Bureau de normalisation du Québec

PORTRAIT DES NORMES LIÉES À LA TECHNOLOGIE DE L'HYDROGÈNE

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INTRODUCTION

Ce document est écrit par le Bureau de Normalisation du Québec (BNQ) pour Transition Énergétique Québec (TEQ).

Ce catalogue non exhaustif des documents normatifs principaux dans le domaine émergeant des technologies de l'hydrogène forme une base de connaissance préliminaire. Le domaine des technologies de l'hydrogène est considéré comme émergeant, mais, selon l'International Energy Agency (IEA), a un potentiel de devenir un vecteur d'énergie propre. D'ailleurs, cette même agence indique :

"Enhanced international co-operation is needed across the board but especially on standards, sharing of good practices and crossborder infrastructure. Hydrogen production and use need to be monitored and reported on a regular basis to keep track of progress towards long-term goals."

Le BNQ est fortement impliqué dans le domaine des technologies de l'hydrogène de par la publication du document **CAN/BNQ 1784-000** *Code canadien d'installation de l'hydrogène*, la gestion du comité technique international ISO/TC 197 Technologies de l'hydrogène, ainsi que l'administration du Comité parallèle canadien de l'ISO/TC 197 Technologies de l'hydrogène.

Il est important de rappeler la portée d'application d'une norme : sauf les normes exceptionnelles qui sont inscrites dans la règlementation, les normes sont d'application volontaire. Cet aspect d'application volontaire est en réalité la force d'une norme : si une organisation cherche à se conformer aux exigences et aux recommandations d'une norme ou à être certifiée ou accréditée selon une norme, elle le fait de façon volontaire. Nous entendons que les normes n'ont pas strictement de portée régionale, mais les organismes d'élaboration de normes (OEN) sont assujettis aux exigences d'accréditation de leur pays d'appartenance.

Ainsi, les OEN sont assujettis à un protocole national établi. Qui plus est, les experts présents sur des comités de normalisation ont nécessairement en considération les règlementations nationales ou régionales, et les considérations appropriées pour le lieu de publication. À titre d'exemple, les normes canadiennes sont publiées avec la participation d'experts canadiens dans le contexte canadien. Dans la même logique, les normes américaines sont publiées

avec l'approbation de l'expertise américaine, ciblant principalement le marché américain et les normes françaises sont publiées avec l'approbation de l'expertise française et ainsi de suite.

Les normes internationales sur le sujet de la production, du stockage et du transport d'hydrogène, principalement publiées par les organisations ISO, IEC et CEN/CENELEC, peuvent nécessiter une modification ou une harmonisation nationale ou régionale pour être applicables, mais généralement sont écrites avec les connaissances de l'expertise approfondie offerte par l'ensemble des experts des pays de la communauté internationale. Une norme publiée par un autre pays, par exemple l'Allemagne par DIN, peut avoir des exigences ou des recommandations complémentaires aux normes canadiennes, mais sans l'approbation de l'expertise canadienne pour assurer que ces recommandations ne sont pas en contradiction avec les règlementations ou les autres normes canadiennes, les normes étrangères ne sont pas régulièrement référencées de façon systématique. Une norme publiée selon les règles de normalisation canadiennes est identifiée par les lettres CAN (pour le Canada), ou ANSI (pour les États-Unis d'Amérique). Ainsi, une norme CAN/BNQ est une norme ayant été rédigée et publiée par le BNQ selon les règles canadiennes déterminées par le Conseil canadien des normes (CCN, ou SCC – Standards Council of Canada).

Les pays qui ont un intérêt marqué dans les technologies de l'hydrogène (ainsi que leurs organismes de normalisation nationaux) sont identifiés dans le Tableau 1.

TABLEAU 1 : PAYS IMPLIQUÉS DANS LE DÉVELOPPEMENT DE NORMES DE TECHNOLOGIES DE L'HYDROGÈNE

Pays	Sigle de l'Organisation de normalisation	Pays	Sigle de l'Organisation de normalisation
Allemagne	DIN	Autriche	ASI
Argentine	IRAM	Brésil	ABNT
Australie	SA	Égypte	EOS
Belgique	NBN	Hong Kong	ITCHKSAR
Canada	SCC	Hongrie	MSZT
Chine	SAC	Iran, République islamique d'	ISIRI
Corée, République de	KATS	Pologne	PKN
Danemark	DS	Roumanie	ASRO
Espagne	UNE	Serbie	ISS
États-Unis	ANSI	Sri Lanka	SLSI
Finlande	SFS	Suisse	SNV
France	AFNOR	Thaïlande	TISI
Inde	BIS	Turquie	TSE
Italie	UNI		
Japon	JISC		
Norvège	SN		
Nouvelle-Zélande	NZSO		
Pays-Bas	NEN		
Royaume-Uni	BSI		
Russie, Fédération de la	GOST R		
Suède	SIS		
Tchèque, République	UNMZ		

Ce catalogue est structuré selon les 4 volets significatifs suivants :

1. Composantes et applications véhiculaires;
2. Environnement des installations et sureté;
3. Production, stockage et transport d'hydrogène;
4. Applications stationnaires et piles à combustible.

Ces volets sont regroupés par les thèmes dans lesquels les documents normatifs gravitent naturellement selon les demandes.

Les normes sont listées suivant l'ordre alphabétique de l'organisation qui publie le document. Certaines organisations sont plus significatives que d'autres dans chacun des volets. Les organisations qui publient des documents, mais qui ne sont pas des organisations nationales de normalisation, sont identifiées dans le Tableau 2.

