

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

**Wednesday, February 1, 2023
TIME: 2:00 PM EDT**

Minutes

**Victoria Ammermann
Nick Barilo
Michael Conrad
Christina Daniels
Mark Duda
Brian Ehrhart
John Eihusen
Jennifer Gangi
Kevin Harris
Kelvin Hecht**

**Martin Hering
Laura Hill
Owen Hopkins
Will James
Chris LaFleur
Ian MacIntire
Sara Marxen
Iris Monner
Eric Nelson
Norm Newhouse**

**Haboon Osmond
Ozlem Ozturk Bilal
Karen Quackenbush
Spencer Quong
Mark Siira
Mike Steele
Christine Watson
Juana Williams**

I. Welcome and Housekeeping Items

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

II. DOE/HQ Update

Christine Watson

- [Hydrogen and Fuel Cell Technologies Office FOA in Support of Hydrogen Shot](#)
 - a. Concept Paper Submission Deadline: 2/24/2023
 - b. Full Application Submission Deadline: 4/28/2023
- For those attending the Hydrogen & Fuel Cell Seminar, there will be a DOE Workshop "Enabling Decarbonization with Clean Hydrogen at Scale" on February 7th.

III. Codes & Standards Events and Fuel Cell Safety Information

Karen Quackenbush

- Calendar of events: <https://www.hydrogenandfuelcellsafety.info/safety-report-calendar>
- Any committee members who have materials they would like hosted on the website can send them to Karen Quackenbush (kquackenbush@fchea.org) or Haboon Osmond (hosmond@fchea.org).

IV. Global Technical Regulations

Ian MacIntire

- GTR 13 Phrase 2 has been approved by RSP. It may be voted on by WP 29 at their June 2023 meeting.

V. Codes and Standards Organization Updates

Institute of Electrical and Electronics Engineers

Mark Siira

- IEEE 1547's revision process started on January 9th.
 - Karen Quackenbush is now a voting member of the IEEE 1547 committee, which means she'll be able to review the draft document, help develop it, and share any issues as they come up with WG members to facilitate contribution.

International Electrotechnical Commission IEC TC 105

Kelvin Hecht

- Joint Activity TC9 (Electrical Equipment for Railways) & TC105 (Fuel Cells)
 - CDV IEC 63341-3
 - *Railway applications - Rolling Stock - Part 3 Fuel Cells for Propulsion - Performance Test Methods*
 - Posted for comments in January. Comments due in April.

International Standards Organization ISO/TC 197

Karen Quackenbush

- The following three Working Groups are seeking experts to participate:
 - ISO/TC 197/WG 1 - "Liquid hydrogen - Land vehicles fuel tanks"
 - ISO/TC 197/SC 1/WG 1 - "Methodology for Determining the Greenhouse Gas Emissions Associated with the Production, Conditioning and Transport of Hydrogen to Consumption Gate"
 - ISO/TC 197/WG 35 - "Liquid Hydrogen Land Vehicle Fueling Protocol"
- If interested, please reach out to Thomas Deary by email at tdeary@cganet.com.
- ISO/TC 197/WG 21 "Gaseous hydrogen fueling station compressors" had a 3-day meeting from January 17th to January 20th near Philadelphia, Pennsylvania.
- There will be a series of hydrogen quality meetings on February 13th and 14th to discuss ISO/CD 14687, *Hydrogen fuel quality — Product specification*
- WG 24 and 5 will meet March 7th to March 10th

National Fire Protection Association NFPA 2

Chris LaFleur

- The 2023 edition of NFPA 2 is now available. The next edition, in the Fall 2025 revision cycle, is open for public input until January 4, 2024.

International Codes Council (ICC)

Gabriel Maser/Matt Sigler

- No updates.

Society of Automotive Engineers (SAE)

Mike Steele

Task Force	Document	*	Title	Date	Status
Interface	J2600_201510	S	Compressed Hydrogen Surface Vehicle Fueling Connection Devices	21-Oct-15	Being revised in conjunction with ISO 17268
Interface	J2601_202005	S	Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles	29-May-20	Being revised
Interface	J2601/2_201409	TIR	Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles	24-Sep-14	Discussing Stabilization of content
Interface	J2601/4	TIR	Ambient Temperature Refueling	21-Nov-16	Being developed. Anticipate voting on draft 1Q23.

