

**National Hydrogen and Fuel Cell Codes and Standards Coordinating Committee  
(NHFCSCC)**

**Wednesday, December 15, 2021  
TIME: 2:00 – 3:00 pm (Eastern Standard Time)**

**Minutes**

**Attendees**

**Connor Dolan  
Juana Williams  
Jay Keller  
Will James  
Spencer Quong  
Rich King  
Laura Hill**

**Karen Quackenbush  
Ian MacIntire  
Mike Steele  
Eric Prause  
Christine Watson  
Jennifer Gangi  
Brian Ehrhart**

**Sara Marxen  
Rob Kaminsky  
Douglas Olenick  
Christina Daniels  
Norman Newhouse**

**I. Welcome and Housekeeping Items**

The Committee reviewed FCHEA's anti-trust guidelines and meeting agenda. The Committee approved the previous meeting minutes.

**II. DOE/HQ Update**

**Laura Hill / Brian Ehrhart**

Last week DOE held a webinar last week on the hydrogen provisions in the Infrastructure Investment and Jobs Act.

The presentation is available at: <https://www.energy.gov/eere/fuelcells/articles/doe-update-hydrogen-shot-rfi-results-and-summary-hydrogen-provisions>

**III. Codes & Standards Events and Fuel Cell Safety Information**

<http://www.hydrogenandfuelcellsafety.info/events/>

**Karen Quackenbush**

**Request:** technical resource updates for the Hydrogen and Fuel Cell Safety website. Any committee members who have materials they would like hosted on the website can send them to Karen Quackenbush ([kquackenbush@fchea.org](mailto:kquackenbush@fchea.org)) or Connor Dolan ([cdolan@fchea.org](mailto:cdolan@fchea.org)).

**IV. Global Technical Regulations**

**Ian MacIntire**

GTR 13 Phase 2 has postponed submission of informal document based on the IWG's Chairman decision. This is due to continued changes being made to the document to allow for time for broader circulation and development. There is now a six month extension to complete the work for GTR 13 Phase 2.

The next GTR IWG meeting will be on Monday, January 24<sup>th</sup> and Thursday, January 27<sup>th</sup>.

**V. Codes and Standards Organization Updates**

**Institute of Electrical and Electronics Engineers**

**Mark Siira**

No update at this time

**International Electrotechnical Commission IEC TC 105**

**Kelvin Hecht**

No update at this time

**International Standards Organization ISO/TC 197**

**Karen Quackenbush/Jay Keller**

The annual meeting was held earlier this month.

The subcommittee was approved and a roundtable was held to discuss questions on scope, process, and title. There was a good presentation to demonstrate the structure and how it would fit into the broader committee. The Technical Advisory Board members for TC 197 will be the same for the subcommittee. Paperwork and ballot will continue through March 2022.

There were several reaffirmations of working groups and convenorships.

Several months ago there was a ballot on liquid hydrogen standards that needed to be updated, reaffirmed, or withdrawn. A ballot was held and it was agreed to withdraw the standard, however, that decision was overwritten as some countries (including Australia and others) have them included in reference within their regulations.

The ISO headquarters have changed their view on technical references with respect to specific language. That impacts things going forward and our work on TR 15916. While the scope of work is straightforward to fix the materials table and include cold work (liquefied hydrogen and cyro). That group will now need to review the document to ensure the references are correct. That work is now expected to move from a TR to a TS.

There will be ISO TC/197 H2 Quality meetings the week of Jan 24.

**National Fire Protection Association NFPA 2**

**Chris LaFleur**

NFPA 2 is working on developing timing of the second draft meeting. It is expected to be held in February/March of 2022 which could potentially put the document a cycle behind NFPA 55 which has already held its second draft meeting.

**International Codes Council (ICC)**

**Spencer Quong**

The second draft ballot finished a couple months ago and is proceeding to publication. No updates are expected for some time.

