



## Regulatory Affairs Matrix

June 30, 2023 Version

FCHEA’s Regulatory Affairs Matrix is a tool designed to report progress in the development of codes, standards, and regulations of interest to our members. Redline/strike-out markings depict changes over the past quarter. In addition to status updates on each document, position of items within the matrix provides information regarding application, activity level, and importance of the effort to commercialization.

The matrix is divided into clusters based upon application, such as infrastructure, portable power, stationary, etc. Applications are depicted in the far-right column. Level of activity is represented vertically, with items with the highest level of activity appearing towards the top of the matrix. Position within the columns represent the importance of the effort to industry commercialization timeframes.

The matrix is updated on a quarterly basis and reviewed with members during our technical working group meetings. Feedback is used to evaluate importance to commercialization and identify new efforts for future tracking.

For questions or updates regarding this matrix, please contact Karen Quackenbush by email at [kquackenbush@fchea.org](mailto:kquackenbush@fchea.org).

Significance to Commercialization  
 More Critical ←  
*Highest Effort*

A. Essential To or Enables Commercialization	B. Important to Commercialization	C. Supports Commercialization	
	<b>ISO 19880-2: Gaseous hydrogen filling station dispensers</b> Comments from DIS are being resolved. Next stage is FDIS.  <b>ISO 17268 Gaseous Hydrogen Land Vehicle Refuelling Connection Devices: ISO/TC 197</b>	<b>NFPA 55: Compressed Gases and Cryogenic Fluids Code: 2023</b> edition has been published. The 2026 edition is now open for input. o A task group is working to resolve any hydrogen overlap between NFPA 2 and	<b>INFRASTRUCTURE</b>  <b>Transportation WG (all)</b>

agreed to create a multipart series, based ISO/AWI 17268; to revise ISO/AWI 17268 “Gaseous hydrogen land vehicle refuelling connection devices” as ISO/AWI 17268-1 for a 24-month project duration. New title is proposed to be Gaseous Hydrogen land vehicle refuelling connection devices – Part 1: Flow capacities up to and including 120 g/s. This project will be developed by WG 5 under Vienna agreement. Work is now underway.

ISO/TC 197 invited United States to formally submit an NP to develop ISO/AWI 17268-2 “Gaseous hydrogen – Land vehicle refuelling connection devices” for a 36 month project duration. New title is proposed to be Gaseous Hydrogen land vehicle refuelling connection devices – Part 2: Flow capacities greater than 120 g/s. This project will be developed by WG 5, with Livio Gambone as project leader, under Vienna agreement.

**ISO/AWI 17268-3 Gaseous hydrogen land vehicle refuelling connection devices — Part 3: Cryo-compressed hydrogen gas:** Ballot to create the project has passed. Work is beginning.

**ISO 19880-4: Gaseous Hydrogen Fueling Stations – Part 4 – Compressors:** New Schedule to be confirmed once CD is circulated and project is officially restarted. ~~Working draft to be revised based on input received, and a meeting is scheduled in conjunction with the TC 197 plenary in December 2022.~~

NFPA 55. NFPA 2 will own all of the scope for hydrogen, so instead of extracting material from NFPA 55, it will be deleted from NFPA 55 and moved to NFPA 2.

**ISO CD 19885 -1, -2, -3 Gaseous hydrogen – Fuelling protocols for hydrogen-fuelled vehicles – Parts 1, 2 and 3**

Multiset of documents consisting of three key parts:

1. Design and development process for fueling protocols  
A standard design and development process to ensure that work is conducted in a transparent manner to improve understanding and facilitate acceptance and implementation of a fueling protocol in dispensing systems. Completed CD ballot. In editing for DIS phase.

2. Definition of communications between the vehicle and dispenser control systems  
Provide basic information needed by the developer of fueling protocols to define the methodology and data to be transmitted between the vehicle and dispenser control system. Work is underway.

3. High Flow Hydrogen Fueling Protocols for Heavy Duty Road Vehicles  
A universal and versatile HF (above 60 g/s) hydrogen fuelling protocol for HD applications including buses and trucks with primary focus on H70 ~~Heavy-Duty High-Flow~~ road vehicles and systems with large

