



**CSA/ANSI HGV 5.2:24**  
National Standard of Canada  
American National Standard



# Compact hydrogen fuelling systems



# Legal Notice for Standards

Canadian Standards Association and CSA America Standards Inc. (operating as "CSA Group") develop standards through a consensus standards development process approved by the Standards Council of Canada and the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. Although CSA Group administers the process and establishes rules to promote fairness in achieving consensus, it does not independently test, evaluate, or verify the content of standards.

## Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document's fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party's intellectual property rights. CSA Group does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA Group makes no representations or warranties regarding this document's compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA GROUP, ITS VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OR OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF CSA GROUP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA Group is not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and CSA Group accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA Group is a private not-for-profit company that publishes voluntary standards and related documents. CSA Group has no power, nor does it undertake, to enforce compliance with the contents of the standards or other documents it publishes.

## Intellectual property rights and ownership

As between CSA Group and the users of this document (whether it be in printed or electronic form), CSA Group is the owner, or the authorized licensee, of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. Without limitation, the unauthorized use, modification, copying, or disclosure of this document may violate laws that protect CSA Group's and/or others' intellectual property and may give rise to a right in CSA Group and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by licence or by law, CSA Group reserves all intellectual property rights in this document.

## Patent rights

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. CSA Group shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

## Authorized use of this document

This document is being provided by CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF format.

Limited copies of this document in printed or paper form may be distributed only to persons who are authorized by CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and must not permit others to

- alter this document in any way or remove this Legal Notice from the attached standard;
- sell this document without authorization from CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents hereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.



# ***Standards Update Service***

## ***CSA/ANSI HGV 5.2:24*** ***March 2024***

**Title:** *Compact hydrogen fuelling systems*

To register for e-mail notification about any updates to this publication

- go to [www.csagroup.org/store/](http://www.csagroup.org/store/)
- click on **CSA Update Service**

The **List ID** that you will need to register for updates to this publication is **271024**.

If you require assistance, please e-mail [techsupport@csagroup.org](mailto:techsupport@csagroup.org) or call 416-747-2233.

Visit CSA Group's policy on privacy at [www.csagroup.org/legal](http://www.csagroup.org/legal) to find out how we protect your personal information.

**Canadian Standards Association (operating as “CSA Group”)**, under whose auspices this National Standard has been produced, was chartered in 1919 and accredited by the Standards Council of Canada to the National Standards system in 1973. It is a not-for-profit, nonstatutory, voluntary membership association engaged in standards development and certification activities.

CSA Group standards reflect a national consensus of producers and users — including manufacturers, consumers, retailers, unions and professional organizations, and governmental agencies. The standards are used widely by industry and commerce and often adopted by municipal, provincial, and federal governments in their regulations, particularly in the fields of health, safety, building and construction, and the environment.

More than 10 000 members indicate their support for CSA Group’s standards development by volunteering their time and skills to Committee work.

CSA Group offers certification and testing services in support of and as an extension to its standards development activities. To ensure the integrity of its certification process, CSA Group regularly and continually audits and inspects products that bear the CSA Group Mark.

In addition to its head office and laboratory complex in Toronto, CSA Group has regional branch offices in major centres across Canada and inspection and testing agencies in fourteen countries. Since 1919, CSA Group has developed the necessary expertise to meet its corporate mission: CSA Group is an independent service organization whose mission is to provide an open and effective forum for activities facilitating the exchange of goods and services through the use of standards, certification and related services to meet national and international needs.

For further information on CSA Group services, write to  
CSA Group  
178 Rexdale Boulevard  
Toronto, Ontario, M9W 1R3  
Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at [www.scc.ca](http://www.scc.ca).

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada’s economic competitiveness and social wellbeing, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at [www.scc.ca](http://www.scc.ca).

Standards Council of Canada  
600-55 Metcalfe Street  
Ottawa, Ontario, K1P 6L5  
Canada



Cette Norme Nationale du Canada n’est disponible qu’en anglais.

*Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users to judge its suitability for their particular purpose.*

®A trademark of the Canadian Standards Association, operating as “CSA Group”

## CSA Group

The Canadian Standards Association (operating as “CSA Group”), under whose auspices this National Standard has been produced, was chartered in 1919 and accredited by the Standards Council of Canada to the National Standards system in 1973. It is a not-for-profit, nonstatutory, voluntary membership association engaged in standards development and certification activities.