**Society of Automotive Engineers (SAE)**

**Mike Steele**

<i>Task Force</i>	<i>Document</i>	<i>Title</i>	<i>Date</i>	<i>Status</i>
<b>Interface</b>	J2600_201510	Compressed Hydrogen Surface Vehicle Fueling Connection Devices	21-Oct-15	Being revised in conjunction with ISO 17268

<b>Interface</b>	J2601_202005	Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles	29-May-20	Being revised
<b>Interface</b>	J2601/2_201409	Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles	24-Sep-14	Needs affirmation ballot of existing content
<b>Interface</b>	J2601/3_201306	Fueling Protocol for Gaseous Hydrogen Powered Industrial Trucks	12-Jun-13	Ballot passed. Comment reconciliation process underway.
<b>Interface</b>	TIR J2601/4	Ambient Temperature Refueling		Being developed
<b>Interface</b>	J2719_202003	Hydrogen Fuel Quality for Fuel Cell Vehicles	18-Mar-20	Revised
<b>Interface</b>	J2799_201912	Hydrogen Surface Vehicle to Station Communications Hardware and Software	13-Dec-19	Revised
<b>Interface</b>	TIR J3219	Hydrogen Fuel Quality Screening Test of Chemicals for Fuel Cell Vehicle		Ballot passed. Comment reconciliation process underway.
<b>Safety</b>				
<b>Safety</b>	J1766_201401	Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing	10-Jan-14	Revised - Action required
<b>Safety</b>	J2578_201408	Recommended Practice for General Fuel Cell Vehicle Safety	26-Aug-14	Revised - Action required
<b>Safety</b>	J2579_201806	Standard for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles	15-Jun-18	Revised
<b>Safety</b>	J2594_201611	Recommended Practice to Design for Recycling Proton Exchange Membrane (PEM) Fuel Cell Systems	15-Nov-16	Reaffirmed
<b>Safety</b>	J2990/1_201606	Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice	3-Jun-16	Issued
<b>Safety</b>	J3089_201810	Characterization of On-Board Vehicular Hydrogen Sensors	43382	Issued
<b>Fuel Economy</b>				
<b>Fuel Economy</b>	TIR J3202	Recommended Practice for Measuring and Simulating Fuel Consumption and Range of Heavy Duty Fuel Cell Hybrid Road Vehicles Fueled by Compressed Gaseous Hydrogen		Being developed

<b>Fuel Economy</b>	J2572_201410	Recommended Practice for Measuring Fuel Consumption and Range of Fuel Cell and Hybrid Fuel Cell Vehicles Fuelled by Compressed Gaseous Hydrogen	16-Oct-14	Needs affirmation ballot of existing content
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<b>Performance</b>	J2615_201110	Testing Performance of Fuel Cell Systems for Automotive Applications	20-Oct-11	Stabilized
<b>Performance</b>	J2616_201108	Testing Performance of the Fuel Processor Subsystem of an Automotive Fuel Cell System	12-Aug-11	Stabilized
<b>Performance</b>	J2617_201108	Recommended Practice for Testing Performance of PEM Fuel Cell Stack Sub-system for Automotive Applications	12-Aug-11	Stabilized
<b>Safety</b>	J2574_201109	Fuel Cell Vehicle Terminology	6-Sep-11	Stabilized
<b>Safety</b>	J2760_201106	Pressure Terminology Used in Fuel Cells and Other Hydrogen Vehicle Applications	1-Jun-11	Stabilized

CSA

Sara Marxen

Active / Recently Published Projects		
TSC	Designation/Title	Status
HGV 4.3	HGV 4.3, Test methods for hydrogen fueling parameter evaluation	This project is a revision of an existing standard and will include content related to MC formula. The Technical Committee Ballot closed 12/4/2021. No negative votes were received but there a few comments to address.
HGV 4.2	HGV 4.2, Hoses for dispensing compressed gaseous hydrogen	This project is a revision of an existing standard, and will update to align with current hose technology, and remove requirements for on-board vehicle hoses (content will be transferred to HGV 3.1). The Technical Committee Ballot closed 11/23/2021. One negative vote was received, and we are working with the TSC/TC Chairs and commenter to address.
HGV 5	HGV 5.2, Compact hydrogen fueling systems	This project is to develop a NEW standard for Compact Hydrogen Fueling Systems (HGV 5.2). The TSC completed content development. The draft is available for public review (closing January 18, 2022). Click here to access: <a href="https://publicreview.csa.ca/Home/Details/4410">https://publicreview.csa.ca/Home/Details/4410</a>
HGV 3	HGV 3.1, Onboard vehicle components for hydrogen gas vehicles	This project is a revision of an existing standard for technology updates, as well as inclusion of the on-board vehicle hose requirements (transferred from HGV 4.2). The draft is available for public review (closing January 4, 2022). Click here to access: <a href="https://publicreview.csa.ca/Home/Details/4400">https://publicreview.csa.ca/Home/Details/4400</a>
HGV 4.1	HGV 4.5, Priority	This project is to develop a standard to REINSTATE an

	and sequencing equipment for hydrogen vehicle fueling	updated edition of a Priority and Sequencing standard. A seed document draft has been prepared and a kickoff meeting with the HGV 4.1 TSC is being scheduled for Fall 2021.
C22.2 No. 22734	Hydrogen generators using water electrolysis	The CSA technical subcommittee has initiated work on a binational adoption of ISO 22734. Contact Mark Duda ( <a href="mailto:mark.duda@csagroup.org">mark.duda@csagroup.org</a> ) with questions or for additional information.