**Distribution WG (NFPA 55, CSA B107)**

**Commercial WG (NFPA 55, CSA B107)**

	<p><b>CSA B107 – Enclosed Hydrogen Equipment.</b> 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.</p>	<p>hydrogen capacity at gaseous hydrogen fueling stations.</p> <p>Task 2 continues to work. Task 3 is on hold until completion of 1 &amp; 2.</p>	
	<p><b>ISO 19880-8- Gaseous hydrogen -- Fueling stations -- Part 8: Hydrogen quality control.</b> <del>Restarted the revision work to be along with ISO 14687 revision after amendment has been completed. CD comment period closed. Awaiting results.</del></p> <p><b>ISO/AWI 14687: Hydrogen fuel quality Product specification</b> – Update in progress. <del>Out for</del> CD comment <u>period closed. Awaiting results.</u></p> <p><b>ISO 19880-9, Gaseous hydrogen — Fuelling stations — Part 9: Sampling for fuel quality analysis</b> –Work is underway. The seed document is based on the work done in ISO TC 197 WG 24 and ISO 19880 1 Annex K. <del>Completed CD ballot. Currently in editing for DIS phase. DIS has been registered, and will be circulated for comments and voting shortly.</del></p>	<p><b>ISO/NP TS 19870</b> has been approved. Methodology for Determining the Greenhouse Gas Emissions Associated with the Production, Conditioning and Transport of Hydrogen to Consumption Gate. The project is located under SC 1 and will be conducted by SC 1 WG 1. Project duration is 18 months. Convenor is Gabriel Lassery of Brazil. <del>CD</del> <u>Study</u> comment period is closing.</p> <p><b>ISO 13985:</b> Liquid hydrogen — Land vehicle fuel tanks: A new revisions has been approved. Seeking interested parties to join WG 1.</p>	<p><b>FUELS</b></p> <p><b>Transportation WG (All)</b></p> <p><b>Production WG (ISO/AWI 14687; ISO/NP TS 19870)</b></p>
	<p><b>IEC 62282-6-101 Micro Fuel Cell Power Systems – Safety- General Requirements</b> The following documents recently completed CIB processing: IEC 62282-6-101: Micro fuel cell power systems – Safety – General requirements IEC 62282-6-106 Micro fuel cell power systems – Safety – Indirect Class 8 (corrosive) compounds</p>	<p><b>IEC 62282-6-300 Ed.2 - Fuel Cartridges</b> – extended publication stability date to 2024.</p> <p><b>IEC 62282-6-200 Ed.3 - Micro Fuel Cells – Performance</b> – stability date is now 2024.</p> <p><b>IEC 62282-6-401: Fuel cell technologies – Part 6-401: Micro fuel cell power systems –</b></p>	<p><b>MICRO</b></p> <p><b>Power WG (IEC docs)</b> <b>Transportation WG (all)</b></p>

	<p>IEC 62282-6-107 Micro fuel cell power systems – Safety – Indirect water-reactive (Division 4.3) compounds. Documents passed CDV circulation. <u><a href="#">FDIS to be submitted in July 2023. DIS stage has begun.</a></u></p> <p><b>Drones/UAS</b> Commercial drones must be registered with the FAA. Non-commercial drones (hobby) no longer need to be registered with the FAA, but rules are in flux.</p> <p>Further FAA guidance for UAS: <a href="https://www.faa.gov/uas/resources/uas_regulations_policy/">https://www.faa.gov/uas/resources/uas_regulations_policy/</a></p> <p>Rules for UAS are also being developed by ISO/TC 20 SC 16. Although there are no rules currently under development specific to hydrogen or fuel cells, this SC is very active developing and revising rules that would apply to such systems. <a href="https://www.iso.org/committee/5336224.html">https://www.iso.org/committee/5336224.html</a>.</p>	<p><b>Power, data interchangeability and performance test methods for laptop computers:</b> <del>Committee Draft (CD) recently failed. Awaiting report and seeking experts from North American with interest in this activity. Addressing comments from CDV.</del></p> <p><del><b>IEC 62282-6-400: Micro fuel cell power systems – Power and data interchangeability – to be opened for revision in 2022.</b></del></p> <p><b>Airworthiness certification guidelines:</b> To fly a UAV above 55lbs in FAA airspace requires three types of additional certification. These include airworthiness certification of the aircraft. Guidelines exist for this but they are designed for manned airplanes and rotorcraft. Monitor for hydrogen and/or fuel cell applicability. See CFR, Title 14: Aeronautics and Space, PART 21— CERTIFICATION PROCEDURES FOR PRODUCTS AND ARTICLES</p> <p><b>ASTM WK60937: New Specification for Design of Fuel Cells for Use in Unmanned Aircraft Systems (UAS)</b> under development. Negative vote in ballot requires addressing and reballoting.</p>	
<p><b>NFPA 2: Hydrogen Technologies Code:</b> 2023 edition has been published and is available at <a href="https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=2">https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=2</a>.</p>	<p><b>ASME B31.12 Hydrogen Piping and Pipelines</b>, will be due for its next cycle publication in 2022. B31.12 is in the final balloting process; the document may be out for public review within the next two months.</p>	<p><b>IEC TS 62282-7-2</b> Fuel cell technologies - Part 7-1: Test methods - Single cell performance tests for polymer electrolyte fuel cells (PEFC) was published in 2017. The proposal to transition IEC 62282-7-1 Ed. 2 into a standard had not</p>	<p><b>GENERAL</b></p> <p><b>Distribution WG (all)</b></p> <p><b>All WGs (NFPA 2)</b></p>

Several Technical Interim Amendments have been balloted. The 2026 edition is open for public input until January 4, 2024.

B31.12 European International Working Group is in the works.

reached consensus. The main point of concern is that the test methods to test PEM cells are still evolving and continues to be debated. IEC TC 105 decided to start the revision of IEC TS 62282-7-1 Ed. 2 in 2023 and that the next edition shall be a TS. A CD wais expected in June 2023.

