ~~per~~ SAE J2799. If the station has communication capabilities, it should terminate the fueling within 5 seconds upon receiving an FC=Abort command. This communication may not necessitate an emergency shutdown per the requirements of ~~clause~~ Clause 5.	

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US 6		7.2.2.4.1	P3	Te	The station should not only “be operated” so the fueling protocol limits are not exceed, but take action if they are. J2601 requires termination of fueling within 5 seconds.	Insert the following as a second sentence to this paragraph: "During filling the station dispenser should terminate the fueling within 5 seconds if any of the following table based fueling protocol limits are exceeded."	
SE6		7.2.2.4.1	3rd paragraph	ed	The reference to Annex B.2.3 seems to be incorrect.	Change to Annex B.3.4	
US 7		7.3	P1	Te	It is critical that the hydrogen quality specification apply to the fuel dispensed to the vehicle to ensure the fuel cell stack or other vehicle components are not contaminated. The current text is vague and could apply to anywhere in the station.	The hydrogen quality at the nozzle should be consistent with the requirements of ISO 14687-2.	
US 8		7.3	P2	Te	This statement is a comment to the requirement and should be made into a note. In addition, FCEVs are in production and stating they are “developing rapidly” implies they are still maturing.	Note: ~~Fuel Cell Electric Vehicles (FCEV) and related technologies are developing rapidly. For this reason, according to the introduction to the ISO 14687-2 standard, specifically~~ As the industry matures the list of impurities and their thresholds in ISO 14687-2, should be revised appropriately and according to technical progress, taking into account: - Proven detrimental effect to fuel cell vehicle systems; - Feasibility of measurement of very low concentrations; - Complexity of appropriate purification, sampling and analysis.	

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US 9		7.4	P3	Te	The risk analysis of the supply chain may result in an increase of testing specification. The text should reflect this possibility and not assume the analysis will always “relax” testing	Analysis of the whole supply chain will allow station operators to identify quality risks and modify ~~relax~~ testing specifications, while maintaining the same quality assurance and limits.	
US 10		7.4	P7	Te	The monitoring does not need to be all constituents. The proposed text allows for monitoring of canary species.	Fueling stations with onsite hydrogen production or purification equipment should have a continuous monitoring of one or more critical canary species or process control system to ensure that the hydrogen gas at the nozzle meets the specification in ~~Clause~~ 7.3.	
US 11		7.4.1	P1	Te	The installation location of the filter is a separate requirement from the filter size/efficiency. The current text suggests that the location of the filter could replace the filter size/efficiency specifications. In addition, it is important to state that the filter should be as close to the nozzle as possible, because upstream of the breakaway includes most of the station. Finally, the dispenser temperature and pressure sensor have no relationship to the filter location. The proposed text fixes these three issues.	There should be a filter with a capability to prevent particulates of a maximum size of ≥ 5 µm and with a minimum removal efficiency of 99 % under expected process conditions~~, or alternatively a 5 µm~~ The filter~~,~~ should be installed upstream ~~of the~~ and as close as possible to the hose breakaway device ~~and dispenser temperature and pressure sensors~~.	
CN10		8.1.1		te	There are three types of hydrogen embrittlement, i.e., hydrogen environment embrittlement, internal reversible hydrogen embrittlement, and hydrogen reaction embrittlement. Hydrogen embrittlement is commonly addressed by environment, material, stress, and manufacturing process.	Change hydrogen embrittlement corrosion to hydrogen embrittlement. Hydrogen embrittlement is commonly addressed by environment, material, stress, and manufacturing process.	

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SE7		8.2		te	The prevention of corrosion of piping should be added to the standard. This is an important factor, especially for underground piping. Also pipes in trenches might be exposed in colder areas where road salt is used during winter.	Add a new paragraph: Piping that might be exposed to corrosive environments (eg. underground pipes or pipes in trenches) should be protected from corrosion through choice of materials or by other suitable means.	
SE8		8.3.1	3rd paragraph		Firewater protection is not as reliable as thermally activated PRDs. Water supply may dry out, pipes may freeze etc.	Remove “fixed firewater protection”.	
CA5		8.3.1	3	Te	It would be appropriate to recognize under the Gaseous Hydrogen Storage Vessels clause that storage systems employing hydrogen stored in a metal hydride storage system may be used for buffer storage.	Add sentence along the lines of: “Buffer storage may include hydrogen absorbed in a metal hydride storage system.”	
SE9		8.3.2.1			The material of the foundation is important to gaseous hydrogen as well as liquid hydrogen (see 6.2.2.3, third paragraph).	Change 2nd sentence to: The foundation for a gaseous hydrogen storage tank should be appropriate to accommodate the weight of the equipment placed on it, and should be made of concrete or any other suitable non-combustible material.	

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SE10		8.3.2.3		ge	It is clearly stated in the scope that the standard should be used in addition to applicable national regulations and codes. In a few places in the standard this is also pointed out specifically when national regulations might diverge from the TR text (e.g. note 2 in clause 11.1). This is good, since the user otherwise may end up with a fuelling station that does not live up to national regulations. Roof top storage tanks are prohibited in Sweden, and possibly other countries. This is another example of where national regulations diverges from the TR.	Add under 8.3.2.3.1: NOTE: Roof top installations may be prohibited by national regulations.	