CSA Group standards reflect a national consensus of producers and users including manufacturers, consumers, retailers, unions and professional organizations, and governmental agencies. The standards are used widely by industry and commerce and often adopted by municipal, provincial, and federal governments in their regulations, particularly in the fields of health, safety, building and construction, and the environment.

More than 10 000 members indicate their support for CSA Group’s standards development by volunteering their time and skills to Committee work.

CSA Group offers certification and testing services in support of and as an extension to its standards development activities. To ensure the integrity of its certification process, CSA Group regularly and continually audits and inspects products that bear the CSA Group Mark.

In addition to its head office and laboratory complex in Toronto, CSA Group has regional branch offices in major centres across Canada and inspection and testing agencies in fourteen countries. Since 1919, CSA Group has developed the necessary expertise to meet its corporate mission: CSA Group is an independent service organization whose mission is to provide an open and effective forum for activities facilitating the exchange of goods and services through the use of standards, certification and related services to meet national and international needs.

For further information on CSA Group services, write to:  
CSA Group  
178 Rexdale Boulevard, Toronto, Ontario, M1W 1P7  
Canada

## American National Standards Institute

The American National Standards Institute (ANSI), Inc. is the nationally recognized coordinator of voluntary standards development in the United States through which voluntary organizations, representing virtually every technical discipline and every facet of trade and commerce, organized labor and consumer interests, establish and improve the some 10 000 national consensus standards currently approved as American National Standards.

ANSI provides that the interests of the public may have appropriate participation and representation in standardization activity, and cooperates with departments and agencies of U.S. Federal, state and local governments in achieving compatibility between government codes and standards and the voluntary standards of industry and commerce.

ANSI represents the interests of the United States in international nontreaty organizations such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). The Institute maintains close ties with regional organizations such as the Pacific Area Standards Congress (PASC) and the Pan American Standards Commission (COPANT). As such, ANSI coordinates the activities involved in the U.S. participation in the standards process.

ANSI approval of standards is intended to verify that the principles of openness and due process have been followed in the approval procedure and that a consensus of those directly and materially affected by the standards has been achieved. ANSI coordination is intended to assist the voluntary system to ensure that national standards needs are identified and met with a set of standards that are without conflict or unnecessary duplication in their requirements.

Responsibility of approving American standards rests with the  
American National Standards Institute, Inc.  
25 West 43rd Street, Fourth floor  
New York, NY 10036

*National Standard of Canada  
American National Standard*

*CSA/ANSI HGV 5.2:24*

*Compact hydrogen fuelling systems*



*\*A trademark of the Canadian Standards Association, operating as "CSA Group"*



*American National Standards Institute, Inc.*



*Approved on February 16, 2024 by ANSI  
Published in March 2024 by CSA Group  
A not-for-profit private sector organization  
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3*

*To purchase standards and related publications, visit our Online Store at  
[www.csagroup.org/store/](http://www.csagroup.org/store/) or call toll-free 1-800-463-6727 or 416-747-4044.*

*ICS 27.075  
ISBN 978-1-4883-4324-7*

*© 2024 Canadian Standards Association  
All rights reserved. No part of this publication may be reproduced in any form whatsoever  
without the prior permission of the publisher.*

# Contents

Technical Committee on Hydrogen Transportation 6

Subcommittee on Hydrogen Fuelling Systems 10

Preface 12

SDG Foreword 14

## 1 Scope 15

- 1.1 General 15
- 1.2 Application 15
- 1.3 Unit of measure 15
- 1.4 Standard conditions 15
- 1.5 Pressure references 15
- 1.6 Resolution of conflict 15
- 1.7 Alternative means 16
- 1.8 Terminology 16

