ISO/TC 197
Hydrogen technologies

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Comments from DIS 19880-3 2016

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Background: Here is the Compilation and treatment of the comments received with the DIS 19880-3 Ballot from 2016.
It is the Annex B of the Form 13 Report of voting N 839.

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

Template for comments and secretariat observations

Date: **2017-02-06**	Document: Comments from the DIS 19880-3 Ballot 2016	Project: **WG 20**

MB/ NC[1]	Line number	Clause/ Subclause	Paragraph/ Figure/ Table/	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
FR 01		All		GE	In the materials characterization, the abrasive effect (valve) is not mentioned (due to high speed and sensitivity of the materials facing the flow)	B: Filter early and often. Before and after the compressor. Tube trailer delivery involves small particles off the trailer. I see it as an issue. Particles should be taken out.	HRS No need for abrasive effect because of pure-hydrogen stations and the effect is very limited.
US 1				te	Some tests are missing which we believe are important. These are included in the fittings draft and also should be included in this document: 。 FMEA Non-metallic synthetic immersion Thermal shock Leakage	Add new clause and language for relevant tests – consider using WD 19880-5 for wording.	Disagree。 FMEA involves design and manufacturing processes, which is too much for a product standard. The immersion test as proposed is not necessary for dispensers since pure hydrogen gas will have no chemical reactions suggested by the test. Thermal shock conditions for valves don't exist in reality. They are tested at the operating conditions including cold gas flow. Leakage is already included.
JP 19				Ed	Consistency: decimal point as , 小数点の統一	Use either . or , consistently.	Agree.
CA 01				ge	This standard does not reflect the issues hydrogen stations are having in the field. There are issues with valves leaking after a number of cycles, o-rings leaking when pressurized with -40C gas.		Agree. Such a test is needed downstream of the pre-cooler as the cold gas in warm valve test. Included for shut-off valves and breakaway.
FR 02		Scope		TE	Regulators and pressure controllers are excluded from the scope of this document. Are they taken into account somewhere else?	B: Testing for off-the-shelf regulators?	Disagree. The flow-control valve of a FCV performs the pressure regulation. There is a pressure regulator (pressure reducing valve) in the outlet line of the compressor, but typically the FCV takes the lead in this function.

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							Therefore no need to cover it by this document. FCVs have regulators of different designs from those of compressors, which is another reason why this document shouldn't cover them.
US 2		1		te	Valves generally used in the station need only comply with the piping code. These valves do not extensive and needless testing. This standard should focus on valves with critical safety requirements.	Delete check valves (Section 6), pressure safety valves (Section 11), and shutoff valves (Section 12). Rename manual valves (Section 10) as "Emergency manual shutoff valves" and flow control valves (Section 8) as "Emergency automatic shutoff valves."	Disagree. ASME (ISO) is referenced, but it is more of a design standard. We need a standard for operation and performance in hydrogen service.
US 3		1	Paragrap h 1	te	The parent document, ISO 19880-1, indicates that piping should comply with ISO 15649 or other national/regional standards. The test methods provided in this document provides one method to verify components and demonstrate compliance with these standards, but there are other alternatives allowed within ISO 15649 that should not be precluded by this document. Forcing all components within the system will force needless re-test of components that have been used successfully by the hydrogen industry for decades. This is an impractical situation!	*Add the following to the end of first paragraph*: These requirements and test methods can be used to demonstrate compliance with ISO 15649 but does not preclude the use of other methods or methodologies that are allowed within ISO 15649 or other national/regional standards.	Agree The following sentence is inserted in the 4th para: This document does not require existing valves designed under exiting codes and regulations and field-proven to be retested.
US 4		2		te	Why isn't the piping code referenced and listed?	Add and use ISO 15649. *Petroleum and natural gas industries — Piping*	Agree in principle. The change proposed above should address the concern. There is a desire not to reference ISO 15649 without specific provisions because it means any new valve for hydrogen service will have to be subject to not only this document but also ISO 15649.
FR 03		3.2		TE	Note 1 mentions 15.56°C. Is this figure an error? Do we need such precision or do we have to understand 15°C (=59+F not	Correct as mentioned.	Disagree with the temperature. It is a simple conversion. Because of the

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					56).Why describe a ΔP in kg/m^2 and not in ISO N/m^2. (Pa) unit.		definition of Cv, we can't change it. Will insert (60 F). The industry uses Cv instead of Kv that is the SI unit for this. Agree with the second part of the comment.
FR 04		3.2	Note 1	TE	Delta P to be verified (low pressure 709 kg/m2), the reference is often 1 bar		Agree. Corrected to 709 x 9.70665 = 6 894N/m2.
FR 05		3.2			Flow coefficient Cv is the volume （in US gallons） of water at 60°F that will flow per minute through a valve with a pressure drop of 1 psi across the valve. (source wikipedia), Kv is used when using SI system.		Disagree. Kv is not common and Cv is a standard value used in the industry.
JP 18		3.2	Note 1	Ed	Typo	15.56℃	Agree with a comma.
FR 06		3.3		ED	Fueling not Fuelling (one l only)		Agree
US 5		3.4 & 3.6		te	Service pressure and nominal working pressure are vehicle terms, not a piping code terms. Use piping code terms. This document is supporting the piping code. The AHJs know the piping code.	Replace "service pressure" reference with maximum allowable working pressure (MAWP). Rated pressure or Pressure Class is typical piping component terminology.	Agree. Action 3.6 deleted. Also 3.5 is deleted because NWP is not used in the text.
JP1		3.4		te	No MAWP values are given, and manufacturers may have different values for MAWP. It is therefore better to define it as 96.3MPa（for 70MPa）, the setpoint for PSV. CSA HGV4.4 provides 98 MPa, and this is something, I feel, we need to coordinate the values.	Add NOTE 2 as in CD19880-1, 3.35. Please consider harmonizing with the CSA document.	Disagree for the time being because MAWP is different between dispensers and FCVs. Harmonization with the -1 document is the priority.
FR 07		3.5		TE	NWP: It may be necessary to give the reference temperature for this pressure (15°C or 20°C)	Select a figure.	Disagree Please see US05.
CA 24		3.5		ed	Delete definition of NWP as term is not applicable to hydrogen fueling station operations – only MAWP should be used. Also, the term NWP is only used once in the draft standard – again, it should be replaced with MAWP.	Delete definition 3.5	Agree and please see US05.
US 6		3.5 and 3.6		ed	Sections 3.5 and 3.6 need to be harmonized as per "Note 1 to entry: NWP is also called service pressure." However, the definition for nominal working pressure (NWP) under section	Delete both NWP and service pressure; see earlier U.S. comment on 3.4 & 3.6.	Agree Please see US05