## Compressed Gas Association (CGA)

Rob Early

Status of current and future publications:

Standard	Current edition	Status
CGA G-5, <i>Hydrogen</i>	8 <sup>th</sup> (2017)	Deadline to submit proposed changes for next edition is 7/7/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-019">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-019</a>
CGA G-5.3, <i>Commodity specification for hydrogen</i>	7 <sup>th</sup> (2017)	Deadline to submit proposed changes for next edition is 6/4/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013</a>
CGA G-5.4, <i>Standard for hydrogen piping systems at user locations</i>	6 <sup>th</sup> (2019)	Deadline to submit proposed changes for next edition is 12/22/2024. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54</a>
CGA G-5.5, <i>Hydrogen vent systems</i>	3 <sup>rd</sup> (2014)	The 5 <sup>th</sup> edition has been published and can be found at <a href="https://portal.cganet.com/Publication/Details.aspx?id=G-5.5">https://portal.cganet.com/Publication/Details.aspx?id=G-5.5</a> Deadline to submit proposed changes for next edition is 03/04/2026. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3</a> Heat radiation testing at Chart Industries in New Prague, MN date is planned for this fall. The goal is for the task force to review test results this fall.
CGA G-5.6, <i>Hydrogen pipeline systems</i>	1 <sup>st</sup> (2005 – reaffirmed 2013)	Deadline to submit proposed changes for next edition is 8/1/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018</a>
CGA H-1, <i>Service conditions for portable, reversible metal hydride systems</i>	2 <sup>nd</sup> (2011)	Deadline to submit proposed changes for next edition is 2/3/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-033">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-033</a>
CGA H-2, <i>Guideline for classification and labeling of hydrogen storage</i>	2 <sup>nd</sup> (2018)	Deadline to submit proposed changes for next edition is 6/4/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-033">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-033</a>

<b>Standard</b>	<b>Current edition</b>	<b>Status</b>
<i>systems with hydrogen absorbed in reversible metal hydrides</i>		<a href="#">e/Outline.aspx?work_id=22-012</a>
CGA H-3, <i>Standard for cryogenic hydrogen storage</i>	3 <sup>rd</sup> (2019)	Deadline to submit proposed changes for next edition is 12/1/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-036">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-036</a>
CGA H-4, <i>Terminology associated with hydrogen fuel technologies</i>	3 <sup>rd</sup> (2020)	Deadline to submit proposed changes for next edition is 12/1/2024. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59</a>
ANSI/CGA H-5, <i>Standard for bulk hydrogen supply systems</i>	3 <sup>rd</sup> (2020)	The deadline to submit proposed changes for the next edition is 2/26/2024. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010</a>
CGA H-10, <i>Combustion safety for steam reformer operation</i>	2 <sup>nd</sup> (2018)	Deadline to submit proposed changes for next edition is 12/1/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038</a>
CGA H-11, <i>Safe start-up and shutdown practices for steam reformers</i>	2 <sup>nd</sup> (2020)	Deadline to submit proposed changes for next edition is 8/11/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30</a>
CGA H-12, <i>Mechanical integrity of syngas outlet systems</i>	1 <sup>st</sup> (2016)	Deadline to submit proposed changes for next edition is 3/1/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016</a>
CGA H-13, <i>Hydrogen pressure swing adsorber (PSA) mechanical integrity requirements</i>	1 <sup>st</sup> (2017)	Deadline to submit proposed changes for next edition is 8/1/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027</a>
CGA H-14, <i>HYCO plant gas leak detection and response practices</i>	1 <sup>st</sup> (2018)	Deadline to submit proposed changes for next edition is 12/8/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045</a>
CGA H-15, <i>Safe catalyst handling in HYCO plants</i>	1 <sup>st</sup> (2020)	Deadline to submit proposed changes for next edition is 9/1/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59</a>
CGA H-XXX (TBD), <i>Small scale hydrogen production and delivery</i>	New publication not released yet	Task force has created the first draft that will then go to the CGA membership for review.
CGA P-28, <i>OSHA process safety management and EPA risk management plan guidance document for bulk liquid hydrogen</i>	4 <sup>th</sup> (2014)	The ad hoc committee reviewed and updated the draft of the 5 <sup>th</sup> edition on September 10. The draft will go to Standards Council for final balloting.