Interface	J2601/5	TIR	MC Formula High Flow General (MCF-HF-G) <i>(title may change)</i>	1-Jul-22	Draft posted
Safety	J1766_201401	RP	Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing	10-Jan-14	Revised - Action required. Awaiting GTR 13 Phase 2
Safety	J2990/1_201606	RP	Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice	3-Jun-16	WIP - draft posted
Fuel Economy	J3202	RP	Recommended Practice for Measuring and Simulating Fuel Consumption and Range of Heavy Duty Fuel Cell Hybrid Road Vehicles Fueled by Compressed Gaseous Hydrogen	25-Apr-19	Being developed. No draft posted
Fuel Economy	J2572_201410	RP	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

CSA

Sara Marxen

Active Projects		
TSC	Designation/Title	Status
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). Working with the TC and TSC Chairs to disposition. Meeting will be planned with TSC to discuss.
HGV 5	HGV 5.1, Residential hydrogen fuelling appliances	This project is to develop a NEW standard for Residential fueling appliances. Project was kicked off in October. Content development continues.
HGV 2	HGV 2, Compressed hydrogen gas vehicle fuel containers	This project is a revision of an existing standard. The TSC is dispositioning comments and ballot to Technical Committee is being planned.
HGV 4.1	HGV 4.5, Priority and sequencing equipment for hydrogen vehicle fueling	This project is to develop a standard to REINSTATE an updated edition of a Priority and Sequencing standard. The document has been sent out for industry review and the TSC will be meeting soon to discuss the comments received.
HGV 4.3	HGV 4.3, Test methods for hydrogen fueling parameter evaluation	This project is a revision of an existing standard. A Task Force was put together to develop text to transition from a testing standard to a standard that can be used for certification. The TSC will proceed with this project and discuss lower boundary prior to publication.
B22734	Hydrogen generators using water electrolysis	The first edition draft is being finalized for publication. Contact Mark Duda (mark.duda@csagroup.org) with questions or for additional information.

B107	Enclosed Hydrogen Equipment	Work has begun on a new standard that will address safety requirements related to hydrogen equipment use inside an enclosure. Contact Mark Duda (mark.duda@csagroup.org) with questions or for additional information.
SPE-701	SPE-701 – Hydrogen fuel storage containers for aviation applications	The project is to develop a new document for requirements and recommendations for the material, design, manufacture, marking, and testing of serially produced, refillable hydrogen fuel storage containers intended only for the storage of compressed hydrogen gas or liquid hydrogen fuel for aviation applications. Contact Mark Duda (mark.duda@csagroup.org) with questions or for additional information.

Compressed Gas Association (CGA)

Rob Early

Updates from last month's report are highlighted.

Status of current and future publications:

Standard	Current edition	Status
CGA G-5, <i>Hydrogen</i>	8 th (2017)	Deadline to submit proposed changes for next edition was 7/7/2022. CGA has started working on resolving the proposed changes and will issue G-5 as an ANSI standard. For updates on the work item progress see https://portal.cganet.com/WorkItem/Details.aspx?id=22-019
CGA G-5.3, <i>Commodity specification for hydrogen</i>	7 th (2017)	Deadline to submit proposed changes for next edition is 5/1/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013
CGA G-5.4, <i>Standard for hydrogen piping systems at user locations</i>	6 th (2019)	Deadline to submit proposed changes for next edition is 12/22/2024. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54
CGA G-5.5, <i>Hydrogen vent systems</i>	3 rd (2014)	The 5 th edition has been published and can be found at https://portal.cganet.com/Publication/Details.aspx?id=G-5.5 Deadline to submit proposed changes for next edition is 03/04/2026.

Standard	Current edition	Status
		https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3 Heat radiation testing at Chart Industries in New Prague, MN date is ongoing. The goal is for the task force to review test results as soon as they are completed.
CGA G-5.6, <i>Hydrogen pipeline systems</i>	1 st (2005 – reaffirmed 2013)	Deadline to submit proposed changes for next edition is 8/1/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018
CGA H-3, <i>Standard for cryogenic hydrogen storage</i>	3 rd (2019)	Deadline to submit proposed changes for next edition was 12/1/2022. CGA has started the process of designating this as an ANSI standard. Please contact Rob Early at rearly@cganet.com if interested in joining the ANSI committee. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-036
CGA H-4, <i>Terminology associated with hydrogen fuel technologies</i>	3 rd (2020)	Deadline to submit proposed changes for next edition is 12/1/2024. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59
ANSI/CGA H-5, <i>Standard for bulk hydrogen supply systems</i>	3 rd (2020)	The deadline to submit proposed changes for the next edition is 2/26/2024. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010
CGA H-10, <i>Combustion safety for steam reformer operation</i>	2 nd (2018)	Deadline to submit proposed changes for next edition is 12/1/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038
CGA H-11, <i>Safe start-up and shutdown practices for steam reformers</i>	2 nd (2020)	Deadline to submit proposed changes for next edition is 8/11/2025. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30
CGA H-12, <i>Mechanical integrity of syngas outlet systems</i>	1 st (2016)	Deadline to submit proposed changes for next edition is 3/1/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016
CGA H-13, <i>Hydrogen pressure swing adsorber (PSA) mechanical integrity requirements</i>	1 st (2017)	Deadline to submit proposed changes for next edition is 11/12/2022. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027