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					3.5 is worded differently than that for service pressure under section 3.6.		
FR 08		3.6		ED	Delete 3.6 (already defined in 3.5)		Agree Please see US05
CA 25		3.6		ed	Delete definition of service pressure as term is not applicable to hydrogen fueling station operations – only MAWP should be used. Also, the term service pressure is only used once in the draft standard – again, it should be replaced with MAWP.	Delete definition 3.6	Agree. Please see US05.
FR 09		3.7.1 and 3.7.6		ED	Should these 2 definitions be reunited in a single one by adding « manually » to 3.7.1. There may be a confusion with 3.7.4 “Flow control valve”.	Correct as mentioned.	Disagree. Please see 3.7. There are no manually operated shut-off valves in our definition.
FR 10		3.7.5		TE	In the definition, it should be precised that there is a double obturation. the flow is cut off from upstream and downstream of the breakaway.		Disagree. No need to say about downstream. The current definition is sufficient. Also see 9.2.7.
JP 15		3.7.5 or 9		Ge	Better to have definitions for “one time use” device and “reusable” device.	one time use” device・・・device that is, once decoupled, required to be recoupled after maintenance service or to be replaced with a new unit of the same model.	Agree in principle. See 9.2.7, which distinguishes the two and no need to write them out in the definition.
FR 11		3.7.7		TE	Definition of the PSV should be precised. a reference to an international standard defining a PSV should be made such as ISO 4126-1:2013 : Safety devices for protection against excessive pressure -- Part 1: Safety valves		Disagree. The definition of PSV is harmonized with that of WG24: 3.50 in 19880-1.
FR 12		3.7.7		TE	Generally, there is pressure difference between the opening pressure and closing pressure of a PSV. The sentence is unclear.	Replace 'and re-closes when the pressure falls below the set point' by 'and re-closes when the pressure falls below the closing set point'	Agree in principle. No change in the definition because it is harmonized with that of WG24. It is written out in 11.8.
US 7		3.7.x		te	Only define valves recommended in comments on scope. The emergency manual valve is a valve easily accessible to	Delete check valves (Section 6), pressure safety valves (Section 11), and shutoff valves (Section 12). 。	Disagree. We include valves for manual operation, regulating operation, in

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					the fire service and is used to isolate a fire from the fuel. Remotely actuated emergency automatic shutoff valves are usually activated by an E-Stop. An earthquake valve can be either or both of these valves depending on local regulations.	Rename manual valves (Section 10) as “Emergency manual shutoff valves” and flow control valves (Section 8) as “Emergency automatic shutoff valves.”	addition to emergency shut-off valves. Fast acting emergency valves in the emergency shut-off system may be activated by controls or manual e-stops.
US 8		4.2		te	No need to limit to specific grades of hydrogen. Hydrogen, reformate, hythane all apply. Any mixture where the concentration of hydrogen is sufficient to adversely affect the materials of construction.	Components shall be made of materials suitable for use with compressed hydrogen gas. Components designed to comply with this standard are intended to be used with hydrogen ~~fuel that is in compliance with ISO 14687-2~~ **and hydrogen rich gases.**	Disagree. This document is for hydrogen gas only. We don’t include methane or hythane in this standard.
FR 13		4.3		TE	Reference to ISO11114-2 (non metallic materials) and ISO11114-4 (metallic materials) should be made. An additional point shall be made concerning the potential presence of particles (up to the levels specified in ISO14687-1) in the gas, and their potential effect on valves internals		Agree in principle because it is a good practice, but please see FR 01. The fuel quality for this standard comes from 14687-2 with little potential for such an issue. This is a minimum standard. In addition, ISO 11114-2 is mostly concerned with oxygen and specialty gases, not specific to hydrogen. In addition there is no proposed change given.
US 9		4.3		te	Brass/copper are susceptible to ammonia	Add: “Resistance to season cracking shall be taken under consideration if copper or copper alloys.”	Disagree because of not much potential for the combination of the use of brass/copper and ammonia or chlorine in HRS.
CA 26		4.3	Para 1	te	A motherhood statement such as considering “resistance to chloride stress corrosion cracking” should clarify that this resistance is only required for components exposed to external environments.	Revise the 1st sentence as follows; “When selecting stainless steels, resistance to chloride stress corrosion cracking shall be taken into consideration when the materials are	Agree in principle. However, the current wording covers the selection based on the external influence.