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JP2		8.10.3.2	Table 1	te	We shouldn't apply the NWP, MOP, and other approaches that we use for FCV tanks directly to station equipment and systems. For hydrogen stations, pressure values are determined by their designs, and it is not appropriate to define them unilaterally at a single value or using a certain factor. This issue should be given full attention in this IS preparation. As the starting point, I would like to propose the following: 1. No definitions of pressure except for the definition of pressure described in the definition clause for the entire document. Delete Table 1 and Annex D. 2. Define MOP and MAWP but not NWP. MOP shall be the maximum fill pressure to be determined by the designer of the station, where MOP < MAWP. 3. Keep the present definition of pressure but make it applicable only to filling systems and equipment, where MOP<MAWP should be the fundamental relationship.	We would like to propose the following: 1. No definitions of pressure except for the definition of pressure described in the definition clause for the entire document. Delete Table 1 and Annex D. 2. Define MOP and MAWP but not NWP. MOP shall be the maximum fill pressure to be determined by the designer of the station, where MOP < MAWP. 3. Keep the present definition of pressure but make it applicable only to filling systems and equipment, where MOP<MAWP should be the fundamental relationship.	
US 14		8.10.4.1	2	Te	SAE J2600 uses 300% times NWP based on the high pressure code of ANSI/ASME B31.3 (ISO 15, 649)	TC 197 should consider the basis the hydrostatic pressure level for all dispenser fueling components	
SE1 1		8.11.2	Last paragraph	te	Fuelling hose should not be longer than necessary.	Add at end of last sentence: …, but not longer than necessary.	

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MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
US 12		8.12.1	P1	Te	The current text is confusing and combines the standard and pressure requirement. The proposed edit separates these two requirements	The fueling nozzle should comply with ISO 17268 or SAE J2600 and be rated for the appropriate ~~for the rated~~ pressure class. The use of adapters should be prohibited.	
GB22		8.14.6	Para 1	Te	Remove error in cross-reference. However, the cross-reference mentioned doesn't apply to the venting requirements?	Replace "specified in 7.2.2.8" with a more appropriate requirement.	
CN11		8.14.6		te	"The vent piping diameter should not be smaller than the diameter of any pressure-relief valve outlet, and large enough to avoid exeeding the maximum allowable pressure drop specified in 7.2.2.8", but the pressure drop specified in 7.2.2.8 is 15MPa between the dispenser pressure sensor and the nozzle, there is no comparability.		
CN12		8.14.7		ge	This item need more explanation or to be clarified.		
US 13		8.16	P1	Te	Section 7.4 requires continuous monitoring or process controls for "onsite hydrogen production or purification equipment" The addition of the reference notifies the read they need to meet both 7.3 and 7.4	Hydrogen purification should be provided as necessary to meet the recommendations of 7.3 and 7.4 under all operating conditions where vehicle fueling is possible.	
GB23		10.2	Bullet 3	Ed	Unnecessary ";" after "electrical"	Remove	
SE12		10.2	2nd paragraph	te	Ex-sign should be placed to identify hazardous areas.	Add to list: hazardous areas (e.g. Ex-sign)	

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SE13		12.2	List after 3rd paragraph	te	Installations in hazardous areas should be inspected.	Add to list: Installations in hazardous areas (see clause 9.2)	
US15		12.3	Bullet List	Te	The station test need to ensure the vehicle, overall fueling protocol, and table based fueling protocol limits are not exceeded, not just the "Vehicle Hydrogen Storage Safety Limits" (which is an undefined phrase. By referencing the specific sections in the document, it makes the testing requirement clear	Modify 5th bullet to read: • Testing to ensure fueling does not exceed the limits as per, 7.2.1, 7.2.2.2 and 7.2.2.4.1 and the station terminates the fueling within 5 seconds if these limits are exceeded ~~Limits to avoid exceeding Vehicle Hydrogen Storage Safety Limits also with a Hydrogen Station Test Apparatus. See Annex B.~~	
US16		12.3	Bullet List	Te	It is critical the hydrogen quality be part of the minimum acceptance testing to ensure vehicles are not contaminated.	Add new bullet that reads: • Hydrogen quality testing as per 7.3	
US17		12.3	Bullet List	Te	It is critical the fueling protocol be part of the minimum acceptance testing to ensure vehicles are fuelled correctly.	Add new bullet that reads: • Hydrogen protocol testing as per 12.3.5.1 and Annex B	
CN13		12.3.2	Paragraph 6	ed	The sixth paragraph is repetitive.	Delete the paragraph.	
US18		12.3.5.1.2	Number list #1	Te	The additional text provides clarification to the reader what is meant by "reacts properly". If the text is not included, the tester could take a wide opinion in what properly means.	The station ~~reacts properly~~ terminates the fueling within 5 seconds, if the safety and performance process limits for all fueling protocols, as listed in ~~Section~~ 7.1.3, (or, for example, Sections 7 and 9 of SAE J2601) are exceeded	