TABLEAU 2 : SIGLES DES ORGANISMES QUI PUBLIENT DES DOCUMENTS NORMATIFS

Organisation	Sigle ou acronyme	Commentaires si nécessaires
American Society of Mechanical Engineers	ASME	Organisation américaine, mais dont la participation et les documents sont reconnus à l'échelle internationale.
Compressed Gas Association	CGA	Organisation américaine, mais dont la participation et les documents sont reconnus à l'échelle internationale.
Groupe CSA	CSA	Organisation canadienne, mais avec des bureaux dans plusieurs pays (et donc qui peuvent publier des normes selon des exigences autres que canadiennes.
Commission Électrotechnique Internationale	IEC	Basé à Genève (Suisse).
Organisation Internationale de normalisation	ISO	Basé à Genève (Suisse).
National Fire Protection Association	NFPA	Organisation américaine, mais dont la participation et les documents sont reconnus à l'échelle internationale.
Society of Automotive Engineers	SAE	Organisation américaine, mais dont la participation et les documents sont reconnus à l'échelle internationale.

L'objet et le domaine d'application sont retranscrits dans la mesure du possible. Il est conseillé aux utilisateurs de vérifier le résumé de chaque document afin de valider qu'il n'y ait pas d'exclusions applicables avant de se procurer le document.

Lorsqu'elle est disponible, l'information est donnée en français. Lorsqu'elle est uniquement disponible en anglais, l'information est en italique.

Si elle est donnée, l'année de publication de la plus récente édition est donnée après les deux points. Si une publication plus récente existe, il est recommandé aux utilisateurs d'utiliser la plus récente édition.

1 COMPOSANTES ET APPLICATIONS VÉHICULAIRES

L'hydrogène est typiquement utilisé comme carburant pour des piles à combustible afin de convertir l'énergie qui découle de la réaction chimique avec l'oxygène ambiant en électricité. Certains projets marginaux visent à utiliser l'hydrogène en tant que carburant ou composante du carburant dans un moteur à combustion interne. Il existe des projets pour utiliser les piles à combustible afin d'alimenter des véhicules aériens.

Au Canada, et en général, les véhicules qui utilisent des piles à combustible ou des moteurs pour une combustion interne de l'hydrogène suivent généralement les mêmes règles de construction et d'essais que les autres véhicules à batterie ou à moteur à combustion interne.

Les normes identifiées dans ce tableau sont principalement utilisées pour la conception, la fabrication, et l'inspection des éléments liés aux véhicules et aux composantes véhiculaires qui utilisent l'hydrogène comme combustible. Bien que les travaux ne soient pas normatifs dans un sens strict, nous citons également les efforts d'harmonisation des groupes de l'Organisation des Nations Unies (UN) GTR 13 et GTR 29. Ces groupes *de Global Technical Regulations* visent à harmoniser respectivement les sujets suivants : *Global Technical Regulation concerning the hydrogen and fuel cell vehicles,* et *Global Technical Regulation concerning Hydrogen Vehicles - Liquid Hydrogen, Gaseous Hydrogen.*

Typiquement, les manufacturiers d'automobiles et de pièces et connecteurs se fient aux normes SAE, surtout les normes SAE J2601, et SAE 2799. Les fabricants de carburant se fient régulièrement à la norme ISO 14687.

Les documents notamment utilisés pour la terminologie du milieu sont ISO/TR 8713 et SAE J2760.

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
CGA C-6.4	*Methods for External Visual Inspection of Natural Gas Vehicle (NGV) and Hydrogen Gas Vehicle (HGV) Fuel Containers and Their Installations*	*This publication provides information and procedures for the periodic visual examination and inspection of natural gas and hydrogen fuel containers and the condition of the installation. These containers are installed in vehicles qualified by the original equipment manufacturer (OEM) or aftermarket vehicle manufacturer to meet the following U.S. or Canadian standards:* *– ANSI NGV2, American National Standard for Natural Gas Vehicle Containers;* *– U.S. Department of Transportation (DOT) National Highway Traffic Safety Administration (NHTSA)* *FMVSS, Standard No. 304, Compressed Natural Gas Fuel Container Integrity;* *– Canadian Motor Vehicle Safety Regulations, Standard 301.2, CNG Fuel System Integrity; and* *– Canadian Standards Association (CSA) B51, Boiler, Pressure Vessel, and Pressure Piping Code.*	• Inspection • Stockage • Véhicules
CSA HGV 2	*Compressed hydrogen gas vehicle fuel containers*	*This Standard contains requirements for the material, design, manufacture, marking, and testing of serially produced, refillable Type HGV2 containers intended only for the storage of compressed hydrogen gas for on-road vehicle operation. These containers:* *a) are to be permanently attached to the vehicle* *b) have a capacity of up to 1 000 liters (35.4 ft3) water capacity* *c) have a nominal working pressure that does not exceed 70 MPa*	• Matériaux • Essais • Stockage • Véhicules
CSA HGV 3.1	*Fuel System Components for Hydrogen Gas Powered Vehicles*	*This Standard establishes requirements for newly produced compressed hydrogen gas fuel system components, intended for use on hydrogen gas powered vehicles as listed below:* *a) check valves;* *b) manual valves;* *c) manual container valves;* *d) automatic valves;* *e) gas injectors;* *f) pressure indicators;* *g) pressure regulator;* *h) pressure relief valves;* *i) pressure relief devices;* *j) excess flow valves;* *k) gas-tight housing and leakage capture lines and passages;*	• Composantes • Véhicules