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						exposed to external environments".	
CA 27		4.3	Para 2	te	It is not enough to simply have a motherhood statement to watch out for hydrogen embrittlement, especially when hydrogen exposure is a normal operational environment. Need to reference specific standard that should be followed for embrittlement resistance.	Include a reference to ANSI/CSA CHMC 1-2014 "Test methods for evaluating material compatibility in compressed hydrogen applications – Metals"	Agree in principle, but there are many local material requirements. The documents cited are local ones and can't be referenced.
FR 14		4.4		ED	One word or one sentence is missing to this paragraph	Add the missing element.	Disagree. No missing part when compared to CD2.
US 10		4.4		te	Keep it to the document this standard is supporting, the piping code.	Modify first list item to read: - MAWP and/or Pressure Class (H-rating) in accordance with ISO 19880-1	Agree. Reference TS19880-1 instead.
US 11		4.5		te	Prioritize the markings. There may not be enough real estate for all the information. The rest of the information can be in the product literature. Actuator information like voltage belongs on the actuator which might not be part of the valve. The piping industry has already addressed actuator requirements. (see UL for US example)	Replace with 1. MAWP & temperature ratings or class 2. MFG's name, logo, etc. 3. Model number 4. Serial number/date code 5. Direction of flow	Agree in principle. Want to reduce the marking requirements because of a limited space. 2 and 3 only and the other information to be described in the literature.
JP2		4.5.1		te	No MAWP values are given, and manufacturers may have different values for MAWP. It is therefore better to use the nominal pressure.	Mark by a H-rating	Withdrawn.
JP3		4.5.1		te	No material names are necessary because more than one material are involved.	Delete Material name or code.	Agree. See US11.
FR 15		Section 5/6		GE	General comments to 5/6 : - a opening / closing cycling test in H2 at full DP is missing. - for hot and cold temperatures condition, what is the gas temperature? - for dispenser valves, all tests should be done at the rated dispenser temperature (-40°C for T40) and ambient temperatures, but with similar number of cycles..		Agree in principle. This is a general description only and the concern is covered by the description of the test given to each specific valve. See 12.3.2. The gas temperature is not defined because it is difficult to control in the gas cycle test.
FR 16		5.1		TE	If hydrogen is re-used, we should indicate the minimum quality level (/impurity) of hydrogen to be guaranteed during		Disagree. Even for recycled hydrogen, 14687-2 is applicable.

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					the test. 水素が再利用されるなら、試験中に保証すべき水素の最低品質（不純物）を指定すべき。		
JP 14		5.1.4 or 9		te	The test at -40℃ for 35MPa breakaway couplings seems unnecessary based on the fact that 35MPa systems have no precooling.	Insert the following in 5.1.4 (or only in 9): For devices intended to be used in stations without precooling, no testing at -40℃ is required.	Agree in principle, but no need to change because 5.1.4 sets out the test temperature can be selective.
CA 28		5.1.4		te	Tolerances are required for test temperatures, since it is not possible to test exactly at the specified temperatures. In addition the specified tolerances are required to ensure repeatability between test labs.	"….shall be conducted between -40 (-5)°C and +85 (+5)°C. ~~If the manufacturer specifies……the maximum of the range.~~	Agree in principle. Use ±5℃. A shutdown may occur if – 45 degrees C is used in some stations.
US 12		5.1.5		te	Needlessly complicated. Two fluids only.	~~a) hydrogen for leak tests,~~ ~~b) hydrogen for permeation,~~ ~~c) hydrogen for gas pressure cycle test,~~ ~~d) liquids (e.g., water or oil) for hydrostatic strength tests,~~ ~~e) hydrogen, helium, nitrogen, or dry air for all other tests.~~ Use hydrogen for all pneumatic tests and a non-compressible fluid (e.g. water/glycol) for all hydraulic tests	Disagree. Hydrostatic tests are to be done with liquid. It is important to have this for breakaway devices. The use of hydrogen for them may be dangerous if they fail. Hydrogen alone is not adequate. Agree to delete dry air. Action.
JP 16		5.2		Ge	What is the basis for specifying 16000 cycles for the valve-seal replacement?	JP16	The source is HGV 4.7.6.6. No ground is given in HGV but the number seems reasonable for one year of operation.
FR 17		5.2.1		TE	Why 102000 cycles? valves seals are not defined.		See above for the cycles. No need for defining valve seals. Commonly used.

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CA 02		5.2.1		ge	"replacement of valve seals shall be acceptable at intervals of 16,000 cycles" The number should be higher and reflect at least a 5 year maintenance period.		Please see above. The cycle value of 16 000 is given in the CSA/HGV.
CA 29		5.2.1		ed	Every test in the standard should open with a “General” subclause, wherein the reason for the test and the requirements is explained – a rationale, as was done in 5.7.1.	Include an explanation regarding why 102,000 pressure cycles, and 16,000 pressure cycles for valve seals, are the selected numbers.	Disagree to insert the basis. It was given by HGV with no reasoning. For metal, 300,000 cycles is required for permanent strength. Somehow 100,000 was chosen as a reasonable number. 40 vehicles per day x 400 days per year = 16,000 cycles. 102,000 = 100,000 + 1,000 for high temperature and 1,000 low temperature.
FR 18		5.2.2		TE	Add a mention that the valve should be opened during the tests		Agree in principle. This is a general description. It is specified in each specific valve provision.
CA 03		5.2.2		ge	What position is the valve in? open or closed? Clearly state if the valve should be open or closed.		Agree in principle. This is a general description. It is specified in each specific valve provision.
CA 30		5.2.2		te	Require temperature tolerances as per 5.1.4 comment above.	Same proposed change as in 5.1.4 above, and delete the last sentence.	Agree in principle. Will change to $\pm$ 5^{o}C.
FR 19		5.3.1		TE/ED	The end of the first line should use the terminology « NWP Nominal Working pressure” defined in §3.5. In addition why shall the valve be closed at 30% of NWP since the first test to be carried out is the external leakage test. And then the test pressure is very different? In the second sub paragraph write Ncm3 and do not write “normal” between parentheses.	Correct as mentioned, and check the coherence of the figures.	Agree in principle: Will use MAWP instead. 30% is used to represent partial pressurization. This is not a test pressure. Partial pressurization is required for temperature control. The use of inert gas is for safety. Approximately is inserted. Done.