Standard	Current edition	Status
CGA H-14, <i>HYCO plant gas leak detection and response practices</i>	1 st (2018)	Deadline to submit proposed changes for next edition is 12/8/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045
CGA H-15, <i>Safe catalyst handling in HYCO plants</i>	1 st (2020)	Deadline to submit proposed changes for next edition is 9/1/2025. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59
CGA H-17, <i>Small scale hydrogen production and delivery</i>	New publication not released yet	Task force has created the first draft that is out for proposed changes; the deadline to submit proposed changes is 12/15/2022. https://portal.cganet.com/WorkItem/Details.aspx?id=18-093
CGA P-28, <i>OSHA process safety management and EPA risk management plan guidance document for bulk liquid hydrogen supply systems</i>	5 th (2022)	Deadline to submit proposed changes for next edition is 08/01/2027 https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-49
CGA PS-31, <i>Position statement on cleanliness for proton exchange membranes hydrogen piping / components</i>	1 st (2007 – reaffirmed 2019)	Deadline to submit proposed changes for next edition is 6/12/2025. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16
CGA PS-33, <i>Position statement on the use of LPG or propane tanks as compressed hydrogen storage buffers</i>	1 st (2008 – reaffirmed 2020)	Deadline to submit proposed changes for next edition is 12/10/2026. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41
CGA PS-46, <i>Position statement on roofs over hydrogen storage systems</i>	1 st (2017)	Deadline to submit proposed changes for next edition is 3/6/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012
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 st (2016)	Deadline to submit proposed changes for next edition was 2/12/2021. Standard has been on hold until NFPA 2:2023 has been issued. Now that NFPA 2:2023 has been issued, work will restart on updates to PS-48 to point to NFPA 2 for hydrogen. For updates see the link below: https://portal.cganet.com/WorkItem/Details.aspx?id=21-062

Standard	Current edition	Status
PS-69, <i>Liquid Hydrogen Supply Systems Separation Distances</i>	1 st (2022)	CGA has developed a position statement pointing users to the new liquid hydrogen system distances that will be in NFPA 2:2023 and are not yet released. The position statement covers the process of requesting a variance to use the numbers from the NFPA 2 section of the NFPA web site. PS-69 is free for downloading at https://www.cganet.com/wp-content/uploads/PS-69_1.pdf
CGA work item 21-127, <i>Transfer and unloading of hydrogen at near-consumer use points</i>	New publication not released yet	Develop a 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 a 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. The task force held a meeting November 1 and is working on developing content for the publication.
CGA work item 22-107, <i>Hydrogen system best practices</i>	New publication not released yet	Develop a new standard to capture recommended best practices for handling hydrogen, filling containers, starting up systems, maintaining hydrogen systems, and similar topics to ensure safe practices for those new to the hydrogen space and to share best practices with those already experienced with hydrogen. Planned date for the first draft is March 2023. The task force has met twice to collect and organize best practices from members.

Upcoming events:

CGA is working a hydrogen seminar in November 2023 with support from CGA members and partners. More details and a call for papers will be out soon.

CGA has established a new hydrogen membership category for those interested in hydrogen activities and not the whole range of industrial gases. The new membership category has a lower fee structure. More details can be found at <https://www.cganet.com/cga-announces-formation-of-hydrogen-membership/>. Those who are interested are encouraged to review the material at the CGA web site and/or contact Rob Early at rearly@cganet.com.