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		l) rigid fuel lines; *m) flexible fuel lines;* *n) filter housing;* *o) fittings; and* *p) discharge line closures.* *This Standard applies to devices that have a service pressure of either 25MPa, 35MPa, 50MPa, or 70MPa.*	
ISO 6469	Véhicules routiers électriques — Spécifications de sécurité — Partie 3: Sécurité électrique *Electrically propelled road vehicles — Safety specifications — Part 1: Rechargeable energy storage system (RESS)*	*This document specifies safety requirements for rechargeable energy storage systems (RESS) of electrically propelled road vehicles for the protection of persons.* *It does not provide the comprehensive safety information for the manufacturing, maintenance and repair personnel.*	• Sécurité • Véhicules
ISO/TR 8713	Véhicules routiers électriques — Vocabulaire *Electrically propelled road vehicles — Vocabulary*	*This document establishes a vocabulary of terms and the related definitions used in ISO/TC 22/SC 37 standards.*	• Véhicules
ISO 13984:1999	Hydrogène liquide — Interface des systèmes de remplissage pour véhicules terrestres *Liquid hydrogen — Land vehicle fuelling system interface*	*This International Standard specifies the characteristics of liquid hydrogen refuelling and dispensing systems on land vehicles of all types in order to reduce the risk of fire and explosion during the refuelling procedure and thus to provide a reasonable level of protection from loss of life and property.* *This International Standard is applicable to the design and installation of liquid hydrogen (LH2) fuelling and dispensing systems. It describes the system intended for the dispensing of liquid hydrogen to a vehicle, including that portion of the system that handles cold gaseous hydrogen coming from the*	• Hydrogène liquide • Ravitaillement • Véhicules

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		vehicle tank, that is, the system located between the land vehicle and the storage tank.	
ISO 13985:2006	Hydrogène liquide — Réservoirs de carburant pour véhicules terrestres *Liquid hydrogen — Land vehicle fuel tanks*	*This standard specifies the construction requirements for refillable fuel tanks for liquid hydrogen used in land vehicles as well as the testing methods required to ensure that a reasonable level of protection from loss of life and property resulting from fire and explosion is provided.* *It is applicable to fuel tanks intended to be permanently attached to land vehicles.*	• Hydrogène liquide • Stockage • Véhicules
ISO 14687	Qualité du carburant hydrogène — Spécification de produit *Hydrogen fuel quality — Product specification*	*This document specifies the minimum quality characteristics of hydrogen fuel as distributed for utilization in vehicular and stationary applications.* *It is applicable to hydrogen fuelling applications.*	• Qualité • Carburant
ISO 17268:2020	Dispositifs de raccordement pour le ravitaillement des véhicules terrestres en hydrogène gazeux *Gaseous hydrogen land vehicle refuelling connection devices*	Le présent document définit les caractéristiques de conception, de sécurité et d'exploitation des connecteurs destinés au ravitaillement des véhicules terrestres à hydrogène gazeux (GHLV). Les connecteurs de ravitaillement des GHLV sont constitués des éléments suivants, selon le cas: — un réceptacle et un bouchon de protection (montés sur le véhicule); — un pistolet; — un module de communication. Le présent document s'applique aux connecteurs de ravitaillement ayant une pression de service nominale ou un niveau de service d'hydrogène ne dépassant pas 70 MPa. Le présent document ne s'applique pas aux connecteurs de ravitaillement servant à distribuer des mélanges d'hydrogène et de gaz naturel.	• Ravitaillement • Véhicules

Norme	**Titre**	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
ISO 19880-1:2020	Carburant d'hydrogène gazeux — Stations-service — Partie 1: Exigences générales *Gaseous hydrogen — Fuelling stations — Part 1: General requirements*	*This document defines the minimum design, installation, commissioning, operation, inspection and maintenance requirements, for the safety, and, where appropriate, for the performance of public and non-public fuelling stations that dispense gaseous hydrogen to light duty road vehicles (e.g. fuel cell electric vehicles).* *This document is not applicable to the dispensing of cryogenic hydrogen, or hydrogen to metal hydride applications.* *While this document is targeted for the fuelling of light duty hydrogen road vehicles, requirements and guidance for fuelling medium and heavy duty road vehicles (e.g. buses, trucks) are also covered.* *Many of the generic requirements within this document are applicable to fuelling stations for other hydrogen applications. However, further specific requirements that can be necessary for the safe operation of such fuelling stations are not addressed in this document.*	• Ravitaillement • Véhicules • Stations
ISO 19880-3:2018	Carburant d'hydrogène gazeux — Stations-service — Partie 3: Vannes *Gaseous hydrogen — Fuelling stations — Part 3: Valves*	*This document provides the requirements and test methods for the safety performance of high pressure gas valves that are used in gaseous hydrogen stations of up to the H70 designation.* *This document covers the following gas valves:* *- check valve;* *- excess flow valve;* *- flow control valve;* *- hose breakaway device;* *- manual valve;* *- pressure safety valve;* *- shut-off valve.*	• Ravitaillement • Véhicules • Stations • Composantes