## 2 Reference publications 16

## 3 Definitions 22

## 4 General requirements 23

- 4.1 Safety requirements and protective measures 23
  - 4.1.1 General 23
  - 4.1.2 Electrical 23
- 4.2 Non-hydrogen hazards 24
- 4.3 Functional safety 24
- 4.4 Physical, environmental, and operating conditions 24
  - 4.4.1 General 24
  - 4.4.2 Electrical power input 24
  - 4.4.3 Physical environment and operating conditions 24
  - 4.4.4 Process inputs 25
  - 4.4.5 Shock and vibration 25
  - 4.4.6 Handling and transportation 25
  - 4.4.7 System purging 25
  - 4.4.8 Noise emissions 25
  - 4.4.9 Freeze protection 26
  - 4.4.10 Oxygen systems 26
    - 4.4.10.1 Hydrogen generation rates 26
    - 4.4.10.2 Selection of materials 26
      - 4.4.10.2.1 General 26
      - 4.4.10.2.2 Prohibited materials 26
      - 4.4.10.2.3 Hazards from materials 26
      - 4.4.10.2.4 Materials for containment of oxygen 27
      - 4.4.10.2.5 Materials for containment of hydrogen 27
      - 4.4.10.2.6 Cleanliness 27

|          |   |           |
|----------|---|-----------|
| 4.5.7    | Hazardous materials                           | 27        |
| 4.5.8    | Thermal insulating materials                  | 27        |
| 4.6      | Pressure equipment and piping                 | 28        |
| 4.6.1    | General                                       | 28        |
| 4.6.2    | Process and pressure vessels                  | 28        |
| 4.6.3    | Piping, tubing, fittings, and components      | 28        |
| 4.6.4    | Piping marking                                | 29        |
| 4.6.5    | Tapered threads                               | 29        |
| 4.7      | Electrical safety                             | 29        |
| 4.7.1    | General considerations                        | 29        |
| 4.7.2    | Electrical components and devices             | 29        |
| 4.7.3    | Physical environment and operating conditions | 29        |
| 4.7.4    | Electrical testing and verification           | 29        |
| 4.8      | Protection against fire or explosion hazards  | 29        |
| 4.8.1    | General                                       | 29        |
| 4.8.2    | Area classification                           | 29        |
| 4.8.3    | Ventilation                                   | 30        |
| 4.8.4    | Deflagration prevention and control           | 30        |
| <b>5</b> | <b>Construction</b>                           | <b>30</b> |
| 5.1      | General                                       | 30        |
| 5.1.1    | General                                       | 30        |
| 5.1.2    | Required information                          | 30        |
| 5.1.3    | Sharp edges                                   | 30        |
| 5.1.4    | Guards  | 30        |
| 5.1.5    | Leakage containment                           | 31        |
| 5.1.6    | Manual controls                               | 31        |
| 5.1.7    | Touch temperatures                            | 31        |
| 5.2      | Equipment enclosures                          | 31        |
| 5.2.1    | General                                       | 31        |
| 5.2.2    | Construction                                  | 31        |
| 5.2.3    | Service access                                | 32        |
| 5.2.4    | Guards and protection                         | 32        |
| 5.2.5    | Leak detection and mitigation                 | 32        |
| 5.3      | Valves  | 33        |
| 5.3.1    | General                                       | 33        |
| 5.3.2    | Manual valves                                 | 33        |
| 5.3.3    | Automatic valves                              | 34        |
| 5.3.4    | Shut-off valves                               | 34        |
| 5.4      | Filters                                       | 34        |
| 5.4.1    | Filters and separators                        | 34        |
| 5.4.2    | Filter installation                           | 34        |
| 5.4.3    | Size and rating                               | 35        |
| 5.5      | Sensors                                       | 35        |
| 5.5.1    | General                                       | 35        |
| 5.5.2    | Sensors for fuelling                          | 35        |
| 5.5.3    | Pressure gauges                               | 35        |
| 5.5.4    | Pressure measurement                          | 36        |
| 5.5.5    | Temperature measurement                       | 36        |