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							The ISO convention is cm3 (normal).
US 13		5.3.1		te	There is no way that a valve manufacturer will know what the service pressure is. They design to a rated pressure which the integrator is not to exceed. Where is the justification of 30%? 30%の根拠は？	Prior to conditioning, purge the valve with nitrogen and then seal it at 30 % of MAWP. Please provide the justification for the use of 30% and an explanation for requiring nitrogen as the purge gas.	Please see above. Partial pressurization at 30% of MAWP is deemed reasonable for safety and rough leak check. During the procedure of temperature setting, the use of inert gas (nitrogen) is good for safety.
CA 04		5.3.1		te	"20cm3/h" 20 cm3/h is a typical leakage rate for the CNG industry. 10cm3/h is the standard leakage rate for the hydrogen industry. Valves in the hydrogen station should be made to the same standard as all other hydrogen valves. 。	Change to 10cm3/h	Agree. The value of 20 came from ANSI/CSA, HGV 4.7.6.2.
CA 05		5.3.1		te	hydrogen or helium	Remove helium. 5.1.5 states hydrogen to be used	Agree to remove helium.
CA 31		5.3.1		te	Need to explain why nitrogen is the purge gas, and why 30% is the seal pressure.	Include rationale under this clause.	See US13.
CA 32		5.3.1		te	Replace "service pressure", as a manufacturer will not know this term for a fueling station. Fueling stations are based on MAWP, as this is the term that approval authorities will be looking for.	Replace "service pressure" with "MAWP"	Agree. Done. , MAWP に変更。(SW)
FR 20		5.3.2		TE	The test gas is either H_2 or He. This is not coherent with what is stated in § 5.1.5 a)	Make both paragraph coherent.	Agree. See CA31.
FR 21		5.3.2		TE	We can measure/calculate the leak rate based on pressure drop without using flow measurement.	Replace 'A flow measuring device' by 'A measuring device'.	Agree in principle. Please see the change. Pressure is still a difficult parameter to capture small leaks at a100 MPa level.
FR 22		5.3.3		TE		Replace 'A flow measuring device' par 'A measuring device'	See above.

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FR 23		5.3.3		TE	There is no criteria for passing the test.		Disagree. See 5.3.1 for the criteria.
CA 06		5.3.3		te	hydrogen or helium	Remove helium. 5.1.5 states hydrogen to be used	Agree.
FR 24		5.4		TE	What is the justification of factor 4? what is the typical accepted value in other standards concerning valves, PSV, check valves?		Came from ANSI/CSA HGV4.6. Japan and ASME also use 4. Please see the second sentence that allows national values.
FR 25		5.4.1		TE	Why do we have a coefficent of 4 compared to MAWP? For Pw 700 bar, estimated MAWP > 800 bar, so test pressure > 3200 bar		See above. 320 MPa is testable. (Up to 500 MPa is tested.) 87.5 x 4 = 350MPa
NZ	2 of Section 5.4.1	5.4.1 Test pressure		ge	The sentence “When a country has its own regulation, the test pressure should follow the regulation.” is unacceptable.	Delete this sentence as it could be seen to be endorsing unsafe practice if a country’s regulations allow a test pressure significantly less than that recommended by this ISO document.	Comment is well taken. But the language is needed to cover existing HRS that have been built in accordance with the national regulations, which establish safety.
CA 33		5.4.1		te	In the second sentence, one cannot simply state in a standard, that one can follow the local regulations. Then it is not a standard at all! One cannot standardize an unknown requirement.	Delete the second sentence	Disagree. See above.
FR 26		5.4.2		TE	The flow rate of Hydrotesting machines is low. It is not sure that the flow rate can balance the leak to continue to increase the pressure until 4*MAWP	Add the sentence 'means can be used to reduce this leakage rate if any when performing this test'	Agree.
US 14		5.4.2		te	Acceptance criteria not clear. this is a shell leakage test Where is the process leakage test? Shouldn’t this be repeated at 150% with the discharge open and the valve closed (e.g. gate seated?	@150% of rated pressure No distortion, dimensional changes, functional changes, packing/stem weapage. @400% of rated pressure, no rupture or gross leakage. 定格圧の 400%で、破裂、大きな漏れなし	Disagree. It is difficult to provide detailed criteria because distortion and dimensional changes within the plastic deformation region will occur. Therefore the present criterion of no rupture is the only possible one. No change. This is a test for the strength of the body only. See 5.3.3 for internal leakage.
US		5.4.2		ed	Consistent use of terms.	change “design pressure” to “MAWP”.	Agree.

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15							
CA 34		5.4.2	2nd para	ed	Need to keep consistency in terminology	Replace the term “design pressure” with “MAWP”.	
US 16		5.5 & 5.6		te	This are abnormal load tests. The test should be an axial or tensile load (both directions – pull off and binding). A torqueing or twisting load on the valve (excess torque 5.5) and a bending moment (5.6). これは異常負荷試験だ。軸荷重か引っ張り荷重（両方向つまり引っ張りと拘束）とすべき。バルブのトルクやひねり荷重（トルク 5.5 超）と曲げモーメント（5.6） Need the axial load test. These loads may be due to thermal expansion and contraction or the supporting of other hardware (cantilever effect). Group together as abnormal loads for clarity.	5.5 Abnormal loads tests 異常負荷試験 5.5.1 Axial Load Test 軸荷重試験 The valve assembly shall be tested with a compressive and tensile load. 5.5.1.1 Compression The compressive load shall be equivalent to the load generated by a 6-metre length of pipe of the same material class as the valve pinned at both ends. The diameter and wall thickness of the pipe shall be suitable to meet the MAWP or pressure class rating per ISO 15649. The load shall be the equivalent of the pipe being heated 70°C (15°C to 85°C). The valve assembly shall not leak, deform, or rupture. Additionally, the valve shall cycle properly. 5.5.1.2 Tension The tensile load shall be equivalent to the load generated by a 6-metre length of pipe of the same material class as the valve pinned at both ends. The diameter and wall thickness of the pipe shall be suitable to meet the MAWP or pressure class rating per ISO 15649.	Disagree. The test load is not well defined, making the tests not very practical. The piping code has requirements to eliminate these loads when systems are installed. Harmonization with WG23 will be needed because the joint is to be tested comparatively to fittings.