CGA has launched <https://www.safehydrogenproject.org/> to grow awareness and access to standards and safety information. More details can be found at <https://www.cganet.com/compressed-gas-association-announces-landmark-hydrogen-initiative/>

American Society for Testing & Materials (ASTM)

Jennifer Hamilton

Standards	Status
D7606 Sampling of High Pressure Hydrogen	Work group needs to be started. Discuss heavy duty sampling and harmonization with ISO 19880-9.
D7634 Visualizing Particulate Sizes	Interlaboratory study in progress. If anyone knows of any labs performing this testing, let Christina Daniels (christina.daniels@cdfa.ca.gov) know.
D7651 Gravimetric Measurement of Particulate Concentration	Interlaboratory study required. Looking for a technical expert to lead this effort.
D7653 Gaseous Contaminants in Hydrogen Fuel by FTIR	Interlaboratory study results need to be balloted.
D7675 Total Hydrocarbons in Hydrogen by FID-THC	Interlaboratory study in progress. If anyone knows of any labs performing this testing, let Christina Daniels (christina.daniels@cdfa.ca.gov) know.
D7676 Screening Method for Organic Halides in Gaseous Fuels	Standard open for review.
D7892 Total Organic Halides, Total Non-Methane Hydrocarbons, and Formaldehyde by GC-MS	Interlaboratory study in progress. If anyone knows of any labs performing this testing, let Christina Daniels (christina.daniels@cdfa.ca.gov) know.
D7941/D7941M Hydrogen Purity Analysis Using CRDS	Interlaboratory study has completed. Results were balloted. Waiting on publication from ASTM.

American Society of Mechanical Engineers (ASME)

Ray Rahaman

- No updates.

VI. Discussion Topics

Facilitating Deployment

All

- No updates.

Center for Hydrogen Safety

Nick Barilo

- The CHS Europe conference will be held in Rotterdam, Netherlands, May 9-11, 2023. CHS is taking abstracts for presentation. See

<https://www.aiche.org/chs/conferences/european-hydrogen-safety-conference/2023> for more information and links for submitting an abstract.

- A questionnaire has been made available to assess the safety culture of organizations working with hydrogen. The questionnaire will help inform an international IEA activity and lead to the development of safety culture resources. Please consider taking the questionnaire at <https://h2tools.org/form/hydrogen-safety-culture-question>

Regulatory Matrix Review and Comment

Karen Quackenbush

- This Matrix is updated quarterly and keeps FCHEA members up-to-date in the development of codes, standards, and regulations.
- As of December 31, 2022:
<https://static1.squarespace.com/static/5668416ddc5cb4375e2a9ef8/t/63b7029b035a2d2b4a51609b/1672938139529/FCHEA+Regulatory+Matrix+Markup+December+31+2022.pdf>
- Please direct any updates, questions, or comments to Karen Quackenbush via email at kquackenbush@fchea.org or Haboon Osmond at hosmond@fchea.org.

Permitting and Installation of Hydrogen Fueling Stations

California Station Implementation

Jennifer Hamilton

- There will be a workshop at next week's Hydrogen and Fuel Cell Seminar on Tuesday morning: "From Code Development to Station Deployment"

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

- They continue to perform hydrogen quality sampling and analysis testing throughout the state. To date, they have had no failures of any open retail stations according to the SAE J2719 specification.
- They are still in the process of procuring a new DMS testing device.
- Each year DMS posts a current version of weights and measure laws and regulations on their website: <https://www.cdfa.ca.gov/dms/publications.html>.
- There is a new RSA database for service agency registration and agent licensing through the RSA Portal: <https://www.cdfa.ca.gov/dms/rsaportal/>

Legal Metrology Standards Hydrogen Fuel Quality and Measurement

Juana Williams

(1) U.S. Weights and Measures Standards Development Process

The final 2023 Interim Meeting Reports (NCWM Publication 16) on the status and points considered by the NCWM Committees that addressed the proposals to modify hydrogen gas commercial measurement standards on January 8-11, 2023 will be published in late March 2023. Proposals assigned a "Voting" status will be up for adoption at the July 30 - August 5, 2023 108th NCWM Annual Meeting in Norfolk, VA. A preliminary report on those proposals is listed in the table below:

NCWM Committee	Committee Agenda Item Status, No., Title	Submitter's Stated Purpose	Submitter's Proposed Modification to the Code in the January 2023 NCWM Interim Meeting Agenda	<u>Preliminary NCWM Agenda Item Status (Final Interim Rpt. late March 2023)</u>
Specifications and Tolerances (S&T)	<p>Developing HGM-23.1</p> <p>UR.3.8. Safety Requirement</p>	Add safety requirement for hydrogen gas measuring devices.	<p>Add a new user requirement paragraph UR3.8. to read:</p> <p><u>UR 3.8 Safety Requirement –All hydrogen gas-measuring devices subject to this code shall maintain verification of testing demonstrating conformance with the latest version of SAE J2601 Fuel Protocols for Light Duty Gaseous Hydrogen Surface Vehicles, as determined by the latest version of ANSI/CSA HGV 4.3 “Test Methods for Hydrogen Fueling Parameter Evaluation. (Nonretroactive as of January 1, 10XX)</u></p>	<p>NIST Handbook 44 includes legal metrology requirements and does not include safety requirements. California has indicated SAE J2601 is more than a safety requirement because it is also a performance requirement applied to its public station. The submitter has indicated the dispenser’s fueling protocol can harm test equipment. The Submitter acknowledges that handbooks do not address safety and requested informational status and that the proposal undergo further development.</p> <p>On review of these comments the Committee assigned the proposal “Developing” status.</p>
Laws and Regulations (L&R)	<p>Developing FLR-23.3</p> <p>Section 2.20. Hydrogen Fuel</p>	Add equivalent hydrogen quality standard, ISO 14687 to 2.20.	<p>Modify Section 2 Standard Specification 2.20 as follows:</p> <p>2.20. Hydrogen Fuel. – Shall meet the latest version of SAE J2719, “Hydrogen Fuel Quality for Fuel Cell Vehicles.” <u>or ISO 14687 “Hydrogen fuel quality — Product specification”.</u></p>	<p>Recommended for further development by the submitter of the proposal.</p> <p>Proposal was further modified to specify it is the “Grade D” part of ISO 14687 being proposed for recognition.</p> <p>On review of these comments the Committee</p>

NCWM Committee	Committee Agenda Item Status, No., Title	Submitter's Stated Purpose	Submitter's Proposed Modification to the Code in the January 2023 NCWM Interim Meeting Agenda	<u>Preliminary NCWM Agenda Item Status (Final Interim Rpt. late March 2023)</u>
			(Added 2012) <u>(Amended 20XX)</u>	assigned the proposal "Developing" status.
L&R	Voting FLR-23.4 Section 4.3. Dispenser Filters	Add filter requirements for commercial hydrogen dispensers	Modify Section 4.3.1 Engine Fuel Dispensers Filters to include a new subparagraph (c) as follows: 4.3. Dispenser Filters 4.3.1 Engine Fuel Dispensers <u>(c) All gaseous hydrogen dispensers shall have a 5 micron or smaller nominal pore-sized filter, and a filter to protect the vehicle from liquid contamination.</u> (Amended 2014 <u>and 20XX</u>)	Recommended for adoption in July 2023 <i>pending</i> further modification of the proposal to include specifications for liquid filters. The NCWM Fuels and Lubricants Subcommittee is seeking input from stakeholders as a result of hearing there is confusion about the proposal in industry and among State Directors. The level of maintenance has also come into question.

The NCWM Specifications and Tolerances and Laws and Regulations Committees addressing the proposals for including a hydrogen dispenser fueling safety protocol into NIST Handbook (HB) 44 and recognizing a second hydrogen fuel quality standard and filter requirements (i.e., for particulates & liquids) in NIST HB 130 have requested further input of these agenda items. The NCWM S&T and L&R Committees can be contacted through the NCWM website available at: info@ncwm.com.

Comments on these proposals are encouraged and can be provided to the chairperson or in-person during open hearings in the May 2023 regional weights and measures associations meetings up through the July 30 - August 5, 2023 NCWM Annual Meeting in Norfolk, VA. Committee contact and meeting information for upcoming events in the weights and measures community are listed below:

2023 NEWMA Annual Meeting (TBD): The latest information on NEWMA is on the NCWM website available at: <https://newma.us/Specifications-and-Tolerances-Committee> or <https://newma.us/Laws-and-Regulations-Committee>.

The May 15-18, 2023 CWMA Annual Meeting in Grand Rapids, MI: The latest information on CWMA is on the NCWM website available at: (<https://cwma.net/event-4911389>) and CWMA committees at: <https://cwma.net/page-1075182> (S&T Cmte.) or <https://cwma.net/page-1075179> (L&R Cmte.).

If you have questions or comments regarding the USNWG or NIST OWM's work on hydrogen projects in the areas of device standards, test procedures, or hydrogen fuel specifications, please contact Juana Williams by email at: juana.williams@nist.gov or by telephone at (301) 975-3989.

VII. Open Discussion & Other Issues

- None.

VIII. Next Meeting – Wednesday, March 1st, at 2:00 PM US Eastern Time