|        |   |    |
|--------|---|----|
| 5.5.6  | Flow measurement devices                        | 36 |
| 5.6    | Fuelling hose assemblies                        | 37 |
| 5.6.1  | General   | 37 |
| 5.6.2  | Hoses and nozzles                               | 37 |
| 5.6.3  | Breakaway devices                               | 37 |
| 5.6.4  | Security and protection                         | 37 |
| 5.6.5  | Hose-retrieving mechanism                       | 37 |
| 5.6.6  | Depressurization of nozzle                      | 37 |
| 5.6.7  | Shutdown protection                             | 38 |
| 5.6.8  | Safety shut-off valve                           | 38 |
| 5.6.9  | Pressure drop assumptions                       | 38 |
| 5.6.10 | Depressurization of hose                        | 38 |
| 5.7    | Hydrogen storage                                | 38 |
| 5.7.1  | General   | 38 |
| 5.7.2  | Accessibility                                   | 38 |
| 5.7.3  | Storage capacity                                | 39 |
| 5.7.4  | Interconnected storage systems                  | 39 |
| 5.7.5  | Vessel protection                               | 39 |
| 5.7.6  | Area classification of storage compartment      | 39 |
| 5.7.7  | Leak detection                                  | 39 |
| 5.7.8  | Vehicle impact protection                       | 39 |
| 5.8    | Oxygen processing systems                       | 40 |
| 5.9    | Rotating equipment                              | 40 |
| 5.9.1  | General   | 40 |
| 5.9.2  | Motors  | 40 |
| 5.9.3  | Pumps   | 40 |
| 5.10   | Overpressurization protection                   | 40 |
| 5.10.1 | General   | 40 |
| 5.10.2 | Pressure relief device construction and marking | 40 |
| 5.10.3 | Sizing and venting                              | 40 |
| 5.11   | Process vent system                             | 41 |
| 5.11.1 | General   | 41 |
| 5.11.2 | Vent location                                   | 41 |
| 5.11.3 | Documentation                                   | 41 |
| 5.11.4 | Accumulation of debris                          | 41 |
| 5.11.5 | Hydrogen vent systems                           | 41 |
| 5.11.6 | Oxygen vent systems                             | 41 |
| 5.11.7 | Separation of hydrogen and oxygen vent systems  | 41 |
| 5.12   | Surface temperature                             | 42 |
| 5.13   | Installation and maintenance                    | 42 |
| 5.13.1 | General   | 42 |
| 5.13.2 | Documentation                                   | 42 |
| 5.13.3 | Maintenance documentation                       | 42 |
| 5.13.4 | Sensor verification                             | 42 |
| 5.14   | Labelling                                       | 42 |
| 5.14.1 | General   | 42 |
| 5.14.2 | Equipment labelling                             | 43 |
| 5.14.3 | Warning signage                                 | 43 |
| 5.14.4 | User instruction plate                          | 43 |

|        |                                     |    |
|--------|-------------------------------------|----|
| 5.14.5 | Marking legibility                  | 43 |
| 5.14.6 | Marking methods                     | 43 |
| 5.15   | Compression equipment               | 43 |
| 5.16   | Hydrogen generation                 | 43 |
| 5.16.1 | General                             | 43 |
| 5.16.2 | Generation rates                    | 43 |
| 5.16.3 | Temperature of reactor              | 44 |
| 5.16.4 | Steam methane reformers             | 44 |
| 5.16.5 | Electrolyzers                       | 44 |
| 5.17   | Hydrogen source and fuel quality    | 44 |
| 5.17.1 | General                             | 44 |
| 5.17.2 | Hydrogen fuel quality assurance     | 44 |
| 5.17.3 | Delivered hydrogen                  | 44 |
| 5.17.4 | Continuous process control          | 44 |
| 5.17.5 | Water in the fuel processing system | 45 |
| 5.18   | Dispensing equipment                | 45 |
| 5.19   | Fuelling protocol                   | 45 |

## **6 Control systems and protective components** 46

|       |                        |    |
|-------|------------------------|----|
| 6.1   | General requirements   | 46 |
| 6.1.1 | Prevention of failures | 46 |
| 6.1.2 | Control systems        | 46 |
| 6.1.3 | Equipment start-up     | 46 |
| 6.1.4 | Complex installations  | 48 |
| 6.1.5 | Operating modes        | 48 |
| 6.2   | Sensors                | 48 |
| 6.3   | Remote monitoring      | 48 |
| 6.4   | Safety systems         | 48 |
| 6.4.1 | Safety circuit         | 48 |
| 6.4.2 | Loss of utilities      | 48 |
| 6.5   | Gas detection          | 49 |