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						The load shall be the equivalent of the pipe being cooled 70°C (30°C to -40°C). The valve assembly shall not leak, deform, or rupture. Additionally, the valve shall cycle properly. 5.5.2 Excess torque resistance test (Insert section 5.5 from the DIS voting draft.) 5.5.3 Bending moment test (Insert section 5.6 from the DIS voting draft.)	
CA 07		5.5		te	leak test Fittings that have been torqued should be installed for the leak test. - after the fitting has been over torqued to 150% it should not leak.	Fittings that have been torqued should be installed for the leak test	Agree in principle, but already covered by c) that requires a test under 5.3 for leakage.
CA 35		5.5		te	Need a "General" subclause to explain the rationale for the 150% torque value.		Agree. ISO 12619-2. 7. Excess torque resistance as the basis for 150% as a note.
FR 27		5.6		ED	The sub paragraph must be d) and e) since d) is mentioned later in this paragraph.		Agree.
FR 28		5.6		TE	The test description is not clear. Shall the tightness be checked after each position or only once, when the 3 rotations are carried out. In the first case the valve must be mounted and dismounted from the bench 3 times, in the second case, only once.	Please give the required precisions regarding the test procedure.	See Figure 1. This shows the joint on the short end is loosened to rotate the valve. No need to describe how to loosen since this is a test for the strength of connection.
FR 29		5.6		ED	The numbering in this section is to be revised as b), c) and d) are missing.		Agree.
FR 30		5.6			Without removing the weight, 'perform leak test...' Est il nécessaire de faire les essais de fuite pendant le bending test à -40°C et +85°C? Pourquoi ne pas montrer que la même vanne, à la temperature ambiante ne fuit pas plus lors du test de fuite,		Agree. It is already included in the text. See c) in the new text. Testing at normal temperature before a low or high temperature test is considered a general practice.

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					que lors du bending test?		
US 17		5.6		te	The bend test loads are way too low. The loads are such that the pipe has to be at less than one fourth of the bending stresses allowed by the piping codes. The valves should be at least robust enough to withstand allowable loads without leaking. Even better, change the allowable loads such that thin wall tubing will deform permanently before the valve is harmed.	Increase the applied bending moments to be at least as high as the piping codes allow for thin wall tubing. Modify existing text as shown here: With the valve in the closed position and pipe of the of the same material class as the valve and **the diameter/wall thickness suitable to meet the MAWP or pressure class rating per ISO 15649, a bending load shall be 300 mm from the valve. The load shall be applied until the pipe had permanently deformed a minimum of 50 mm.** **The valve assembly shall not leak, deform, or rupture. Additionally, the valve shall cycle properly.** ~~NOTE Depending on how this test is performed, raising the load to compensate buoyancy may be necessary.~~ Conduct procedure d) 4 times, rotating the valve 90^{o} around the horizontal axis between each test. Between procedures, open and close (if applicable) the valve 3 times with the bending moment removed. At the completion of the above tests, remove the valve and examine it for deformation; then subject it to the leakage test according to 5.3. ~~Table 1 shows the pipe diameters and their corresponding bending moments~~	Disagree. The piping code for thin-wall tubing is not relevant. This table is based on ANSI/CSA HGV 4.6 Table 2. By removing anything larger than 1", the remaining values look reasonable. Disagree to the title change proposal. This is a figure describing the bending moment test. ISO15649 simply refers to ANSI/ASME B31.3 for major provisions.

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						(Delete table 1) ~~Figure 1 — Test method of bending moment~~ (Amend title for figure 1 – it is incorrect) **Figure 1 Test method for excess torque resistance**	
US 18		5.6		ge	Is it correct that the procedures go from a) then to e) without a section b), c), or d)? Also, I am not sure where section d) is in this section.	Correct sequential list	Agree.
JP 20		5.6		Ed	Typo: e) comes after a)	e) → b) or a)→d)	Agree.
JP 21		5.6		Ed	Check this assembly for leaks prior to subjecting it to procedure d). 手順 d を行う前に漏えいのチェックを行う。	No d) in the text	Agree
CA 36		5.6		te	Need a “General” subclause to explain the rationale for the bending moment test values, plus tolerances on lengths, angle, and pressure		Agree in principle but these are based on ANSI/CSA HGV. Please see the change adding “minimum.”
US 19		5.7		Ed	It does not matter if the non-metallic material is synthetic or natural	Delete “synthetic” here and elsewhere in the standard.	Agree. Please see the change.
CA 37		5.7		ed	If there are “non-metallic synthetic” materials, are there also “non-metallic natural” materials that also need testing?	Delete the term “synthetic” from the term “non-metallic materials” throughout the document.	
US 20		5.7		te	Is this an explosive decompression test? Why is the ramp rate 30 seconds or greater? A breach may be much faster.	Working group experts should discuss the need for 30 seconds ramp rate	Agree.
CA 08		5.7.1		ge	General There is no test described in this section. There should be a test, similar to ISO 15500-2:2012 clause 13 but for hydrogen.		Disagree. The test is described as 5.7.2, which is a valve test. The comment is for material alone.