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
ISO 19880-5:2019	*Gaseous hydrogen — Fuelling stations — Part 5: Dispenser hoses and hose assemblies*	*This document specifies the requirements for wire or textile reinforced hoses and hose assemblies suitable for dispensing hydrogen up to 70 MPa nominal working pressure, in the operating temperature range of −40 °C to 65 °C.* *This document contains safety requirements for material, design, manufacture and testing of gaseous hydrogen hose and hose assemblies for hydrogen fuelling stations.*	• Ravitaillement • Matériaux • Stations
ISO 19880-8:2019	Hydrogène gazeux — Stations de remplissage — Partie 8: Contrôle qualité du carburant *Gaseous hydrogen — Fuelling stations — Part 8: Fuel quality control*	*This document specifies the protocol for ensuring the quality of the gaseous hydrogen at hydrogen distribution facilities and hydrogen fuelling stations for proton exchange membrane (PEM) fuel cells for road vehicles.*	• Ravitaillement • Qualité • Stations • Carburant
ISO 19881:2018	Hydrogène gazeux — Réservoirs de carburant pour véhicules terrestres *Gaseous hydrogen — Land vehicle fuel containers*	*This document contains requirements for the material, design, manufacture, marking and testing of serially produced, refillable containers intended only for the storage of compressed hydrogen gas for land vehicle operation. These containers* *a) are permanently attached to the vehicle,* *b) have a capacity of up to 1 000 l water capacity, and* *c) have a nominal working pressure that does not exceed 70 MPa.* *The scope of this document is limited to fuel containers containing fuel cell grade hydrogen according to ISO 14687 for fuel cell land vehicles and Grade A or better hydrogen as per ISO 14687 for internal combustion engine land vehicles. This document also contains requirements for hydrogen fuel containers acceptable for use on-board light duty vehicles, heavy duty vehicles and industrial powered trucks such as forklifts and other material handling vehicles.*	• Manufacture • Véhicules • Stockage
ISO 19882:2018	Hydrogène gazeux — Dispositifs limiteurs de pression thermiquement activés pour les conteneurs de	*This document establishes minimum requirements for pressure relief devices intended for use on hydrogen fuelled vehicle fuel containers that comply with*	• Composantes

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
	carburant de véhicules à hydrogène comprimé *Gaseous hydrogen — Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers*	*ISO 19881, IEC 62282-4-101, ANSI HGV 2, CSA B51 Part 2, EC79/EU406, SAE J2579, or the UN GTR No. 13.* *The scope of this document is limited to thermally activated pressure relief devices installed on fuel containers used with fuel cell grade hydrogen according to SAE J2719 or ISO 14687 for fuel cell land vehicles, and Grade A or better hydrogen according to ISO 14687 for internal combustion engine land vehicles. This document also contains requirements for thermally activated pressure relief devices acceptable for use on-board light duty vehicles, heavy duty vehicles and industrial powered trucks such as forklifts and other material handling vehicles, as it pertains to UN GTR No. 13.* *Pressure relief devices designed to comply with this document are intended to be used with high quality hydrogen fuel such as fuel complying with SAE J2719 or ISO 14687 Type 1 Grade D.* *Pressure relief devices can be of any design or manufacturing method that meets the requirements of this document.*	
SAE AS 6858	*Installation of Fuel Cell Systems in Large Civil Aircraft*	*This is a joint SAE/EUROCAE development. This document will be released as both an SAE Aerospace Specification (AS) and a EUROCAE Minimum Aviation System Performance Standard (MASPS).* *This document defines the technical requirements for the safe integration of gaseous hydrogen fueled Proton Exchange Membrane (PEM) Fuel Cell Systems (FCS) within the aircraft.* *Most of the technical concepts and approaches covered by this document represent current industry "best practice". Others require specific approval from the procuring activity before use. This requirement for approval is not intended to prohibit their use; but rather to ensure that the prime contractor has fully investigated their capability to perform reliably and to be sufficiently durable under the required conditions and that the prime contractor can present substantiating evidence for approval before the design is committed to.*	• Matériaux • Avions • Composantes

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
SAE AIR 6464	*Hydrogen Fuel Cells Aircraft Fuel Cell Safety Guidelines*	*This document defines the technical guidelines for the safe integration of Proton Exchange Membrane (PEM) Fuel Cell Systems (FCS), fuel (considered to be liquid and compressed hydrogen storage types only), fuel storage, fuel distribution and appropriate electrical systems into the aircraft.*	• Stockage • Avions • Sécurité
SAE J1766	*Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing*	*Electric, Fuel Cell and Hybrid vehicles may contain many types of high voltage systems. Adequate barriers between occupants and the high voltage systems are necessary to provide protection from potentially harmful electric current and materials within the high voltage system that can cause injury to occupants of the vehicle during and after a crash. This SAE Recommended Practice is applicable to Electric, Fuel Cell and Hybrid vehicle designs that are comprised of at least one vehicle propulsion voltage bus with a nominal operating voltage greater than 60 and less than 1,500 VDC, or greater than 30 and less than 1,000 VAC. This Recommended Practice addresses post-crash electrical safety, retention of electrical propulsion components and electrolyte spillage.*	• Essais • Véhicules • Sécurité
SAE J2572	*Recommended Practice for Measuring Fuel Consumption and Range of Fuel Cell and Hybrid Fuel Cell Vehicles Fueled by Compressed Gaseous Hydrogen*	*This SAE Recommended Practice establishes uniform procedures for testing fuel cell and hybrid fuel cell electric vehicles, excluding low speed vehicles, designed primarily for operation on the public streets, roads and highways. The procedure addresses those vehicles under test using compressed hydrogen gas supplied by an off-board source or stored and supplied as a compressed gas onboard.* *This practice provides standard tests that will allow for determination of fuel consumption and range based on the US Federal Emission Test Procedures, using the Urban Dynamometer Driving Schedule (UDDS) and the Highway Fuel Economy Driving Schedule (HFEDS).* *Chassis dynamometer test procedures are specified in this document to eliminate the test-to-test variations inherent with track testing, and to adhere to standard industry practice for fuel consumption and range testing.*	• Essais • Carburant • Consommation
SAE J2574	*Fuel Cell Vehicle Terminology*	*This SAE Information Report contains definitions for hydrogen fuel cell powered vehicle terminology. It is intended that this document be a resource for those*	• Vocabulaire