## **7 Type testing** 50

|       |                           |    |
|-------|---------------------------|----|
| 7.1   | Test requirements         | 50 |
| 7.1.1 | Operation requirements    | 50 |
| 7.1.2 | Representative samples    | 50 |
| 7.1.3 | Test media                | 50 |
| 7.1.4 | Test pressure             | 50 |
| 7.1.5 | Test temperature          | 50 |
| 7.2   | Pressurized leakage test  | 51 |
| 7.2.1 | General                   | 51 |
| 7.2.2 | Pneumatic leakage test    | 51 |
| 7.2.3 | Hydrostatic leakage test  | 52 |
| 7.3   | Strength tests            | 52 |
| 7.3.1 | General                   | 52 |
| 7.3.2 | Pneumatic strength test   | 52 |
| 7.3.3 | Hydrostatic strength test | 53 |
| 7.4   | Ingress test              | 54 |
| 7.4.1 | Design                    | 54 |

|           |  |           |
|-----------|--|-----------|
| 7.4.2     | Requirements                                       | 54        |
| 7.4.3     | Protection   | 54        |
| 7.5       | Surface component temperatures                     | 57        |
| 7.6       | Normal operation                                   | 58        |
| 7.6.1     | General  | 58        |
| 7.6.2     | System tests                                       | 58        |
| 7.6.3     | Operational tests                                  | 59        |
| 7.6.4     | Safety circuit test                                | 59        |
| 7.7       | Enclosure ventilation                              | 59        |
| 7.8       | System hose failure detection test                 | 60        |
| 7.8.1     | Objective  | 60        |
| 7.8.2     | Method of test                                     | 60        |
| 7.8.3     | Acceptance criteria                                | 61        |
| 7.9       | Dielectric voltage-withstand test                  | 61        |
| 7.10      | Dispensing tests                                   | 61        |
| 7.10.1    | General  | 61        |
| 7.10.2    | Fault tests  | 61        |
| 7.10.3    | Communication tests                                | 62        |
| 7.10.4    | Fuelling protocol function tests                   | 62        |
| 7.10.5    | Fuelling protocol evaluation tests                 | 63        |
| 7.11      | Compressor system leakage tests.                   | 64        |
| 7.12      | Ground continuity                                  | 64        |
| 7.12.1    | General  | 64        |
| 7.12.2    | Method of test                                     | 65        |
| 7.12.3    | Acceptance criteria                                | 65        |
| 7.13      | Protection against residual voltages (capacitance) | 65        |
| 7.13.1    | Objective  | 65        |
| 7.13.2    | Method of test                                     | 65        |
| 7.13.3    | Acceptance criteria                                | 65        |
| <b>8</b>  | <b>Manufacturing and production tests</b>          | <b>66</b> |
| 8.1       | Leakage test                                       | 66        |
| 8.2       | Ground continuity test                             | 66        |
| 8.3       | Dielectric withstand test                          | 66        |
| <b>9</b>  | <b>Marking, labelling, and packaging</b>           | <b>66</b> |
| 9.1       | General requirements                               | 66        |
| 9.2       | System marking                                     | 66        |
| 9.3       | Operator instructions                              | 66        |
| 9.4       | Technical documentation                            | 67        |
| 9.4.1     | General  | 67        |
| 9.4.2     | Installation manual                                | 67        |
| 9.4.3     | Maintenance manual                                 | 68        |
| 9.4.4     | Installation, service, and operating instructions  | 69        |
| <b>10</b> | <b>Quality assurance plan</b>                      | <b>69</b> |
| 10.1      | General  | 69        |
| 10.2      | Procedures   | 69        |
| 10.3      | Sampling plan                                      | 70        |