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					Non-metallic hydrogen exposure testing is lacking a good standard. A 70 hour hydrogen exposure test at NWP, is probably the best test. All measurements to be performed within 1 hour of depressurization which must be less than 5 minutes. Pass criteria – No sample shall exhibit swelling greater than 25% or shrinkage greater than 1%. The weight change shall not exceed 10%.		
FR 31		5.7.2		TE	Why should the valve be tight only at room temperature, as it will be mostly operated at the rated dispenser temperature?		Agree in principle, but the valve is subject to 5.3 Leakage at the end, where leakage is checked at the rated temperatures. "at room temperature only" deleted.
CA 09		5.7.2		ge	Test is very similar to 5.2 and therefore is not needed here.		Disagree. 5.7.2 is a long-term exposure test. It is believed that there is a difference between short-term vs. short term exposure to compressed hydrogen. A long-term exposure has a saturation effect.
US 21		6		te	This is a piping code component. Proper selection by a designer who knows the anticipated cycle life is what is required and is a requirement in the piping code.	Use existing values as target and include language to state that the manufacturer shall provide cycle life of the component in the product literature.	Disagree. If a valve manufacturer wants to get its product certified, these tests are appropriate. This is a standard for the requirements and test methods of valves for HRS application.
FR 32		6.2		TE	The procedure will cycle only the inlet of the valve, as the outlet will remain at the maximum gas pressure due to the presence of the check valve seat during the test.		Please see the change made.
CA 10		6.2		te	the valve should comply with 5.3 at room temperature only. Most leakages occur at -40C or +85C. The tests should be carried out after each cycle set. The leakage test should include the gas temperature – leakages often occur with -40C gas even after the valve has passed ambient leakage tests at -40C, +20C & +85C.	The leakage test should be carried out at room temperature after 100,000 cycles. At -40C after 1000 cycle and at 85C after 1000 cycles.	JP4, JP5, JP12 Agree. Please see the changes.
CA 11		6.2		ed	the valve should comply with 5.3 at room temperature only	This should read 6.3 instead of 5.3	Agree in principle. Please see the change.

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CA 12		6.2		ed	"and 5.4 upon completion of the 102,000 cycles	This should read 6.4 instead of 5.4	Agree in principle. See the change.
FR 33		6.4		TE	A criteria is missing.		Agree. Please see the insertion of the criterion.
US 22		6.4		te	The allowable leak rate is not described. ◦	Define the allowable leak rate by revising second sentence of third paragraph: "A flow measuring device capable of indicating the allowable leak rate **as defined in 5.3.1** shall be used.	
FR 34		7.1	note	TE	Some excess flow valves might have to be reset manually.		Agree
FR 35		7.2.5		TE	The internal leak test should be done is the valve in closed position.		Agree.
FR 36		7.2.6		TE	The hydrostatic test should be done is the valve in open position		Agree.
FR 37		7.2.10		TE	20 cycles is very limited.		Disagree. 20 cycles without fail should be more than enough. The valve does not get activated in regular filling. This is for hydrogen flowrate exceeding the maximum allowable gradually.
FR 38		7.2.10		TE/ED	This test is meant for the « Excess flow valves ». It states that the cycle goes from open to close position, whereas in the definition of this type of valve (§3.7.3), this valve cannot be closed but only limit the flow	Should the definition be revised or adapt the test procedure.	Agree. Please see the change. There are two types: the shut-off type will shut the flow, while the flow limit type will limit the flow.
FR 39		7.2.10		ED	Is it correct to state that the valve shall conform to its own paragraph.		Agree. Changed to 7.2.11. Also 5.3 changed to 7.2.4 and 7.2.5.
FR 40		7.2.11		TE	The flow will stop based on a massic cinetic energy criteria, therefore the velocity of the gas and its density is important. Massic cinetic (massive kinetic?)		Agree in principle. We can address the issue by physical observation on the test bench. No change on the text.
US		7.2.12		te	What is the purpose of this test? Are 100 pulses adequate?	Request a justification for this test	This is a test to ensure the

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23					What is the basis of the selection of pulses? What are the magnitudes? This has to be done on hydrogen, denser gasses may give different results.	External vs. Internal:	Internal parts of the valve withstand rapid rises and falls of pressure. Excess flow valves do not get activated during regular filling operation. Such changes occur only in emergency except for startup or maintenance. That is the reason for 100 pulses. Because this is a test for the sudden movement of the disc, the test medium does not have to be hydrogen. The type of gas will not produce significant differences in the result. ISO 15500-14 CNG vehicle component-excess flow valve is the source document.
CA 13		7.2.12		te	Dry air should be removed. Typical tests run at 70 MPa and air would be too dangerous for this type of test.		Agree.
FR 41		8		TE/ED	"Flow control valve": What is the reason for which these valves do not undergo the internal leakage test. A flow control valve may also stop the flow	Change the definition or adapt the test.	Disagree. No need to test flow control valves for shut-off even though some flow control valves can shut off the flow.
US 24		8		te	The actuator must certainly be consistent with use of the valve per IEC60079. Stating the classification in product literature will allow assessment of other zones. However, remotely actuated emergency shut-off fire valve is not addressed. In this case, the valve should demonstrate defaulting to a "fail-safe" position. Amend to an automatic emergency shutoff valve. Also need an axial load test (compression and tension) to this testing as proposed by U.S. comment to Clause 5.5.	Should restrict the scope of the task. Control valves are already clearly address in ISO 15649 and IEC 60079. However, remotely actuated module isolation valves, which are "emergency shutoff" valves, are not. These are the valve or valves that would separate the fuel source from the event location in an emergency. Therefore, change title of Clause 8 to "Flow control valves" Amend Table 4 to include • axial load test (compression and tension) to this testing; refer to comments on 5.5 & 5.6 • demonstrate defaulting to a "fail-safe" position on loss of power.	Agree in principle. Insert the following just as in 12.2: Electrically actuated valves shall also meet the requirements of "intrinsically safe" as defined in IEC 60079. Action. This is a clause for flow control valves. See Cl. 12 for shut-off valves.