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US 19		12.3.5.1.2	Number list #3	Te	It is critical the station terminate the fueling upon receiving the abort signal, in case there is a problem with the fueling. This test is critical to the operation of the station. The additional text provides clarification to the reader what is meant by "reacts properly". If the text is not included, the tester could take a wide opinion in what properly means.	3. The station implements the SAE J2799 or intended vehicle to station fueling communication protocol correctly and ~~reacts properly~~ terminates the fueling within 5 seconds, upon receiving an FC=Abort signal or if an incorrect signal is sent to the station.	
SE14		Annex A.2	Table A.1	ed	Sweden has made some additions and changes to the distances, as well as adding an explaining text.	See email from David Gårsjö to WG24 dated 20150824 (and answer from Nick Hart on same date).	
CN6		Annex A	Table A.1	ge	GB 50516-2010 technical code for hydrogen fueling station provides safety distance.	Please add values from GB 50516.	
GB24		Annex C.1	Para 6	Ed	Full stop missing	Add full stop	
GB25		Annex C.2	Para 1	Ge	If a risk assessment shows that a process will produce clean H2 under normal conditions, then the process itself should be continually monitored, rather than the hydrogen which is produced from it.	When hydrogen production or purification systems are located on-site at the fueling station, the process, or impurities that could result from production process upset conditions, should be monitored continuously, or as routinely as necessary according to the risk assessment of the process.	

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GB26		Annex C.2	Para 2	Ge	'Continuously' is a word which I think could be changed as I don't see a truly continuous online system available. It appears unnecessary in the context of this paragraph. Additionally the example appears to be unrelated to whereabouts in the system the testing occurs.	~~Local hydrogen production system~~ For example, impurities of concern for on-site hydrogen production systems may be ~~tested continuously prior to or after compression~~. ~~Example:~~ H2O in the case of electrolysis and CO in the case of hydrogen production from CxHy sources. See Table C-1 and refer to the risk assessment of the fueling station to determine the needs and best location for impurity analysis.	
GB27		Annex C.2	Para 3	Ed	Full stop missing	Add full stop	
GB28		Annex C.2	Para 4	Ed	Full stop missing	Add full stop	
GB29		Annex C.2	Para 4	Ge	As per comments above; Monitoring the process rather than the hydrogen is a simpler and better way to ensure purity.	The fueling station risk assessment should consider the recommendations in Table C-1 and Table C-2 and implement a continuous monitoring system of the process, or for impurities that may be present due to process upset conditions on the hydrogen supply and processing systems	
GB30		Annex C.3	Table C-1, Table C-2, Table C-3	Ed	"HCOOCH" - typo	HCOOH	
GB31		Annex C.3	Table C-1, Table C-2, Table C-3	Ed	Inert gas should read "Argon" (or "Ar") For consistency with ISO 14687-2, should this column include both chemical name and formula? (Or at least just one rather than mixing between name and formula)	Replace with "Argon" or "Ar" Re-order to same as ISO 14687-2 Either use chemical name, or formula (or both) but not a mixture.	

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GB32		Annex C.3	Table C-1, Table C-2, Table C-3	Ed	Na+ is not in Table 1 of ISO 14687-2, instead is covered by the monitoring of water. Is this no longer considered acceptable, or should this be removed for consistency with ISO 14687-2? If the former, should Na+ be added?	Remove, or Add Na+	
GB33		Annex C.6.1	Note 2	Ed	Improvement to wording	With an appropriate risk assessment and quality control system, the frequency of testing can be reduced to a maximum ~~test period~~ interval of once per year.	
SE15		Annex E.2	1st paragraph	ed	First sentence says at least 120 mm above grade, but point 2 on next page and Figure E1 says 150 mm.	Change 120 mm to 150 mm.	
GB34		Annex F (or Chapter 2?)	All	Ge	Bibliographic references missing for references in Tables 12.1, 12.2 and 12.3, and Annex A	BCGA CP41 - 2014 - The design, construction, maintenance and operation of filling stations dispensing gaseous fuels BCGA CP33 - Rev 1 - 2012 - The bulk storage of gaseous hydrogen at user's premises NFPA 2 - 2011 - Hydrogen technologies code etc	

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GB35		Annex F	All	Ge	Suggested additions to the list of bibliographic references	RR986 - Releases of unignited liquid hydrogen http://www.hse.gov.uk/research/rrhtm/rr986.htm RR987 - Ignited releases of liquid hydrogen http://www.hse.gov.uk/research/rrhtm/rr987.htm **HALL, J., HOOKER, P., and WILLOUGHBY, D**. Ignited Releases of Liquid Hydrogen: Safety Considerations of Thermal and Overpressure Effects. *International Journal of Hydrogen Energy*, 3 Dec. 2014, 39(35), 20547-20553. http://dx.doi.org/10.1016/j.ijhydene.2014.05.141 NASA - NSS 1740.16 - 1997 - Safety standard for hydrogen and hydrogen systems - Guidelines for hydrogen system design, materials selection, operations, storage, and transportation	

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