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		writing other hydrogen fuel cell vehicle documents, specifically, Standards or Recommended Practices.	
SAE J2600	*Compressed Hydrogen Surface Vehicle Fueling Connection Devices*	*AE J2600 applies to the design and testing of Compressed Hydrogen Surface Vehicle (CHSV) fueling connectors, nozzles, and receptacles. Connectors, nozzles, and receptacles must meet all SAE J2600 requirements and pass all SAE J2600 testing to be considered as SAE J2600 compliant.* *This document applies to devices which have Pressure Classes of H11, H25, H35, H50 or H70.*	• Composantes • Ravitaillement
SAE J2601	*Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles*	*SAE J2601 establishes the protocol and process limits for hydrogen fueling of light duty vehicles. These process limits (including the fuel delivery temperature, the maximum fuel flow rate, the rate of pressure increase and the ending pressure) are affected by factors such as ambient temperature, fuel delivery temperature and initial pressure in the vehicle's compressed hydrogen storage system. SAE J2601 establishes standard fueling protocols based on either a look-up table approach utilizing a fixed pressure ramp rate, or a formula based approach utilizing a dynamic pressure ramp rate continuously calculated throughout the fill. Both protocols allow for fueling with communications or without communications. The table-based protocol provides a fixed end-of-fill pressure target, whereas the formula-based protocol calculates the end-of-fill pressure target continuously. For fueling with communications, this standard is to be used in conjunction with SAE J2799, Hydrogen Surface Vehicle to Station Communications Hardware and Software.*	• Protocoles • Ravitaillement
SAE J2601/2	*Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles*	*The purpose of this document is to provide performance requirements for hydrogen dispensing systems used for fueling 35 MPa heavy duty hydrogen transit buses and vehicles (other pressures are optional).* *This document establishes the boundary conditions for safe heavy duty hydrogen surface vehicle fueling, such as safety limits and performance requirements for gaseous hydrogen fuel dispensers used to fuel hydrogen transit buses. For fueling light-duty vehicles SAE J2601 should be used.*	• Protocoles • Ravitaillement • Véhicules lourds

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		SAE J2601-2 is a performance based protocol document that also provides guidance to fueling system builders, manufacturers of gaseous hydrogen powered heavy duty transit buses, and operators of the hydrogen powered vehicle fleet(s). *This fueling protocol is suitable for heavy duty vehicles with a combined vehicle CHSS capacity larger than 10 kilograms aiming to support all practical capacities of transit buses. It is non-prescriptive in how to achieve a full fill or 100% state of charge (SOC) in the vehicle tank storage system.* *This document is an independent document from SAE J2601 "Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles" and should be used separately.* *The fueling limits shown in this document are harmonized with the fueling assumptions used for on-board fuel systems, as provided by gaseous hydrogen transit bus manufacturers.*	
SAE J2601/3	*Fueling Protocol for Gaseous Hydrogen Powered Industrial Trucks*	*This document establishes safety limits and performance requirements for gaseous hydrogen fuel dispensers used to fuel Hydrogen Powered Industrial Trucks (HPITs). It also describes several example fueling methods for gaseous hydrogen dispensers serving HPIT vehicles.* *SAE J2601-3 offers performance based fueling methods and provides guidance to fueling system builders as well as suppliers of hydrogen powered industrial trucks and operators of the hydrogen powered vehicle fleet(s). This fueling protocol for HPITs can support a wide range of hydrogen fuel cell hybrid electric vehicles including fork lifts, tractors, pallet jacks, on and off road utility, and specialty vehicles of all types.* *The mechanical connector geometry for H25 and H35 connectors are defined in SAE J2600 Compressed Hydrogen Surface Vehicle Refueling Connection Devices.*	• Protocoles • Ravitaillement • Véhicules lourds

Norme	**Titre**	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
SAE J2579	*Standard for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles*	*The purpose of this document is to define design, construction, operational, and maintenance requirements for hydrogen fuel storage and handling systems in on-road vehicles.* *Performance-based requirements for verification of design prototype and production hydrogen storage and handling systems are also defined in this document. Complementary test protocols (for use in type approval or self-certification) to qualify designs (and/or production) as meeting the specified performance requirements are described.* *Crashworthiness of hydrogen storage and handling systems is beyond the scope of this document. SAE J2578 includes requirements relating to crashworthiness and vehicle integration for fuel cell vehicles. It defines recommended practices related to the integration of hydrogen storage and handling systems, fuel cell system, and electrical systems into the overall Fuel Cell Vehicle.*	• Stockage • Véhicules
SAE J2760	*Pressure Terminology Used In Fuel Cells and Other Hydrogen Vehicle Applications*	*SAE J2579 is being developed by the SAE Fuel Cell Vehicle (FCV) Standards Committee to provide recommended practices for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles. As part of this work, definitions for pressurized systems and containers were developed. The purpose of this document is to disseminate these definitions prior to the release of SAE J2579 such that other technical groups are aware of the information.*	• Vocabulaire
SAE J2719	*Hydrogen Fuel Quality for Fuel Cell Vehicles*	*This Standard provides background information and a hydrogen fuel quality standard for commercial proton exchange membrane (PEM) fuel cell vehicles. This Report also provides background information on how this standard was developed by the Hydrogen Quality Task Force (HQTF) of the Interface Working Group (IWG) of the SAE Fuel Cell Standards Committee.*	• Qualité • Composantes
SAE J2799	*Hydrogen Surface Vehicle to Station Communications Hardware and Software*	*This standard specifies the communications hardware and software requirements for fueling hydrogen surface vehicles (HSV), such as fuel cell vehicles, but may also be used where appropriate, with heavy-duty vehicles (e.g., busses) and industrial trucks (e.g., forklifts) with compressed hydrogen storage. It contains a description of the communications hardware and communications protocol that may be used to refuel the HSV. The intent of this*	• Protocoles • Communication • Ravitaillement • Véhicules

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		standard is to enable harmonized development and implementation of the hydrogen fueling interfaces. *This standard is intended to be used in conjunction with the hydrogen fueling protocols in SAE J2601 and nozzles and receptacles conforming with SAE J2600.*	
SAE J2990/1	*Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice*	*Electric and alternative fueled vehicles present different hazards for first and second responders than conventional gasoline internal combustion engines. Hydrogen vehicles (H2V) including Fuel Cell Vehicles (FCVs) involved in incidents may present unique hazards associated with the fuel storage and high voltage systems.* *The electrical hazards associated with the high voltage systems of hybrid-electric vehicles and FCVs are already addressed in the parent document, SAE J2990. This Recommended Practice therefore addresses electric issues by reference to SAE J2990 and supplements SAE J2990 to address the potential consequences associated with hydrogen vehicle incidents and suggest common procedures to help protect emergency responders, tow and/or recovery, storage, repair, and salvage personnel after an incident has occurred. Industry design standards and tools were studied and where appropriate, suggested for responsible organizations to implement.*	• Sécurité

2 ENVIRONNEMENT DES INSTALLATIONS ET SURETÉ

Les normes identifiées dans le tableau ici-bas sont principalement utilisées pour les installations et la sécurité de l'environnement. Ceci implique que les installations physiques sont communément conçues et réalisées en citant les documents identifiés. Nous considérons que le terme environnement invoque le concept de lieu physique où se situent les installations. Dans une moindre mesure, CGA P-37 adresse l'environnement dans son sens plus commun pour minimiser les problématiques de contamination.

Au Canada, il est important de signaler l'importance du Code canadien d'installation d'hydrogène, et les installations selon l'ASME BPVC qui sont tous les deux régulièrement cités dans la règlementation. Les parties applicables du BPVC sont également citées ici. Toutes les installations doivent être conformes au Code national du bâtiment du Canda et au Code électrique du Canada. Les autres normes ASME, A13.1, B31.1, B31.3, et B.31.12, sont communément citées dans les normes sur l'hydrogène et sont également considérées comme des documents phares.

La suite des documents CSA HGV 4.X sont les normes qui sont citées à la fois aux États-Unis et au Canada dans le Code Canadien d'Installation d'Hydrogène. Ces normes servent à baliser les installations de stations d'hydrogène sous leurs différents aspects.

Le document CGA G-5 est communément cité pour les caractéristiques physiques et chimiques de l'hydrogène.

Norme	**Titre**	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
ASME BPVC Section II	*Materials*	*Part A)* *This Section is a "Service Section" to the other BPVC Sections, providing material specifications for ferrous materials adequate for safety in the field of pressure equipment. These specifications contain requirements for chemical and mechanical properties, heat treatment, manufacture, heat and product analyses, and methods of testing. They are designated by SA numbers and are identical with or similar to those of specifications published by ASTM and other recognized national or international organizations.* *Part B)* *This Section is a "Service Section" to the other BPVC Sections, providing material specifications for ferrous materials adequate for safety in the field of pressure equipment. These specifications contain requirements for chemical and mechanical properties, heat treatment, manufacture, heat and product analyses, and methods of testing. They are designated by SB numbers and are identical*	• Matériaux • Stockage

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		with or similar to those of specifications published by ASTM and other recognized national or international organizations. *Part C)* *This Section is a "Service Section" to the other BPVC Sections providing material specifications for the manufacture, acceptability, chemical composition, mechanical usability, surfacing, testing requirements and procedures, operating characteristics, and intended uses for welding rods, electrodes and filler metals. These specifications are designated by SFA numbers and are derived from AWS specifications.* *Part D)* *This Section is a "Service Section" for reference by the BPVC construction Sections providing tables of material properties including allowable, design, tensile and yield stress values, physical properties and external pressure charts and tables. Part D facilitates ready identification of materials to specific Sections of the Boiler and Pressure Vessel Code. Part D contains appendices which contain criteria for establishing allowable stress, the bases for establishing external pressure charts, and information required for approval of new materials. Access to the online version of the stress tables is included with purchase of this hard copy.*	
ASME BPVC Section V	*Nondestructive examination*	*This Section contains requirements and methods for nondestructive examination which are referenced and required by other BPVC Sections. It also includes manufacturer's examination responsibilities, duties of authorized inspectors and requirements for qualification of personnel, inspection and examination. Examination methods are intended to detect surface and internal discontinuities in materials, welds, and fabricated parts and components. A glossary of related terms is included.*	• Essai
ASME BPVC Section VIII	*Rules for Construction of Pressure Vessels*	*Division 1)* *This Division of Section VIII provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at*	• Stockage

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		either internal or external pressures exceeding 15 psig. Such pressure vessels may be fired or unfired. Specific requirements apply to several classes of material used in pressure vessel construction, and also to fabrication methods such as welding, forging and brazing. It contains mandatory and nonmandatory appendices detailing supplementary design criteria, nondestructive examination and inspection acceptance standards. Rules pertaining to the use of the U, UM and UV ASME Product Certification Marks are also included. *Division 2)* *This Division of Section VIII provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures exceeding 15 psig. Such vessels may be fired or unfired. This pressure may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof. These rules provide an alternative to the minimum requirements for pressure vessels under Division 1 rules. In comparison the Division 1, Division 2 requirements on materials, design, and non-destructive examination are more rigorous; however, higher design stress intensify values are permitted. Division 2 rules cover only vessels to be installed in a fixed location for a specific service where operation and maintenance control is retained during the useful life of the vessel by the user who prepares or causes to be prepared the design specifications. These rules may also apply to human occupancy pressure vessels typically in the diving industry. Rules pertaining to the use of the U2 and UV ASME Product Certification Marks are also included.* *Division 3)* *This Division of Section VIII provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures generally above 10,000 psi. Such vessels may be fired or unfired. This pressure may be obtained from an external source, a process reaction, by the application of heat from a direct or indirect source, or any combination thereof. Division 3 rules cover vessels intended for a specific service and installed in a fixed location or relocated from work site to work site between pressurizations. The operation and maintenance control is retained*	

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		during the useful life of the vessel by the user who prepares or causes to be prepared the design specifications. Division 3 does not establish maximum pressure limits for either Section VIII, Divisions 1 or 2, nor minimum pressure limits for this Division. Rules pertaining to the use of the UV3 ASME Product Certification Marks are also included.	
ASME BPVC Section IX	*Welding, Brazing, and Fusing Qualifications*	*This Section contains rules relating to the qualification of welding, brazing, and fusing procedures as required by other BPVC Sections for component manufacture. It also covers rules relating to the qualification and requalification of welders, brazers, and welding, brazing and fusing machine operators in order that they may perform welding, brazing, or plastic fusing as required by other BPVC Sections in the manufacture of components. Welding, brazing, and fusing data cover essential and nonessential variables specific to the joining process used.*	• Soudure • Assemblage
ASME BPVC Section X	*Fiber-Reinforced Plastic Pressure Vessels*	*This Section provides requirements for construction of an FRP pressure vessel in conformance with a manufacturer's design report. It includes production, processing, fabrication, inspection and testing methods required for the vessel. Section X includes three Classes of vessel design; Class I and Class III - qualification through the destructive test of a prototype and Class II - mandatory design rules and acceptance testing by nondestructive methods. These vessels are not permitted to store, handle or process lethal fluids. Vessel fabrication is limited to the following processes: bag-molding, centrifugal casting and filament-winding and contact molding. General specifications for the glass and resin materials and minimum physical properties for the composite materials are given.*	• Installation • Sureté • Stockage
ASME BPVC Section XII	*Rules for Construction and Continued Service of Transport Tanks (BPVC-XII)*	*This Section covers requirements for construction and continued service of pressure vessels for the transportation of dangerous goods via highway, rail, air or water at pressures from full vacuum to 3,000 psig and volumes greater than 120 gallons. "Construction" is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and over-pressure protection. "Continued service" is an all-inclusive term referring to inspection, testing, repair, alteration, and recertification of a transport tank that has been in service. This Section contains modal appendices containing requirements for*	• Installation • Sureté • Stockage

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		vessels used in specific transport modes and service applications. Rules pertaining to the use of the T ASME Product Certification Marks are included.	
ASME A13.1	*Scheme for the Identification of Piping Systems.*	*A13.1 is intended to establish a common system to assist in identification of hazardous materials conveyed in piping systems and their hazards when released in the environment. This scheme concerns identification of contents of piping systems in industrial and power plants. It is also recommended for the identification of piping systems used in commercial and institutional installations, and in buildings used for public assembly. It does not apply to pipes buried in the ground nor to electrical conduits.*	• Installation • Sureté • Tuyauterie
ASME B31.1	*Power Piping.*	*ASME B31.1 prescribes minimum requirements for the design, materials, fabrication, erection, test, inspection, operation, and maintenance of piping systems typically found in electric power generating stations, industrial and institutional plants, geothermal heating systems, and central and district heating and cooling systems.* *It also covers boiler-external piping for power boilers and high-temperature, high pressure water boilers in which steam or vapor is generated at a pressure of more than 15 psig; and high temperature water is generated at pressures exceeding 160 psig and/or temperatures exceeding 250 degrees F.*	• Installation • Sûreté • Tuyauterie • Matériaux
ASME B31.3	*Process Piping.*	*ASME B31.3 contains requirements for piping typically found in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, and cryogenic plants; and related processing plants and terminals. It covers materials and components, design, fabrication, assembly, erection, examination, inspection, and testing of piping.* *This Code applies to piping for all fluids including:* *(1) raw, intermediate, and finished chemicals;* *(2) petroleum products;* *(3) gas, steam, air and water;* *(4) fluidized solids;* *(5) refrigerants; and* *(6) cryogenic fluids.*	• Installation • Sureté • Tuyauterie