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						• Add new subclause 8.3 entitled "Documentation" with the following text: The manufacturer's literature shall include, as a minimum: • The area classification of actuator • "fail-safe" (unpowered) position of valve • C_v of valve	Agree in principle. The information is included in 4.4. Cv is already in the text. Done.
US 25		8.1		te	This clause says "This clause applies to the following newly manufactured products only."	Change sentence to read: "This clause applies to the following that are new designs for hydrogen service:	Agree in principle. "Newly manufactured only" is deleted. As stated in Introduction, this document doesn't prevent the use of existing valves. The standard still recommends this test to be done on both new designs and existing designs.
CA 38		8.1		ed	As with other tests, there needs to be a rationale under this subclause to explain why it is limited to "newly-manufactured" products?		See above.
US 26		9		te	Where is the internal or process leakage test? When the sections separate, the supply side shall seal, the demand side will be verified to react per the manufacturer's literature.	Should insert an internal leakage requirement and test. The test should address the leak through requirements when the breakaway is actuated. It should address leakage from the supply side of the breakaway and from the vehicle side.	Disagree. External leakage after separation is addressed in a later subclause 9.2.7. The concern is for external leakage and not for internal leakage.
CA 24		9		ge	Add cold gas in warm valve test (12.3.10) to breakaway devices. add that external leakage test should be conducted during the test		Agree. Inserted the same wording of 12.3.10. Done.
FR 42		9.2.2		TE	What is the justification of having two different test methods which are specific to the breakaway for this device?		Agree. Changed to 5.2.

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JP4		9.2.2		te	Both Test A and Test B have a description of the waveform and cycling. It is better not to have any description of the length of a cycle because it doesn't represent anything significant unless it is extremely long or short.	9.2.2 Hydrogen gas pressure cycle test Test specified in 5.2 shall be conducted as stated. A hose breakaway device shall withstand 102 000 cycles of hydrogen gas pressure without separation or leakage. Test method The outlet of the hose breakaway device shall be plugged and the inlet shall be attached to hydrogen pressure supply. Cycling shall be between 0 MPa and the MAWP. 100 000 cycles shall be completed at room temperature with additional 1 000 cycles at - 40 °C and 1 000 cycles at 85 °C. The device shall not separate during this test. Upon completion of the 102 000 cycles the device shall comply with 9.2.3 at room temperature only, 9.2.4 and 9.2.7.	See above. JP5 JP12
JP5		9.2.2		te	The test requires 65℃ as the test temperature for1000 cycles, but the product specification has -40℃and 85℃. Better to change to 85 degrees C.	Same as above.	See above. JP12
JP 22		9.2.2.1		Ed	To be changed 4.2 into 5.1.4	To be changed 4.2 into 5.1.4.	Agree. But will be deleted as per above.
CA 14		9.2.3		ed	"equivalent test medium"	5.1.5 states hydrogen to be used	Agree.
FR 43		9.2.4		TE	Why is the hydrostatic strength test criteria different from other devices?		When connected, 4 times may cause separation. The body strength shall be tested at a factor of 4.

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US 27		9.2.4		ed	Consistent use of terms.	change “design pressure” to “MAWP.	Agree.
CA 39		9.2.4	6th para	ed	Need to keep consistency in terminology us	Replace the term “design pressure” with “MAWP”.	
JP6	Line 18	9.2.4		te	The test pressure shall be slowly increased to 4 times the MAWP or observe the relevant national standard if available. The static test pressure for breakaway couplings in the stand-alone test is set to four times the MAWP. Should be three times just as in the connected test.	The test pressure shall be slowly increased to 3 times the MAWP or observe the relevant national standard if available.	Disagree. The standard requirement for valves as stand-alone strength is four times.
FR 44		9.2.6		TE	Bending moment test : it should not be applicable if the breakaway is inline (both extremities are connected to a hose)		Agree. See below.
JP7		9.2.6		ge	This test is unnecessary because it is written as if it is testing the strength of the tube or the mounting part rather than that of the breakaway coupling.	Delete this test because it is not applicable to breakaway couplings.	Agree. Please see the change.
JP8	Line 9	9.2.7		ed	Wrong reference	Table7 → Table6	Agree.
JP9	Line 2 from last	9.2.7		ge	・・・at angles deemed most critical by the testing agency. Many breakaway couplings are designed with a hose guide on the dispenser or a dedicated holder so that they are decoupled in the axial direction virtually in all cases. Therefore it is better to say the manufacturer’s specification rather than the discretion of the testing agency for test angles.	・・・at angles deemed most critical by the testing agency. → ・・・at angles specified by the manufacturer as the most critical.	Agree.)
JP 17		9.2.7		Ge	CSA HGV 4.4 provides 222 N to 667 N for pull-away load, while this document, 220 N to 1000 N. They should be coordinated from now.	Please harmonize the values with those of CSA.	Disagree. These are harmonized with WG24. 667 N is for NGV, but this document pays attention to 70 MPa and the low temperature condition coming from precooling.

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JP 10		9.2.8		ge	This test is unnecessary because it is written as if it is testing the strength of the tube or the mounting part rather than that of the breakaway coupling.	Delete this test because it is not applicable to breakaway couplings that are fixed to a dispenser.	Agree. Please see the change.
US 28		9.2.9		te	1.8 meters (6 ft)	Round up to 2 meters (6'8" door jamb height).	Disagree. Pressure vessels are usually dropped from 1.8 m in height.
JP 11		9.2.9	Figure 2	ed	Wrong number.	Revise 4.6m → 4.5m 4.6m → 4.5m	Disagree. 16ft x 30.48 = 457cm = 4.6m
JP 23		9.2.9	Fig.2	Ed	4.6m (15 ft) 1.8m (6ft) No figure in ft according SI rule.	Delete (15ft), (6ft)	Agree.
JP 12	Line 13	9.2.10		te	The test requires 65℃ as the test temperature for 25000 cycles, but the product specification has -40℃and 85℃. Better to change to 85 degrees C.	Change 65℃ → 85℃	Agree.
JP 13	Last line	9.2.10		te	Many breakaway couplings are designed with a hose guide on the dispenser or a dedicated holder so that they are decoupled in the axial direction virtually in all cases. Therefore it is better to say the manufacturer's specification rather than 45 degrees as the test angle.	If the device is intended for connecting directly to a rigid assembly such as the dispenser, a pull force of 89 N at 45º shall be applied during rotation. If the device is intended for connecting directly to a rigid assembly such as the dispenser, a pull force of 89 N at the manufacturer's specified angles shall be applied during rotation.	Agree.
US 29		10		te	This is covered in the piping code. これは配管基準に記載されている。 However, the emergency manual shutoff valve is not addressed. In this case, the valve should demonstrate a tamper tolerant/resistant design (i.e. locking mechanism, removable handle, use of a fire hydrant spanner).	Should restrict the scope of the task. Manual valves are already clearly address in ISO 15649. However, manually actuated module isolation valves, which are "emergency manual shutoff valves," are not. These are the valve or valves that would separate the	Disagree. The type of manual shut-off valve addressed by the commentor is typically used for natural gas consumer-type appliances. For HRS, emergency isolation valves are actuated automatically in upset conditions, or manually operated by eStop buttons. See Clause 12 for shut-off valve