Significance to Commercialization  
More Critical ←  
*Moderate Effort*

A. Essential To or Enables Commercialization	B. Important to Commercialization	C. Supports Commercialization	
	<p><b>International Maritime Organization (IMO) SUB-COMMITTEE ON CARRIAGE OF CARGOES AND CONTAINERS:</b> Developing Requirements for use of low flashpoint fuels on marine vessels – including provisions for fuel cells, bulk liquid hydrogen storage, and other fuels. <a href="http://www.imo.org/en/OurWork/Safety/Pages/Default.aspx">http://www.imo.org/en/OurWork/Safety/Pages/Default.aspx</a></p> <p><b>SAE AS6679 - Liquid Hydrogen Storage for Aviation:</b> This document defines the technical guidelines for the safe integration, operation and maintenance, and for certification of Liquid Hydrogen Storage Systems (LHSS) in aircraft. This document also defines guidelines for safe refuelling operation of hydrogen for aircraft. It is currently under revision. Hydrogen experts are sought.</p> <p><b>SAE AS7373 - Gaseous Hydrogen Storage for General Aviation</b> - This document defines the technical guidelines for the safe integration, operation and maintenance, and for certification of Gaseous Hydrogen Storage Systems (GHSS) in general aviation. This document also defines guidelines for safe refuelling operation of gaseous</p>	<p><b>IEC 62282-8-301 Ed. 1: Energy storage systems using fuel cell modules in reverse mode – Performance of power-to methane energy systems</b> – <del>Revision currently in publication.</del> <u>Published May 2023. To be removed in the next revision of this matrix.</u></p> <p><b>ASME BPV:</b> Section VIII committee opened a project to explore options for proposed changes to mandate requirements for cell stack assemblies. <u>A draft Code Case is under development to make the changes available in advance of becoming mandatory.</u> FCHEA is engaging to evaluate the premise and other options for addressing any issues.</p> <p><b>ISO/CD TR 17326: Fuel cell road vehicles — Cold start performances under sub-zero temperature — Vehicles fuelled with compressed hydrogen</b> – approved for DIS registration.</p> <p><u><a href="#">CSA SPE-701 – Hydrogen fuel storage containers for aviation applications - New project.</a></u></p>	<p><b>TRANSPORTATION</b></p> <p><b>Transportation WG (all except IEC, ASME and CGA)</b></p> <p><b>Power WG (IEC, ASME)</b></p> <p><b>Distribution WG (CGA)</b></p>

	hydrogen for aircraft. It is currently under revision. Hydrogen experts are sought.		
<p><b>Global Technical Regulations (GTRs) for Vehicles:</b> GTR for H2 and FC vehicles Phase II underway  <a href="http://www.unece.org/fileadmin/DAM/trans/doc/2017/wp29/ECE-TRANS-WP29-2017-056e.pdf">http://www.unece.org/fileadmin/DAM/trans/doc/2017/wp29/ECE-TRANS-WP29-2017-056e.pdf</a></p> <p>GTR 13 Phase 2 was approved by GRSP. It is expected that WP 29 will vote on establishing the Phase 2 document in their June 2023 meeting. <u>Awaiting results.</u></p>	<p><b>ISO 19887 Gaseous Hydrogen - Fuel system components for hydrogen fuelled vehicles</b> has been established as a joint working group (JWG 30) between ISO/TC 197 and ISO/TC 22/SC 41 under the responsibility of ISO/TC 197. Work is ongoing. WD developed using CSA HGV 3.1 as seed document.</p> <p>WD also harmonizing with UN GTR No. 13, Phase 2.  <u>CD comment period is closing. The document has been registered as a Draft International Standard.</u></p> <p><b>ISO/DIS 23828 fuel cell road vehicles -energy consumption measurement – compressed hydrogen</b> – published by ISO TC 22. To be removed in next update of the matrix.</p>	<p><b>SAE J2600: Compressed Hydrogen Surface Vehicle Fueling Connection Devices</b> - Being revised in conjunction with ISO 17268.</p> <p><b>SAE J2572: Recommended Practice for Measuring Fuel Consumption and Range of Fuel Cell and Hybrid Fuel Cell Vehicles Fuelled by Compressed Gaseous Hydrogen</b> expected to go for affirmation ballot of existing content.</p>	<p><b>VEHICLES</b></p> <p><b>Transportation WG (all)</b></p>
<p><b>NFPA 855: Standard for the Installation of Stationary Energy Storage Systems:</b> 2023 edition <a href="#">has</a> been published. 2026 edition is open for public input until June 1, 2023.</p> <p><b>SAE J2601: Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles</b> – open for revision</p> <p><b>SAE J2601/2: Fueling Protocol for Gaseous Hydrogen Powered Heavy</b></p>	<p><b>ICC International Fire Code:</b> ICC currently has 456 references of hydrogen gas in ICC codes and is engaging with industry to focus on keeping codes and standards up-to-date and addressing any code gaps regarding hydrogen technology. Work has in advance of the next revision cycles for the IFGC, IFC, and potentially others. An ICC Hydrogen Working Group has been established. <u>The ICC The Hydrogen Fuel Gas WG is meeting virtually every two weeks to identify code change proposals for hydrogen use, and is currently focusing on facilitating the use of hydrogen blends in buildings.</u></p>	<p><b>ISO WG 21: Gaseous hydrogen fueling station compressors:</b> Work continues to develop a CD.</p> <p><b>ISO 19880-5 WG 22 Gaseous hydrogen fueling stations - Dispenser hoses and hose assemblies</b> Ballot to proactively cancel the project is closing. Anticipated to restart the project when the CD is ready for submission, expected <u>soon in late 2023.</u></p>	<p><b>INFRASTRUCTURE</b></p> <p><b>Power WG (NFPA 855, CGA G-5.5, ICC, ISO 22734, FC 4, UL)</b></p> <p><b>Production WG (all CGA, ISO 22734, FC 4)</b></p>

**Duty Vehicles** – ~~Action required. SAE is considering~~Reopened to stabilize documentation.

**U.S. Weights and Measures Standards** – 2023 Development Process has begun. All four U.S. regional weights and measures associations met this fall and considered three proposals for commercial hydrogen measurement standards. The proposals will be moved forward to the national level and appeared on technical committee agendas. At the conclusion of the January 8-11, 2023 NCWM Interim Meeting deliberations and open hearings to be held in Savannah, GA (<https://www.ncwm.com/events-detail/2023-interim-GA>) each proposal will be was assigned a status. Agenda items intended for adoption during the July 2023 108th NCWM Annual Meeting must have achieved “V” voting status in January 2023. The NCWM S&T Committee will address a single proposal to modify the 2023 edition of NIST Handbook 44 Specifications, Tolerances, and Other Technical Requirement for Weighing and Measuring Devices, Section 3.39. The L&R Committee will address two separate proposals to modify the 2023 edition of NIST Handbook 130 Uniform Laws and Regulations in the Areas of Legal Metrology and Fuel Quality,

**CGA G-5: Hydrogen:** - CGA has started the process of designating this as an ANSI standard.

**CGA G-5.5 – Hydrogen Vent Systems:** The 5th edition has been published and can be found at <https://portal.cganet.com/Publication/Details.aspx?id=G-5.5>. 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.

Deadline to submit proposed changes for next edition is 03/04/2026.  
[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=26-3](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3)

**CGA G-5.4, Standard for hydrogen piping systems at user locations** - Deadline to submit proposed changes for next edition is 12/22/2024.  
[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=24-54](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54)

**CGA G-5.6, Hydrogen pipeline systems:** Deadline to submit proposed changes for next edition is 8/1/2022.  
[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=19-018](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018)

**CGA work item 21-127, Transfer and unloading of hydrogen at near-consumer use points** – Work initiated to develop a new standard to update traditional hydrogen delivery practices for

**ISO 19880-6 WG 23: Gaseous hydrogen fueling station fittings.** WG 23 now working to resolve CD comments. Project ~~will be was~~ administratively cancelled on May 1, with an expectation to ballot restarting the work when the DIS is ready to be registered, expected in late 2023.

~~SAE TIR J2601/3: Fueling Protocols for Gaseous Hydrogen Powered Industrial Trucks (forklifts) – Recently reaffirmed. To be removed in next edition of the matrix.~~

**SAE J2601/4: Ambient Temperature Fixed Orifice Fueling** – establishes the protocol and process limits for hydrogen fueling of light duty vehicles when the fuel delivery temperature is not pre-cooled, so called “ambient fueling” designated by Table 1 of SAE J2601-2014. Under development. Draft expected soon.

**SAE TIR J2601/5: HD Fueling using the MC Method** (title may change): Under development. Draft posted.

~~CGA H-2, Guideline for classification and labeling of hydrogen storage systems with hydrogen absorbed in reversible metal hydrides: Deadline to submit proposed~~

**Commercial WG (ICC, all CGA, ISO 22734, FC 4)**

**Transportation WG (ICC, All SAE, CGA, and ISO, except ISO 22734, US Weights and Measures)**



Section IV.G. All three proposals under consideration are available in entirety (submitter, justification, links to associated materials, etc.) on the NCWM website available at: [www.NCWM.com](http://www.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.).

industrial users to improve practices for retail applications.

**ISO 22734-1: Hydrogen generators using water electrolysis Test protocols and safety**

**Requirements** - Revision of ISO 22734:2019 in order to establish any additional safety requirements and test methods needed for:

- i. operation of water electrolysis systems coupled with the electricity distribution grid and/or fluctuating and intermittent renewable energy sources (RES) in a dynamic mode.
- ii. safety requirements for venting of oxygen
- iii. requirements for scale up including electrolyser systems installed into buildings
- iv. other areas, such as
  - a. including learnings from other enclosed systems (e.g. HRS) and pre-normative research projects;
  - b. safety integrated systems;
  - c. power electronics for connection to the grid; and
  - d. specific requirements when incorporated into specific applications, e.g. as part of HRS, or hydrogen grid injection system
  - e. (additionally) input from other stakeholders, e.g. IEC/TC 31.

**ISO 19880-7: Gaseous hydrogen**

**Fueling stations O rings** - The new IS shall be harmonized with existing ISO 3601 family Fluid Power Systems O rings. List of types and quality

~~changes for next edition was 6/4/2022.Update needed.~~

~~FC 4 \* C22.2 No 22734: Published as CSA/ANSI 22734—binational adoption of ISO 22734—Hydrogen generators using water electrolysis—Industrial, commercial, and residential applications. To be removed in next edition of matrix.~~

~~Contact Mark Duda (mark.duda@csagroup.org) with questions or for additional information.~~

~~UL 1741: Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources: Edition 3 published recently. To be removed in next edition of the matrix.~~

	<p>acceptance criteria of O rings, back up rings, which are described in ISO 3601 1, 3, 4, are considered to be referenced in the new IS. Special features of groove design and materials for high pressure hydrogen seal are to be discussed in the new IS.</p> <p><del>Under development.</del><a href="#">CD comment period closing.</a></p>		
	<p><b>CGA work item 21-128, Noise from hydrogen venting and hydrogen systems operations</b> – Work is underway to 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.</p> <p><b>CGA work item 22-107, Hydrogen system best practices</b> - Developing 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. <a href="#">The task force has completed the first draft, which is now going through staff review and then membership review. The task force will meet to resolve comments from staff review. The first draft is expected soon.</a></p>	<p><b>ISO TR 15916: <i>Basic considerations for the safety of hydrogen systems</i></b>, is open for revision under WG 29. Comments from the CD circulation have been addressed. WG 29 was polled for a recommendation on whether to keep the document a Technical Report (Informative) by revising to reflect new ISO guidance for Technical Reports, or to move the document to become a Technical Specification (Normative) or International Standard (Normative). <del>Next step is TC ballot.</del><a href="#">Awaiting result of TC ballot.</a></p> <p><b>PWI 105-1: Group title: WG 105 General Safety Standard</b> – new activity starting.</p> <p><b><a href="#">CGA work item 22-116, Hydrogen separation distances</a></b> – New activity. CGA is developing a globally harmonized standard on the methodology for developing separation distances between hydrogen systems and exposures. The standard will provide details on mitigation techniques for reducing required distances, particularly in near-consumer locations (such as vehicular fueling) where room is limited. The goal is to have the</p>	<p><b>GENERAL</b></p> <p><b>All WGs (all)</b></p>

		<p><a href="#">standard released in 2023. The task force is now developing an outline for separation distances development.</a></p>	
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	<p><b>IEC 62282-3-300 Stationary Fuel Cells – Installation</b> - Extension of stability date to 2025 To be removed in next edition of the matrix..</p> <p><b>IEC 62282-3-100 Stationary fuel cell power systems – Safety</b> 3rd edition revision underway. <a href="#">An in-person meeting is scheduled in Frankfurt Germany September 26-28. CD target July 2023.</a></p> <p><b>IEC 62282-8-301: Fuel cell Technologies – Part 8-301 Energy storage systems using fuel cell modules in reverse mode – Power to methane energy systems based on solid oxide cell including reversible operation - Performance test methods</b> Approved for publication. To be removed in next edition of the matrix.</p> <p><b>IEC 62282-2-400 ED1:</b> Fuel cell technologies - Part 2-400: Fuel cell modules - Calculation of Rated Power and Power Density of a PEM stack and PEM module – new activity underway.</p> <p><b>IEC 62282-3-202 ED1:</b> Fuel cell technologies - Part 3-202: Stationary fuel cell power systems - Performance test methods for small fuel cell power systems that can be complemented with a</p>	<ul style="list-style-type: none"> <li>• <b>ISO/DIS 19884, Gaseous hydrogen – Cylinders and tubes for stationary storage:</b> ISO/TC 197 agreed to create a multi-part document developed by WG 15 "Cylinders and tubes for stationary storage" with Proposed Convenor John Eihusen, in order to:             <ul style="list-style-type: none"> <li>• renumber ISO 19884 to be ISO 19884-1 "Gaseous Hydrogen Cylinders and tubes for stationary storage – Part1: General Requirements"; CD <del>comment period closing failed</del>. <a href="#">Project has been cancelled, although it may be restarted at some point in the future.</a></li> <li>• create ISO/TR 19884-2 "Gaseous Hydrogen Cylinders and tubes for stationary storage – Part 2: Material test data of class A materials (steels and aluminum alloys) compatible to hydrogen service" for a 24-month project duration, with Project Leader Prof. Nobuhiro Yoshikawa;</li> <li>• create ISO/TR 19884-3 "Gaseous Hydrogen Cylinders and</li> </ul> </li> </ul>	<p><b>STATIONARY Power WG (all)</b></p> <p><b>Distribution WG (ISO/DIS 19884)</b></p>
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supplementary heat generator for multiple units operation by an energy management system. Underway. In CD stage.

~~CGA RA-248 regarding Canadian Transportation of Dangerous Goods (TDG) and international harmonization. Completed – to be removed in next edition of the matrix.~~

tubes for stationary storage – Pressure cycle test data to demonstrate shallow pressure cycle estimation methods" for a 24-month project duration, with Project Leader Prof. Nobuhiro Yoshikawa.

**ASME PTC 50, the Fuel Cell Power System Performance Testing Code**, began revision work. This effort is expected to help standardize performance reporting across the industry.

**IEC 62282-3-200: Part 3-200: Stationary fuel cell power systems - Performance test methods** – Revision underway. CD ~~posted~~[comments being addressed](#).

**IEC 62282-8-201 Ed.2 Fuel cell technologies - Part 8-201: Energy storage systems using fuel cell modules in reverse mode - Test procedures for the performance of power-to-power systems** – Revision underway. CD posted. [Awaiting results](#).

**IEC 62282-9-101: Evaluation methodology for the environmental performance of fuel cell power systems based on life cycle thinking - Streamlined life-cycle considered environmental performance characterization of stationary fuel cell combined heat and power systems for residential applications** – Revision to start soon.

