

**GRPE Informal Group “Hydrogen/Fuel Cell Vehicles”  
 CGH<sub>2</sub> Expert Working Group  
 RESPONSES TO COMMENTS ON THE  
 GRPE DRAFT ECE COMPRESSED GASEOUS HYDROGEN (CGH<sub>2</sub>) REGULATION  
 Version 12 Dated 14.05.03  
 Results of the Göteborg Meeting On 11.09.03**

**GRPE - 028**

11-09-2003

Supersedes GRPE-027

**GENERAL COMMENTS**

Paragraph/ Annex	Organisation	Comments/Proposed Modification	Agreed	Final Modification Or Reason For Rejection
1.3	RDW	Remove “1” from footnote to avoid confusion with M1/N1 vehicles	Y	
2.1.13/2.4.7	VTEC	Is it now clear when a duty cycle should be used or when a filling cycle should be used?	Y	Add a new paragraph: Annex 8, A2.5, If a component is exposed to the pressure due to refilling operations then filling cycles shall be used. If a component is exposed to pressure due to the operation of the vehicle, i.e. switching of the vehicle activation switch, then duty cycles shall be used.
2.1.15	VTEC	Replace “....pipe rupture...” with “....line rupture...”	Y	
2.1.22	GRPE CGH <sub>2</sub> Experts	“Ful” should be “Fully”	Y	

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6.1.4	VTEC	Does Para. 6.1.4 take precedence over Ann.7/8, Part A1, 1st paragraph? The intention in A1 was to make it clear that equivalent European national standards can be used in place of ASTM standards. Does that imply that the quoted ISO standards are "cast in stone"? 6.1.4 was intended to allow for alternative, but equivalent, test procedures.	-	Ann.7/8, Part A1, 1st paragraph: Retain existing text. Delete Para. 6.1.4
6.2.3.1	GRPE CGH <sub>2</sub> Experts	Change "Containers" to italics	Y	
6.2.3.2	CCS	Clarify that the section refers to container assemblies built up from compartments rather than individual containers in their own right.	-	Not necessary as the definition of a container (see 2.1.11) is sufficiently flexible and the definition may also apply to non-type approved cylinders provided that the assembly fulfils all the requirements.  A possible text was considered but not adopted as it was not thought to be an improvement: "6.2.3 <i>Container Assembly</i>  6.2.3.1 A <i>Container Assembly</i> shall be approved in accordance with the provisions laid down in Annex 7 to this Regulation as appropriate to the type of construction.

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				<p>6.2.3.2 A <i>Container Assembly</i> shall, as a minimum, fulfil the requirements of Paragraphs B12, B18 and B19 of Annex 7 to this Regulation regardless of the constituent <i>Container</i> type or type of construction. “</p> <p>The definition of a container is not restricted to a simple cylinder.</p> <p>Solution agreed by all except S Gingras (ISO/BNQ) and to be incorporated in Rev.12a:  “6.2.3.2 Alternatively a <i>Container Assembly</i> shall be approved as one <i>Container</i> if the <i>Container Assembly</i> fulfils the provisions laid down in <b>Annex 7</b> to this Regulation. The constituent <i>Containers</i> need not fulfil all the provisions laid down in <b>Annex 7</b> to this Regulation, provided that the <i>Container Assembly</i> fulfils all the provisions of Annex 7.”</p> <p>The problem as viewed by S Gingras (ISO/BNQ) is that the <i>Container Assembly</i> is built of individual containers made by different manufacturers, e.g. batch test, welding may not be covered. This is not considered to be a problem by</p>

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				RDW/TUV because of the clear responsibility in the European type approval process, which is the manufacturer noted in the type approval and who may have sub-manufacturers that are not mentioned in the type approval.
14.1.6	DC	Collision has to be deleted, the crash requirements are covered in 14.2.4.	Y	Replace “collision” with “impacts”
14.5.2	DC	Makes no sense because PRD has only to protect the container and not other hydrogen components or the hydrogen system	Y	Add following changes: “It shall not be possible to isolate the <i>Pressure Relief Device</i> from the <i>Container Hydrogen Components</i> or section of the <i>Hydrogen System</i> protected by the <i>Pressure Relief Device</i> , by the normal operation or failure of another component.”
14.7.3	DC	This is a requirement for installation therefore here not relevant delete, or replace mounted by designed	Y	Replace “mounted” by “designed”
14.7.4	DC	Delete: for safety reasons (electrostatic charge) we want an electrical contact over the fuel lines	P	Replace with: “At fixing points, <i>Rigid Fuel Lines</i> and <i>Flexible Fuel Lines</i> shall be fitted in such a way that galvanic and

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				crevice corrosion are prevented.”
14.7.7	DC	If there are no fittings in the passenger or enclosed luggage compartment this requirement makes no sense, because a fuel line is not safety critical	Y	Replace with “If <i>Fittings</i> are installed in the passenger or enclosed luggage compartment the fuel lines and <i>Fittings</i> shall be enclosed in a sleeve which meets the same requirements as specified for a gas tight housing in <b>Paragraph 14.10</b> of this Regulation.”
14.8.1	DC	What about rubber sealings in the fittings?	Y	The aim of the text is to prevent corrosion, therefore, replace with: “The materials used in <i>Fittings</i> shall be chosen in such a way that galvanic and crevice corrosion are prevented.”
14.9.3	DC	Delete because it is also written in 14.4.2 and 14.4.3	Y	There is no need to mention the same requirement twice. Deleting this paragraph is the only guarantee against it being interpreted by someone to be a new requirement.
14.9.6	DC	What is the meaning of “where fitted”???	Y	

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		Delete ??		
14.11.2	DC	To be discussed what e.g. the electric connection to the automatic valve??	Y	Delete "-" Delete existing 14.10.3 and transfer 14.11.2 in its place as it is a gas tight housing requirement.
14.11.3	DC	Contradiction to 14.7.4 delete 14.7.4	N	See 14.7.4 above
14.11.4	DC	Requirement also to the filling station delete or find a new text	Y	Replace with: "During the refilling process the <i>Hydrogen System</i> shall have the means to provide <del>have</del> electrical continuity with the refilling facilities before hydrogen transfer is permitted."
14.11.5	VTEC/RAFS	Change: "...electrical connections for power supply bushing shall not..." To: "...electrical connections and bushings for power supply	P	Replace with: "Power supply connections shall not permit the ingress of hydrogen where hydrogen leaks are possible."

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		cables shall not ..."		
14.11.5	DC	1. not easy to understand 2. what is the exact meaning of "electrical connections for power supply bushing"? See 14.7.6 grommets, is this the same 3. how to make it??	-	See above
Annex 7 Note * <sup>8</sup> to Table 7A.3	GRPE CGH <sub>2</sub> Experts	Change "Liners" to "materials" in section iii) in accordance with the main table and GRPE-ISO Doc. No.N026	Y	
Annex 7, Table7A.8	GRPE CGH <sub>2</sub> Experts	Under Hydrogen Compatibility refer to "Note * <sup>8</sup> to Table 7A.3 of this Annex" instead of test "B7".	Y	
Annex 7, B7.1	Powertech	There should be a clarification at the start of B7 under B7.1. Right now it says that "This test applies to Type 1,2 and 3 Containers." To someone reading this sentence by itself, it gives the impression that all designs must do hydrogen pressure cycle testing per B7 - a very expensive and	Y	Replace 1 <sup>st</sup> sentence of B7.1 with: "This test applies to Type 1,2 and 3 Containers in accordance with Note * <sup>8</sup> to Table 7A.3 of this Annex."

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		frightening proposition! Please add some clarifying statement, such as "This test applies to Type 1,2 and 3 Containers that do not comply with the requirements as stated in note 8 of Table 7A.3." (or something to this effect).		
Annex 8, A3.1.3	VTEC	At the March CGH2 experts meeting it was agreed that test B5 (hydraulic pressure cycle test) was to replace the burst test on the basis that it was an end of life test. But now the component is only subjected to the corrosion test. Maybe an editing mistake? Should the endurance test be switched with the pressure cycle test to follow the agreed philosophy, i.e. the component sample is subjected to the corrosion test, then the endurance test and then the pressure cycle test?	Y	Change test B5 to B6 and vice versa.
Annex 8, B1.2 i)	VTEC	Is it appropriate to quote ISO 11114-1, does it achieve anything?	-	The scope of ISO 11114-1: This standard gives guidance in the selection and evaluation of compatibility between metallic gas cylinder and valve materials, and the gas content. Reference to ISO 11114-1 is correct.