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						fuel source from the event location in an emergency. These valves are accessible to the general public and often are required to be tamper resistant. This resistance may be a lock or might require a special handle which is carried by the first responders. In the United States, many communities that require a valve that uses a hydrant spanner. The hydrant spanner already being on the fire apparatus. This clause should also require and internal leakage test and an axial load test (compression and tension) as defined by the U.S. comment to Clause 5.5.	test (Class B).
CA 15		10		ge	Add a valve operation test. Manual valves should have an open / close cycle test with pressure for about 25 cycles		Agree. A test for 300 cycles inserted.
CA 16		10		ge	Add an excess torque test on the valve handle. Followed by a leak test		Agree.
FR 45		10.1		TE	Depending on on/off sealing technology, positive stops in both open and closed positions should be introduced in order to avoid angular drift of hand wheel throughout lifetime as often encountered with compressed thermoplastics seats in high-pressure applications		Agree in principle, but we don't use such a device for HRS. This would lead to excessive requirements. No change to the document.
FR 46		11		TE	"Pressure relief valve": If changing the seal after 16000 cycles is authorized, the setting of the safety valve lay be altered and be a risk for the installation	Add precautions to always check the setting after changing the seal.	Agree.
US 30		11		te	This is covered in the piping code. However, pressure regulators may have additional specific requirements, similar to those in natural gas application that are not addressed. In this case, the valve should demonstrate the ability to meet these TBD requirements	Amend for pressure regulators. Also add an axial load test (compression and tension) to this testing. WG experts should discuss issues	Agree in principle. The term pressure safety valve is harmonized with WG24. Usually pressure safety valve is called pressure relief valve. We added pressure regulators to clause 8. See clause 8.
CA 17		11.2		te	"16,000 cycles" Change this number to the equivalent of X years. If a station is		See the comments for 5.2.

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					expected to do 30 fills per day or 10,950 per year then the seals replacements should be at =2000 + X(years) x 11,000. Manufacturer of the valve may change the number of years.		
CA 40		11.2	1st para	ed	Need rationale to explain why 100,000 cycles, and not the 102,000 cycles used in 6.2 and 12.3.2		Agree. Please see the change. Please note that MAWP is the MAWP of the system. Component MAWP is referred to as the design pressure of the component.
FR 47		11.8		TE	The second sentence of this paragraph is in contradiction with what is written further down in the same paragraph (± 5% ou ± 15%)	Make the requirements clearer.	The tolerance is bigger on the second part because of the extreme temperature conditions. Changed to 10% instead of 15%.
FR 48		11.8.c)		TE	Criteria at -40°C : if a PSV is set at 96.3MPa, valid opening pressure is 818 bar : this is not acceptable as per SAEJ2601 refilling tables.		Agree. Changed to 10% that meets SAE J2601. -40℃ is only the service environment of PSVs and NOT the temperature of gas. The setpoint is for the protection of the system and not for preventing over filling.
US 31		12		te	Rename clause title as diaphragm valves, or is this actually a pressure regulator? It is not what would be expected as a shut-off valve.	Are these types of valves consistent for this service? If so, retitle clause and replace “shut-off” with “diaphragm” in text. Also add an axial load test (compression and tension) to this testing.	Disagree. See the revised text in clause 8. Also see the requirement for IEC 60079 in 12.2.
CA 18		12.3.2		te	the valve should comply with 5.3 at room temperature only Most leakages occur at -40C or +85C. The tests should be carried out after each cycle set. The leakage test should include the gas temperature – leakages often occur with -40C gas even after the valve has passed ambient leakage tests at -40C, +20C & +85C	The leakage test should be carried out at room temperature after 100,000 cycles. At -40C after 1000 cycle and at 85C after 1000 cycles. the gas temperature for each test should be defined.	Agree.
CA 19		12.3.2		ed	5.3	should read 12.3.3 and 12.3.4	Agree.
CA 20		12.3.2		ed	5.4	should read 12.3.5	Agree.

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Template for comments and secretariat observations

Date: **2017-02-06**	Document: Comments from the DIS 19880-3 Ballot 2016	Project: **WG 20**

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CA 21		12.3.9		te	20 cm3/h Same as 5.3.1	Change to 10cm3/h	Agree.
CA 22		12.3.10		ed	5.3	should read 12.3.3 and 12.3.4	Agree.
CA 23		12.3.10		te		during testing the external leakage rate shall not exceed 10cm3/hr	Agree.
CA 41		12.3.10	2nd para	te	It is not always possible to maintain exactly 90% relative humidity during testing. This requires a wide tolerance. In addition, it should be permitted to use a fine water spray to simulate the high humidity.	Include the sentence, “A fine water spray may be used as an alternative to the 90% humidity requirement.”	Agree in principle. A tolerance of plus minus 10% is inserted. No need to mention humidification means. Action.
US 32		Bibliography		te	Not sure that these are good examples. Stick with the stationary natural gas documents, the piping code and the electrical code (e.g. actuators, area classification) not the CNG vehicle related documents.	Delete all parts of ISO 15500 shown in bibliography.	Disagree for the time being. This is simply a list of documents studied in the preparation of this document.

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by ******)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial