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**CSA
Group**

**ECE R110:
Harmonization
of
CNG Fuel Tank Requirements
with
ISO 11439**

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BACKGROUND



CRAIG WEBSTER

- Convener of ISO TC 58/SC 3 Working Group for the ISO 11439 Standard
- Convener of ISO 11439 since 1995!

ISO 11439

- Covers performance requirements for CNG fuel cylinders on-board vehicles
- Standard first published in 2000

ECE R110

- Annex 3A of the Regulation adopted the 1998 draft of ISO/DIS 11439
- There were significant differences between the 1998 draft and the published version of ISO 11439

HARMONIZATION

- Attempting to align the test requirements in ECE R110 Annex 3A, with those in the latest version of ISO 11439: 2013 for CNG vehicle fuel cylinders

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WHY HARMONIZATION?



SAFETY

- The 2013 version of ISO 11439 contains a number of changes made to improve safety due to in-service cylinder failures

COST TO CYLINDER MANUFACTURERS

- Manufacturers often must test to the Regulation, and perform additional tests to meet ISO 11439

ERRORS IN ECE R110 ANNEX 3A

- In adopting the 1998 ISO/DIS 11439, Annex 3A inadvertently included some erroneous references
- In one case a test cannot even be performed because the completely wrong standard is referenced
- Some tests are difficult to conduct as described

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SAFETY OF CNG FUEL CYLINDERS – Recent In-Service Failures



Date	Place of Failure	No. of Failures	Cylinder Manufact.	Cylinder Design	Source of Data	Cause of Failure
Apr 8 2017	São Gonçalo, Brazil	One	Brazilian?	Type 1 steel	News	During filling
Nov 16 2016	Ry, Kramfors Sweden	One		Composite-reinforced	News	Car fire
Sep 13 2016	Düderstadt, Germany	One	Worthington	Type 1 – steel (VW Touran)	News	Likely external corrosion
Aug 16 2016	Baranovichi, Belarus	One	Worthington ?	Type 1 – steel (VW Touran)	News	Likely external corrosion
July 12 2016	Gothenburg Sweden	Multiple ?			News	Bus fire
July 4, 2016	Gothenburg, Sweden	One	Worthington	Type 1 – steel (VW Touran)	News	Likely external corrosion
May 2016	Nashville, Tennessee	One	Quantum	Type 4	News	Saddle tank - Possible impact from road debris, ruptured during filling
May 4 2016	Litomyšl, Czech Repub.	One	Worthington	Type 1 – steel (VW Touran)	News	External corrosion visually apparent
Jan 26 2016	Hamilton, NJ USA	One	Luxfer (Dynetek)	Type 3	News, NREL	Localized fire in garbage truck caused 1 of 5 cylinders to burst
2015	Arkansas	One	Quantum	Type 4	Industry source	Saddle tank – impact with guardrail
July 9, 2015	Perugia, Italy	One	Bagasco	Type 4	Italian Transport Ministry	Burst in dome transition region while filling – only 2 years in service (manufacturing issue)
June 2015	Buffalo, NY	One	Quantum	Type 4	News & Industry source	Saddle tank - Rupture following impact with train
May 5, 2015	Linköping, Sweden	One	Worthington	Type 1 – steel (VW Touran)	News	Likely external corrosion
Jan 27 2015	Indianapolis USA	Two	Lincoln	Type 4	News	Vehicle fire, PRDs did not activate (localized fire)
Aug 19 2014	Arcadia, California	One	Dynetek?	Type 3 (carbon fibre & aluminum liner)	City of Arcadia	Fire from other sources, PRDs did not activate (localized fire)

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CURRENT APPROACH TO HARMONIZATION



The convener of ISO 11439 had proposed a series of changes that would make the wording in ECE R110 (particularly the test requirements in Annex 3A) match the wording in ISO 11439: 2013

- Detailed wording changes were proposed to avoid the need to simply reference the ISO 11439 standard

The proposed changes were reviewed in some detail by the French, German, Japanese, and Dutch delegations

- The work of these delegations is very much appreciated, and they helped identify several areas for improvement in the ISO 11439: 2013 standard
- The delegations also identified certain areas in ECE R110 where full harmonization with ISO 11439 would be difficult

It is now understood a cylinder standard could have difficulty in some areas completely harmonizing with a vehicle regulation

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FUTURE APPROACH TO HARMONIZATION



100% harmonization of the CNG cylinder requirements between ECE R110 and ISO 11439: 2013 may not be achievable

- One can never achieve complete harmonization, because as soon as the regulation is harmonized with the standard, the standard changes (or the regulation changes)
- In this case, the ISO 11439: 2013 standard is due for its 5 year periodic review in 2018, which will likely result in further changes due to recent safety issues.

ISO therefore intends to propose to the GRSG for consideration at the next meeting, a revised harmonization proposal that will be limited to addressing only issues that:

- Affect the safety of fuel cylinder designs
- Interfere with the ability to perform certain cylinder tests in ECE R110
- Impose a cost burden on cylinder manufacturers by requiring multiple tests to comply with both documents

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