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Ann.8, B5.2.2	VTEC	Should this section be written for both filling and duty cycles?	Y	Replace 1 <sup>st</sup> para with: “The <i>Specific Components</i> shall be subjected to 3 times the number of <i>Filling Cycles</i> or <i>Duty Cycles</i> calculated in accordance with Paragraphs 2.4.6 or 2.4.7 of this Regulation.”
Ann.8, B5.2.2	UTC Fuel cells	<p>1. I suggest the following minor changes (shown in red) to the second paragraph:</p> <p style="padding-left: 40px;">The pressure shall periodically change from 2.0 MPa to 1.25 times <i>Nominal Working Pressure</i> for components upstream of the <i>First Pressure Regulator</i>, or from 0.1 times <i>MAWP</i> to <i>MAWP</i> for components downstream of the <i>First Pressure Regulator</i>, at a rate not exceeding 4 cycles per minute.</p> <p>2. The only thing not specifically addressed by B5.2.2 of Annex 8 is then the demonstration of pressure containment during failure management. To account for failure management, the following sentence should be added to the end of the second paragraph of B5.2.2 of Annex 8:</p> <p style="padding-left: 40px; color: red;">Following completion of pressure cycles, components upstream of the <i>First Pressure</i></p>	<p>1.Y</p> <p>2. N</p>	<p>1. Y</p> <p>2. N. This was discussed and rejected at the last GRPE CGH<sub>2</sub> Expert Working Group meeting in March this year. Additionally, ISO TC197 WG 5 (CGH<sub>2</sub> refilling connectors) rejected a similar proposal at its meeting in Grenoble last week, as this is a filling station and not a vehicle issue. Also note the explanation given in the responses to this comment at the March meeting.</p>

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		<p style="color: red;">Regulator shall be tested to 1.5 times the Nominal Working Pressure, and components downstream of the First Pressure Regulator shall be tested to 1.1 times the MAWP.</p> <p>I recognize that the 3X margin on duty cycles probably accounts for this mild increase in pressure, but it is somewhat bothersome that the regulation does not explicitly require a demonstration of pressure capability consistent with failure management.</p>		
Annex 8 B6.2.1 i)	DC	Change 3rd sentence to "When the valve is in the closed position the downstream pressure shall decay to 0.5 times the NWP of the component."	Y	Change 3rd sentence to "When the valve is in the closed position the downstream pressure shall decay to 0.5 times the NWP of the component or lower."
Annex 8 B6.2.4 ii)	GRPE CGH <sub>2</sub> Experts	Change Tests "B8 and B8" to "B7 and B8"	Y	
Ann.8, B6.2.5	Dyнетek (VTI)	In the second part of the Paragraph, referring to the activation temperature, it is required that "the activation temperature shall correspond to the melting temperature of the fusible metal specified by the Manufacturer within a	P	Change text to: "The activation temperature shall be within a range of ± 5 % of the <i>Manufacturer's</i> specified activation temperature."

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		<p>range of <math>\pm 2</math> °C".  This range is by far too narrow and technically not feasible!  This, in particular is true for a fusible metal alloy, which will hardly melt within 4 °C under the test conditions.</p> <p>Therefore, we suggest the following changes:</p> <p>"The activation temperature shall correspond to the melting temperature of the fusible metal specified by the Manufacturer within a range of <math>\pm 5</math> %".</p> <p>We believe that to refer to a certain percentage of the activation temperature is more reasonable than to refer to a temperature range regardless whether the defined activation temperature is low or high.</p>		
Annex 8 B6.2.7	DC	The rotation of the nozzle under pressure is not possible (This is an information of a supplier)	Y	Delete the sentence. It is not possible to rotate while pressurised.
Annex 8 B5.2.9	DC	Renummer to B6.2.9 (Typing error)	Y	

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Annex 8 Table B6.1	GRPE CGH <sub>2</sub> Experts	Move table to follow Ann8, ParaB 6.2.1.	Y	