# Technical Committee on Hydrogen Transportation

|                      |  |                   |
|----------------------|--|-------------------|
| <b>J. Hamilton</b>   | California Hydrogen Business Council,<br>Sacramento, California, USA<br><i>Category: User Interest</i> | <i>Chair</i>      |
| <b>C. Hayes</b>      | Swagelok Co.,<br>Solon, Ohio, USA<br><i>Category: Producer Interest</i>                                | <i>Vice-Chair</i> |
| <b>A. I. Murra</b>   | Abraham Murra Consulting,<br>Rancho Santa Margarita, California, USA<br><i>Category: Gas Supplier</i>  | <i>Vice-Chair</i> |
| <b>K. Beaulieu</b>   | Transport Canada,<br>Ottawa, Ontario, Canada   | <i>Non-voting</i> |
| <b>M. Blieske</b>    | LIFTE H2 Inc.,<br>Boston, Massachusetts, USA   | <i>Non-voting</i> |
| <b>R. Boyd</b>       | Boyd Hydrogen LLC,<br>Spring Lake Heights, New Jersey, USA<br><i>Category: General Interest</i>        |                   |
| <b>J. P. Cohen</b>   | Air Products and Chemicals Inc.,<br>Allentown, Pennsylvania, USA<br><i>Category: Gas Supplier</i>      |                   |
| <b>M. Conrad</b>     | Ford Motor Co.,<br>Dearborn, Michigan, USA   | <i>Alternate</i>  |
| <b>W. L. Cook</b>    | Plug Power,<br>Newport Beach, California, USA<br><i>Category: Gas Supplier</i>                         |                   |
| <b>R. Early</b>      | Compressed Gas Association Inc.,<br>Chantilly, Virginia, USA   | <i>Non-voting</i> |
| <b>J. E. Eihusen</b> | Hexagon Lincoln Inc.,<br>Lincoln, Nebraska, USA  | <i>Non-voting</i> |

|                       |  |                   |
|-----------------------|--|-------------------|
| <b>L. Gambone</b>     | Nikola Motor,<br>Phoenix, Arizona, USA<br><i>Category: User Interest</i>                                       |                   |
| <b>E. Girouard</b>    | Emcara Gas Development Inc.,<br>Guelph, Ontario, Canada<br><i>Category: Producer Interest</i>                  |                   |
| <b>B. R. Gordon</b>   | Ivys Energy Solutions Inc.,<br>Somerville, Massachusetts, USA<br><i>Category: Producer Interest</i>            |                   |
| <b>K. Harris</b>      | John Cockerill,<br>Los Angeles, California, USA  | <i>Non-voting</i> |
| <b>P. Horacek</b>     | Vancouver, British Columbia, Canada<br><i>Category: General Interest</i>                                       |                   |
| <b>J. F. Jordan</b>   | Hexagon Agility,<br>Cook, Minnesota, USA<br><i>Category: User Interest</i>                                     |                   |
| <b>S. Katz</b>        | S. Katz and Associates Inc.,<br>North Vancouver, British Columbia, Canada<br><i>Category: General Interest</i> |                   |
| <b>S. Mathison</b>    | FirstElement Fuel Inc.,<br>Irvine, California, USA<br><i>Category: Gas Supplier</i>                            |                   |
| <b>C. McWhinney</b>   | Millennium Reign Energy LLC,<br>Dayton, Ohio, USA<br><i>Category: Producer Interest</i>                        |                   |
| <b>G. Meadows</b>     | Westport Fuel Systems Canada Inc.,<br>Cambridge, Ontario, Canada   | <i>Non-voting</i> |
| <b>B. Mezher</b>      | Luxfer Canada Ltd.,<br>Calgary, Alberta, Canada  | <i>Non-voting</i> |
| <b>N. L. Newhouse</b> | Hexagon Lincoln Inc.,<br>Lincoln, Nebraska, USA<br><i>Category: Producer Interest</i>                          |                   |