		<p><b>IEC 62932-2-2: Flow battery energy systems for stationary applications - Part 2-2: Safety Requirements</b> – planning next edition.</p>	
	<p><b>IEC 62282-5-100:2018: Portable Fuel Cell Appliances – Safety:</b> Published. Not yet adopted in U.S. Seeking interest. IEC to open document for revision in 2023.</p>		<p><b>PORTABLE</b> Power WG (all)</p>

Significance to Commercialization

More Critical ←

*Lowest Effort*

A. Essential To or Enables Commercialization	B. Important to Commercialization	C. Supports Commercialization	
	<p><b>SAE AIR 8466, Hydrogen Fueling of Aircraft, in both gaseous and liquid form:</b> 2023 version of the H2-Aero Whitepaper from the vertical flight society to be used as a basis.</p> <p>SAE H2-Aero Whitepaper download (VFS Website-public):  <a href="https://vtol.org/download.cfm?downloadfile=FDA0AB2D-B06C-15F1-5AD5823F326F5CDE&amp;typename=dmFile&amp;fieldname=filename">https://vtol.org/download.cfm?downloadfile=FDA0AB2D-B06C-15F1-5AD5823F326F5CDE&amp;typename=dmFile&amp;fieldname=filename</a>.</p>	<p><b>IEC 63341-3 ED1. Railway applications - Rolling stock - Part 3: Fuel cell systems for propulsion - Performance requirements and test methods.</b> Assigned to JWG 51. <del>Preparing CD for circulation.</del> <a href="#">Addressing CD comments.</a></p> <p><a href="#">SAE J2990/1_201606: Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice – Work Item Proposal posted.</a></p>	<p><b>TRANSPORTATION</b></p> <p>Transportation WG (all)</p>
	<p><b>SAE J1766: Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing</b> – revised. Action needed. Awaiting GTR 13 Phase 2</p> <p><del>IEC 62282-4-102 Ed.2: Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) – Fuel cell power systems for electrically powered industrial trucks – Performance test methods</del> Published. To be removed in next edition of the matrix.</p>	<p><b>SAE 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</b> – underway.</p> <p><del>CSA HGV 3.1 – Onboard vehicle components for hydrogen gas vehicles</del> 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). Published. To be removed in next edition of the matrix.</p>	<p><b>VEHICLES</b></p> <p>Transportation WG (all)</p>

	<p><b>ISO 19881: Gaseous hydrogen – Land vehicle fuel containers</b> and <b>ISO 19882: Gaseous hydrogen – Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers</b> (AWI 19981 and AWI 19882) have been opened for revision. These had been previously put on hold. Activities will focus on incorporating Type 3 and conformable container designs, and working on harmonization with UN GTR 13 Phase II. The WG is working towards consensus on acceptable materials and a suitable ground storage standard that can be used globally. Work is underway.</p>	<p><b>CSA HGV 2, Compressed hydrogen gas vehicle fuel containers</b> - This project is a revision of an existing standard. Content development meetings have concluded and the public review period closed July 11. The TSC is dispositioning comments and ballot to Technical Committee is being planned.</p> <p><b>SAE J2990/1: Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice – Revision initiated.</b> WIP draft posted.</p>	
	<p><b>OSHA Requirements for Hydrogen</b></p> <p>FCHEA HCTF new activity - At the present time, 29 CFR has a long list of requirements for hydrogen systems and also provides guidance for hydrogen pressure vessels and associated equipment that is long out of date. These requirements can be seen here:  <a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9749">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9749</a></p> <p>It is recommended that these requirements be replaced by the up-to-date requirements of NFPA 2.</p> <p><b>CGA H-14, HYCO plant gas leak detection and response practices:</b> 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></p>	<p><b>CGA H-3 cryogenic hydrogen storage:</b> <u>The ANS committee has resolved all the proposed changes, including a request to add flow arrows to the flow diagrams. The publication is now moving through the ANSI review process. For updates use the following link: <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> 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 <a href="mailto:rearly@cganet.com">rearly@cganet.com</a> if interested in joining the ANSI committee. <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></u></p> <p><b>CGA H-5 standard for bulk storage systems</b>  CGA has started working on resolving the proposed changes and will issue G-5 as an ANSI standard. For updates on the work item</p>	<p><b>INFRASTRUCTURE</b></p> <p><b>All WGs (OSHA)</b></p> <p><b>Transportation WG (All CSA, NIST, ASTM)</b></p> <p><b>Production WG (All CGA)</b></p> <p><b>Distribution WG (All CGA)</b></p> <p><b>Power WG (ISO)</b></p>

**CGA H-15, Safe catalyst handling in HYCO plants:**

Deadline to submit proposed changes for next edition is 9/1/2025.

[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=25-59](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59)

**CGA H-17, Small scale hydrogen production and delivery:**

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, OSHA process safety management and EPA risk management plan guidance document for bulk liquid hydrogen supply systems:**

Deadline to submit proposed changes for next edition is 08/01/2027

[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=25-49](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-49)

**CGA PS-31, Position statement on cleanliness for proton exchange membranes hydrogen piping / components:**

Deadline to submit proposed changes for next edition is 6/12/2025.

[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=25-16](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16)

**CGA PS-33, Position statement on the use of LPG or propane tanks as compressed hydrogen storage buffers:**

Deadline to submit proposed changes for next edition is 12/10/2026.

[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=25-41](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41)

progress see

<https://portal.cganet.com/WorkItem/Details.aspx?id=22-019>

**ANSI/CGA H-5, Standard for bulk hydrogen supply systems**

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](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010)

**CGA G-5.3, Commodity specification for hydrogen**

- Deadline to submit proposed changes for next edition is 5/1/2023.

[https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=22-013](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013)

**CSA HGV 5.2 - Hydrogen Fueling Systems:**

Working with the TC and TSC Chairs to disposition. Meeting will be planned with TSC to discuss.