<b>Standard</b>	<b>Current edition</b>	<b>Status</b>
<i>supply systems</i>		
CGA PS-31, <i>Position statement on cleanliness for proton exchange membranes hydrogen piping / components</i>	1 <sup>st</sup> (2007 – reaffirmed 2019)	Deadline to submit proposed changes for next edition is 6/12/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16</a>
CGA PS-33, <i>Position statement on the use of LPG or propane tanks as compressed hydrogen storage buffers</i>	1 <sup>st</sup> (2008 – reaffirmed 2020)	Deadline to submit proposed changes for next edition is 12/10/2026. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41</a>
CGA PS-46, <i>Position statement on roofs over hydrogen storage systems</i>	1 <sup>st</sup> (2017)	Deadline to submit proposed changes for next edition is 3/6/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012</a>
CGA P-48, <i>Position statement on clarification of existing hydrogen setback distances and development of new hydrogen setback distances in NFPA 55</i>	1 <sup>st</sup> (2016)	Deadline to submit proposed changes for next edition is 2/12/2021. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-062">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-062</a>
CGA work item 21-126, <i>Hydrogen system siting and personnel exposures distances</i>		CGA members supported the NFPA 2/55 hydrogen storage task group to update liquid hydrogen system setback distances. The work was not finished before the November 3-5 NFPA 55 second draft meeting but is expected to be finished by the NFPA 2 second draft meeting in 1Q 2022. In the meantime, NFPA 55 has added a pointer to NFPA 2 in anticipation of the new distances being added to NFPA 2.
CGA work item 21-127, <i>Transfer and unloading of hydrogen at near-consumer use points</i>	New publication not released yet	Develop new standard to update traditional hydrogen delivery practices for industrial users to improve practices for retail applications.
CGA work item 21-128, <i>Noise from hydrogen venting and hydrogen systems operations</i>	New publication not released yet	Develop new standard to reduce the noise from hydrogen system operations, including venting, particularly at retail applications where hydrogen system noise is greater than ambient noise

CGA has launched a “Hydrogen Safety is Step One” campaign – see the attached link: <https://www.cganet.com/cga-launches-hydrogen-safety-is-step-one-campaign/>.

**American Society for Testing & Materials (ASTM)**

**Jennifer Hamilton**

We just had a workshop for On-line/In-Line H2 Fuel Quality Analysis with presentations from LANL, NREL, and private industry. Those will be available on the ASTM D03 website.

**American Society of Mechanical Engineers (ASME)**

**Ray Rahaman**

None at this time.

**VI. Discussion Topics**

**Facilitating Deployment**

**All**

**Center for Hydrogen Safety**

**Nick Barilo**

CEP Hydrogen Safety Fundamentals report just published this week.

**Regulatory Matrix Review and Comment**

**Karen Quackenbush**

Please direct any updates, questions, or comments to Karen Quackenbush by email at [kquackenbush@fchea.org](mailto:kquackenbush@fchea.org).

September 30, 2021 version was published and available online at <https://www.fchea.org/s/FCHEA-Regulatory-Matrix-Markup-September-30-2021.pdf>.

**Permitting and Installation of Hydrogen Fueling Stations**

**California Station Implementation**

**Jennifer Hamilton**

We are reviewing fueling verification data (ANSI/CSA HGV 4.3) with CARB and stakeholders for opening another station in CA (yay!).

The CEC released its joint AB 8 report this week.

**California Div. of Measurement Standards/Fuel Quality/Metrology** **Christina Daniels**

No changes on metrology.

A recent presentation on hydrogen sampling and results was provided to ASTM: [LINK HERE](#).

Fuel quality results did not see any contaminant above the reporting limit in 2021 or anything near failure levels. There is nothing that needs to be addressed, but available for those interested.

**Legal Metrology Standards Hydrogen Fuel  
Quality and Measurement**

**Juana Williams/Ralph Richter**

None at this time.



**VII. Open Discussion & Other Issues**

None at this time.

**VIII. Next Meeting** – Wednesday, January 12, 2022 at 2:00 PM US Eastern