|                       |  |                   |
|-----------------------|--|-------------------|
| <b>D. Patel</b>       | ANGI Energy Systems,<br>Janesville, Wisconsin, USA<br><i>Category: Producer Interest</i>                 |                   |
| <b>K. Quackenbush</b> | Fuel Cell & Hydrogen Energy Association,<br>Washington, DC, USA<br><i>Category: General Interest</i>     |                   |
| <b>S. Quong</b>       | Quong & Associates Inc.,<br>San Francisco, California, USA<br><i>Category: General Interest</i>          |                   |
| <b>A. Ryan</b>        | Toyota Motor Engineering & Manufacturing North<br>America,<br>Gardena, California, USA                   | <i>Non-voting</i> |
| <b>A. Sadiku</b>      | Natural Resources Canada,<br>Ottawa, Ontario, Canada   | <i>Non-voting</i> |
| <b>G. Stottler</b>    | Stottler Development LLC,<br>Honeoye Falls, New York, USA<br><i>Category: General Interest</i>           |                   |
| <b>A. Tchouvelev</b>  | A.V. Tchouvelev & Associates Inc.,<br>Mississauga, Ontario, Canada<br><i>Category: General Interest</i>  |                   |
| <b>M. Treacy</b>      | Powertech Labs Inc.,<br>Surrey, British Columbia, Canada   | <i>Non-voting</i> |
| <b>M. Tuttle</b>      | Hexagon Purus,<br>Lincoln, Nebraska, USA   | <i>Non-voting</i> |
| <b>M. Veenstra</b>    | Ford Motor Co.,<br>Dearborn, Michigan, USA<br><i>Category: User Interest</i>                             |                   |
| <b>C. Webster</b>     | TesTneT Canada Inc.,<br>Langley, B.C., Canada<br><i>Category: General Interest</i>                       |                   |
| <b>S. Wheaton</b>     | Choshu Industry Corp. of America Inc.,<br>Calgary, Alberta, Canada<br><i>Category: Producer Interest</i> |                   |

**L. Yang**

Toyota Motor Engineering & Manufacturing North  
America,  
Gardena, California, USA  
*Category: User Interest*

**I. Monner**

CSA Group,  
Calgary, Alberta, Canada

*Project Manager*

# ***Subcommittee on Hydrogen Fuelling Systems***

|                         |   |                   |
|-------------------------|---|-------------------|
| <b>B. R. Gordon</b>     | Ivys Energy Solutions Inc.,<br>Somerville, Massachusetts, USA           | <i>Chair</i>      |
| <b>G. Stottler</b>      | Stottler Development LLC,<br>Honeoye Falls, New York, USA               | <i>Vice-Chair</i> |
| <b>J. P. Cohen</b>      | Air Products and Chemicals Inc.,<br>Allentown, Pennsylvania, USA        |                   |
| <b>W. Collins</b>       | WPCSOL LLC,<br>East Windsor, Connecticut, USA                           |                   |
| <b>J. Hamilton</b>      | California Hydrogen Business Council,<br>Sacramento, California, USA    |                   |
| <b>D. Itoe</b>          | CSA Group,<br>Charlotte, North Carolina, USA                            |                   |
| <b>C. McWhinney</b>     | Millennium Reign Energy LLC,<br>Dayton, Ohio, USA                       |                   |
| <b>E. Mehl</b>          | Resato North America LLC,<br>Houston, Texas, USA                        |                   |
| <b>S. Quong</b>         | Quong & Associates Inc.,<br>San Francisco, California, USA              |                   |
| <b>K. Sumba</b>         | ANGI Energy Systems/Gilbarco-Veeder Root,<br>Janesville, Wisconsin, USA |                   |
| <b>S. Wheaton</b>       | Choshu Industry Corp. of America Inc.,<br>Calgary, Alberta, Canada      |                   |
| <b>E. Wolff-Klammer</b> | UL LLC,<br>Northbrook, Illinois, USA                                    |                   |

**L. Yang**

Toyota Motor Engineering & Manufacturing North  
America,  
Gardena, California, USA

**S. Marxen**

CSA Group,  
Cleveland, Ohio, USA

*Project Manager*

# Preface

This is the first edition of CSA/ANSI HGV 5.2, *Compact hydrogen fuelling systems*.

The CSA Subcommittee reviewed coverage in a variety of standards (CSA Interim Requirement IR 3-18, as well as others from CSA Group and industry hydrogen standards) and current code requirements to develop this new Standard that would focus on coverage for compact hydrogen fuelling systems (CHFS).

CSA Group acknowledges that the development of this Standard was made possible, in part, by the financial support of Natural Resources Canada.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Hydrogen Fuelling Systems, under the jurisdiction of the Technical Committee on Hydrogen Transportation and the Strategic Steering Committee on Transportation, and has been formally approved by the Technical Committee.