~~**CSA HGV 4.2 – Hoses for compressed hydrogen fuel stations**—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). Published. To be removed in next edition of matrix.~~

**CSA HGV 4.3 – Fueling parameter evaluation**

– A Task Force was put together to develop text to transition from a testing standard to a standard that can be used for certification.



**CGA PS-46, Position statement on roofs over hydrogen storage systems:** Deadline to submit proposed changes for next edition was 3/6/2023. [https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=23-012](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012)

**ISO AWI TR 22734-2 Hydrogen generators using water electrolysis – Part 2: Testing guidance for performing electricity grid service**  
This activity has been transferred to the newly-formed ISO/TC 197 SC 1. [The project has not yet been posted to the SC 1 webpage.](#)

The TSC will proceed with this project and discuss lower boundary prior to publication.

**CSA 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.

**CGA H-10, Combustion safety for steam reformer operation:** Deadline to submit proposed changes for next edition is 12/1/2023. [https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=23-038](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038)

**CGA H-11, Safe start-up and shutdown practices for steam reformers:** Deadline to submit proposed changes for next edition is 8/11/2025. [https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=25-30](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30)

**CGA H-12, Mechanical integrity of syngas outlet systems:** Deadline to submit proposed changes for next edition is 3/1/2022. [https://portal.cganet.com/Publication/Workspace/Outline.aspx?work\\_id=21-016](https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016)

**CGA H-13, Hydrogen pressure swing adsorber (PSA) mechanical integrity**

**requirements:** Deadline to submit proposed changes for next edition is 8/1/2022.

[https://portal.cganet.com/Publication/Workpace/Outline.aspx?work\\_id=22-027](https://portal.cganet.com/Publication/Workpace/Outline.aspx?work_id=22-027)

**CGA P-48, Position statement on clarification of existing hydrogen setback distances and development of new hydrogen setback distances in NFPA 55:**

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>

**ASTM D7650-13: Standard Test Method for Sampling of Particulate Matter in High Pressure Hydrogen used as Gaseous Fuel with an In-Stream Filter** - This test method is

primarily for sampling particulates in hydrogen fuel used in hydrogen fuel cell vehicles or gaseous hydrogen powered internal combustion vehicle engines up to pressures of 70 MPa (700 bars) using an in-stream filter. This test method describes sampling apparatus design, operating procedures, and quality control procedures required to obtain the stated levels of precision and accuracy. Published – to be removed in next edition of the matrix.

ASTM D7634 Visualizing Particulate Sizes – Interlaboratory study in progress. Proposed revision, WK64094. This method is using a potentially obsolete method for sampling. Forming a collaboration to discuss how this sampling is actually performed in the field to update the specification accordingly. Expanding the scope of this method to include natural gas as well. Subcommittee ballot closed October 1.

**ASTM D7653 – 18: Standard Test Method for Determination of Trace Gaseous Contaminants in Hydrogen Fuel by Fourier Transform Infrared (FTIR) Spectroscopy**

Interlaboratory study in progress. Looking for funding to purchase the cylinders for the study. This test method employs an FTIR gas analysis system for the determination of trace impurities in gaseous hydrogen fuels relative to the hydrogen fuel quality limits described in SAE TIR J2719 (April 2008) or in hydrogen fuel quality standards from other governing bodies. This FTIR method is used to quantify gas phase concentrations of multiple target contaminants in hydrogen fuel either directly at the fueling station or on an extracted sample that is sent to be analyzed elsewhere. Multiple contaminants can be measured simultaneously as long as they are in the gaseous phase and absorb in the infrared wavelength region. The detection limits as well as specific target contaminants

~~for this standard were selected based upon those set forth in SAE TIR J2719.~~

~~Proposed revision WK 61780.~~

**ASTM D7675-15: Standard Test Method for the Determination of Total Hydrocarbons in Hydrogen by FID Based Total Hydrocarbon (THC) Analyzer**

This test method describes a procedure for total hydrocarbons (THC) measurement in hydrogen intended as a fuel for fuel cells on a C1 Basis. Total Hydrocarbons on a C1 basis is an analytical technique where total carbon is determined, and all of the hydrocarbons are assumed to have the same response as Methane. Sensitivity from 0.1 part per million (ppm,  $\mu\text{mole/mole}$ ) up to 1000 parts per million (ppm,  $\mu\text{mole/mole}$ ) concentration are achievable. Higher concentrations can be analyzed using appropriate dilution techniques. This test method can be applied to other gaseous samples requiring analysis of trace constituents provided an assessment of potential interferences has been accomplished. Proposed revision WK 70956. Interlaboratory study in progress.

**ASTM D7651 Gravimetric Measurement of Particulate Concentration - Interlaboratory study required. Looking for a technical expert to lead this effort.**

[ASTM D7892 Total Organic Halides, Total Non-Methane Hydrocarbons, and Formaldehyde by GC-MS - Interlaboratory study in progress. Looking for funding to purchase the cylinders for the study.](#)

**ASTM D7941/7941M-14: Standard Test Method for Hydrogen Purity Analysis Using a Continuous Wave Cavity Ring-Down Spectroscopy Analyzer**

This test method describes contaminant determination in fuel cell grade hydrogen as specified in relevant ASTM and ISO standards using cavity ring-down spectroscopy (CRDS). This standard test method is for the measurement of one or multiple contaminant including, but not limited to, water, oxygen, methane, carbon dioxide, carbon monoxide, ammonia and formaldehyde.

Awaiting results of ballot at the subcommittee level.

[ASTM D7606 Sampling of High Pressure Hydrogen - Work group WK85676 was started. Discuss heavy duty sampling and harmonization with ISO 19880-9. Monthly meetings.](#)

[ASTM D7676 Screening Method for Organic Halides in Gaseous Fuels – Standard open for review.](#)

		<p><u><a href="#">ASTM Aviation Hydrogen - Work group WK85474</a></u> has been started. Looking for experts to join this group.</p> <p><u><a href="#">ASTM Natural Gas, Hydrogen Blends for Use as a Motor Vehicle Fuel - Ballot closed and received one negative.</a></u></p>	
	<p><b>ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air:</b> published every two years. The 2019-2020 edition of the International Civil Aviation Organization’s (“ICAO”) Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284) (“TIs”), upon which the Dangerous Goods (Consignment by Air) (Safety) Ordinance (CAP. 384) and Air Navigation (Dangerous Goods) Regulations (Schedule 16 to CAP. 448C) are based, went into effect on 1 January 2019.</p> <p><u><a href="https://www.cad.gov.hk/english/pdf/2019-2020%20ICAO%20TI%20Major%20Changes.pdf">https://www.cad.gov.hk/english/pdf/2019-2020%20ICAO%20TI%20Major%20Changes.pdf</a></u></p>		<p><b>CARGO</b></p> <p>Transportation WG (all)</p>
	<p><b>IEEE 1547: IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces</b> - IEEE SCC21 has <del>an approved project</del><u>started</u> to revise IEEE 1547-2018 Interconnection Standard.</p> <p><del>The kick-off meeting held January 9, 2023. Subgroups have formed and have started meeting.</del></p>	<p><b>IEC/TC 105 AHG 11:</b> New Work Item on accelerated stress testing for SOFCs and PEMs.</p> <p><b>IEC 62282-9-102:</b> Evaluation methodology for the environmental performance of fuel cell power systems based on life cycle thinking – Product category rules for environmental product declarations of stationary fuel cell power systems and alternative systems for residential</p>	<p><b>STATIONARY</b></p> <p>Power WG (all)</p>

**IEEE P1547.10 Recommended Practice for DER Gateway Platforms** has begun work on their next revision.

**applications** – anticipating revision work to start.

**IEEE P1547.9: Guide to Using IEEE Standard 1547 for Interconnection of Energy Storage Distributed Energy Resources with Electric Power Systems**

Published. To be removed in the next edition of the matrix.

**IEEE 1547.2: Application Guide for IEEE Standard 1547 For Interconnecting Distributed Resources With Electric Power Systems** - This guide provides technical background and application details to support the understanding of IEEE 1547 for interconnecting distributed resources (DR) with electric power systems (EPS). Published. To be removed in the next edition of the matrix.

**IEEE 1547.3: Guide for Monitoring, Information Exchange, And Control of Distributed Resources Interconnected With Electric Power Systems** - This standard provides guidelines for monitoring, information exchange, and control of distributed resources (DR) interconnected with electric power systems (EPS). Published. To be removed in the next edition of the matrix.

**P1547.3/D3.07, Draft Guide for Cybersecurity of Distributed Energy Resources Interconnected with Electric Power Systems.:**

This document provides guidelines for Cybersecurity of Distributed Energy

		<p>Resources (DER) interconnection with Electric Power Systems (EPS). To be updated to provide guidance by referring to the cybersecurity features available in the protocols specified by IEEE Std, 1547-2018 (IEEE Std 1815, IEEE Std 2030.5, Sunpec Modbus), along with new cybersecurity concepts and technologies that have been developed over recent years. Call for experts closed January 6, 2022. Draft is in the balloting stage with Public Review to follow.</p>	
	<p><b>IEC 62282-4-202: Fuel cell power systems for unmanned aircraft systems (drones) – Performance test methods</b>          Scope - Unloaded weight &lt; 116 kg and maximum take-off weight &lt; 150 kg. Fuel cell rated output voltage &lt; 220 V DC. Questions regarding the further procedure of the project have been clarified in the meantime. A CDV has been submitted, which is currently being prepared by IEC for circulation</p>	<p><b>Drones/UAS</b></p> <p>Many activities in in ISO/TC 20 SC 16: SCOPE: Standardization in the field of unmanned aircraft systems (UAS) including, but not limited to, classification, design, manufacture, operation (including maintenance) and safety management of UAS operations.</p> <p>These activities are not specific to fuel cells for drones, but will be applicable to drones using any technologies.          For further information, see <a href="https://www.iso.org/committee/5336224.html">https://www.iso.org/committee/5336224.html</a>.</p>	<p><b>MICRO</b></p> <p><b>Transportation WG (all)</b></p>

Please note that details of standards and activities that have been published but not currently under revision are no longer shown in the matrix. They are added back to the matrix when the activity enters revision cycle.

- List of Frequently-Used Acronyms:  
 CD - Committee Draft  
 2CD - Second Committee Draft (Did not reach consensus first time)





CD2 - same as above

CDV - Committee draft for vote (term used by IEC to distinguish between a document out for comment only and one ready for vote)

DIS - Draft International Standard (achieved consensus to move from CD phase)

FDIS - Final Draft International Standard (passed DIS vote)

WG - Working Group

IEC - International Electrotechnical Commission - the international standards body for electrochemical devices, including fuel cells, which is covered by Technical Committee 105 (TC 105)

TC - Technical Committee