This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

This Standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

**Interpretations:** The Strategic Steering Committee on Transportation has provided the following direction for the interpretation of Standards under its jurisdiction: “The literal text shall be used in judging compliance of products with the safety requirements of this Standard. When the literal text cannot be applied to the product, such as for new materials or construction, and when a relevant CSA committee interpretation has not already been published, CSA Group’s procedures for interpretation shall be followed to determine the intended safety principle.”

**Notes:**

- 1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- 2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
- 3) *This Standard was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
- 4) *To submit a request for interpretation of this Standard, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Request for interpretation” in the subject line:*
  - a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
  - b) *provide an explanation of circumstances surrounding the actual field condition; and*
  - c) *where possible, phrase the request in such a way that a specific “yes” or “no” answer will address the issue.*

*Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the Current Standards Activities page at [standardsactivities.csagroup.org](http://standardsactivities.csagroup.org).*



- 5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Proposal for change” in the subject line:*
  - a) *Standard designation (number);*

- b) *relevant clause, table, and/or figure number;*
- c) *wording of the proposed change; and*
- d) *rationale for the change.*

# SDG Foreword

CSA Group develops and maintains Standards across a broad range of topics, most of which support the United Nations Sustainable Development Goals (UN SDGs) towards shaping a sustainable and resilient future.

Through a robust mapping process, connections between CSA/ANSI HGV 5.2:24 and the following SDGs have been identified:

|                |   |   |
|----------------|---|---|
| <b>SDG</b>     |  |  |
| <b>Targets</b> | 7.a, 7.2  | 9.2, 9.4  |

CSA/ANSI HGV 5.2:24 has notable linkages with the following SDGs:

- SDG 7: *Affordable and Clean Energy*
- SDG 9: *Industry, Innovation, and Infrastructure*

For further information on CSA Group's SDG Mapping initiative, please visit:

<https://www.csagroup.org/sdg/>

Disclaimer: It is important to note that although some Standards explicitly support SDG targets, not all Standards link to the SDGs. Standards users should always take care and be specific when claiming their support of SDGs through the use of Standards. The SDG mapping outcomes made available by CSA Group are intended to assist users in their evaluation of how the application of a Standard can support their work towards SDG achievement.

# CSA/ANSI HGV 5.2:24

## Compact hydrogen fuelling systems

### 1 Scope

#### 1.1 General

This Standard specifies the mechanical, electrical, and safety requirements for newly designed and manufactured compact hydrogen fuelling systems (cHFS) and similar integral hydrogen generation, compression, storage, and dispensing systems intended to fuel on- or off-road hydrogen motor vehicles equipped with onboard fuel containers that are compliant with SAE J2579 or UN Global Technical Regulation No. 13.

#### 1.2 Application

The requirements in Clause [1.1](#) apply to integrated or factory-matched (i.e., modular) hydrogen generating and fuelling equipment that

- a) is intended for fuelling of hydrogen-powered vehicles only;
- b) is intended for indoor or outdoor installations;
- c) has a hydrogen generator within the enclosure or hydrogen pipeline source;
- d) produces (or consumes if pipeline is used) hydrogen at a rate equal to or less than the limit referenced in NFPA 2, Section 10.7.4.2;
- e) has a compressor with a single or multiple compression stages;
- f) is intended to meet the installation fire safety requirements in accordance with NFPA 2 or CAN/BNQ 1784-000;
- g) is intended for fill pressures of 350 bar and/or 700 bar fuelling;
- h) is intended for fuel quality that meets or exceeds requirements in SAE J2719; and
- i) consists of single and/or dual hose fuelling systems.

**Note:** A cHFS that also supplies oxygen as a product is excluded from the Scope of this Standard.

#### 1.3 Unit of measure

The values given in SI units are the units of record for the purposes of this Standard. The values given in parentheses are for information and comparison only.

#### 1.4 Standard conditions

Unless otherwise stated, standard conditions are as follows:

- a) temperature, 15 °C; and
- b) pressure, 101 kPa.

#### 1.5 Pressure references

Unless otherwise specified, all references to pressure throughout this standard are to be considered gauge pressures.

#### 1.6 Resolution of conflict

In the case of conflict between this Standard and federal, provincial, state, or local requirements, the authority having jurisdiction (AHJ) over requirements take precedence.