Norme	Titre	Objet et domaine d'application (Résumé au besoin)	Mots-Clés
		Also included is piping that interconnects pieces or stages within a packaged equipment assembly.	
ASME B31.12	*Hydrogen Piping and Pipelines.*	*ASME B31.12 Standard on Hydrogen Piping and Pipelines contains requirements for piping in gaseous and liquid hydrogen service and pipelines in gaseous hydrogen service. The general requirements section covers materials, brazing, welding, heat treating, forming, testing, inspection, examination, operating, and maintenance. The industrial piping section covers requirements for components, design, fabrication, assembly, erection, inspection, examination, and testing of piping.* *This Code is applicable to piping in gaseous and liquid hydrogen service and to pipelines in gaseous hydrogen service. B31.12 is applicable up to and including the joint connecting the piping to associated pressure vessels and equipment but not to the vessels and equipment themselves. It is also applicable to the location and type of support elements, but not to the structure to which the support elements are attached.*	• Installation • Sureté • Tuyauterie
CAN/BNQ 1784-000	Code canadien d'installation de l'hydrogène *Canadien Hydrogen Installation Code*	Ce code a pour objet de fixer les exigences quant à l'installation des équipements de production d'hydrogène, des équipements fonctionnant à l'hydrogène, des équipements de distribution d'hydrogène, des récipients de stockage d'hydrogène, de la tuyauterie d'hydrogène, ainsi que de leurs accessoires. Ce code s'applique à toutes les utilisations faisant appel à l'hydrogène gazeux ou liquide, à l'exception, entre autres, d'hydrogène dans les raffineries de pétrole et les usines chimiques comme charge d'alimentation et dans le processus de production. Il a été approuvé par le Conseil canadien des normes (CCN) et porte la désignation **CAN/BNQ.**	• Installation • Sureté
CGA C-21	*Standard for Design, Qualification, and Testing of Pressure Vessels for Portable, Reversible Metal Hydride Systems*	*This publication specifies requirements for design, manufacture, testing, marking, inspection, and approval of a cylindrical pressure vessel component in excess of 4 fl oz (120 ml) internal capacity of a portable, reversible metal hydride storage system.*	• Essais • Stockage • Portable

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
CGA G-4.1	*Cleaning Equipment for Oxygen Service.*	*This publication describes the cleaning methods and requirements for equipment used in the production, storage, distribution, and use of liquid and gaseous oxygen to reduce the risk of fire, explosion, or promotion of combustion. Cleaning in accordance with this publication is required for all surfaces in contact with a gas or liquid that has an oxygen concentration greater than 23.5%. Examples of such equipment include stationary storage tanks, road tankers, and rail cars; pressure vessels such as heat exchangers and distillation columns; compressors and pumps; and associated piping, valves, and instrumentation. However, the cleaning methods and requirements are not limited to this equipment. With modifications, these methods may be used for cleaning other oxygen and oxidizer (e.g., fluorine, nitrogen trifluoride, nitrous oxide) service equipment such as cylinders, cylinder valves, cylinder regulators, welding torches, and pipelines where regulatory re-quirements do not specify cleaning methods.*	• Entretien
CGA G-5	*Hydrogen*	*This publication provides information on the physical and chemical properties of hydrogen and proper handling and use. It is intended to provide background information for personnel involved in the manufacture, distribution, and use of hydrogen. Additional technical information can be obtained from hydrogen gas manufacturers.*	• Vocabulaire • Caractéristiques
CGA G-5.3	*Commodity Specification for Hydrogen*	*This publication describes the current commodity specification for gaseous and liquid hydrogen including hydrogen for fuel cell applications. The document also provides pertinent information on methods of analysis and sampling technique, quality verifications, typical use tables, as well as supplemental graphs and data tables.*	• Caractéristiques
CGA G-5.4	*Standard for Hydrogen Piping Systems at User Locations*	*This standard describes the specifications and general principles recommended for piping systems for gaseous (Type I) or liquid (Type II) hydrogen. The standard applies to hydrogen piping in a supply system (to the source valve) and to customer piping from the source valve to the point of use. For the purposes of this standard, high pressure is defined as gaseous hydrogen at service pressures equal to or greater than 3000 psi (20 680 kPa).* *The information in this standard is general in nature and is intended for designers, fabricators, installers, users, and maintainers of hydrogen piping*	• Tuyauterie • Installations

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		systems as well as for safety personnel, fire departments, building inspectors, and emergency personnel.	
CGA G-5.5	*Hydrogen Vent Systems*	*This publication presents design guidelines for hydrogen vent systems used in gaseous and liquid hydrogen systems at user sites and provides recommendations for safe operation of these vents. It begins at the discharge port of safety devices and other components that control the release of hydrogen and ends at the point where hydrogen concentration in the atmosphere is below the lower flammable limits. Pressure relief devices (PRDs) for cylinders and tube trailers required by U.S. Department of Transportation (DOT) in Title 49 of the U.S Code of Federal Regulations (49 CFR) are not covered in the scope of this publication.*	• Ventilation
CGA G-5.6	*Hydrogen Pipeline Systems*	*This is a joint European Industrial Gases Association (EIGA)/CGA international harmonized standard on metallic transmission and distribution piping systems carrying pure hydrogen and hydrogen mixtures as shown in Figure 1 of Appendix A. It is limited to gaseous products with a temperature range between –40 °C and 175 °C (–40 °F and 347 °F); total pressures from 1 MPa to 21 MPa (150 psig to 3000 psig); and defined concentration criteria.*	• Tuyauterie • Installations
CGA G-5.8	*High Pressure Hydrogen Piping Systems at Consumer Locations (Superseded by G-5.4)*	*This publication describes the specifications and general principles recommended for piping systems for high pressure gaseous (Type I) hydrogen on site from the point where hydrogen enters the distribution piping (the battery limits of the hydrogen storage system) to the point of use at service pressures of 3000 psig (20 684kPa) and above.* *This publication supplements CGA G-5.4, Standard for Hydrogen Piping Systems at Consumer Locations. CGA G-5.4 is limited to service pressures less than 3000 psig, but most of the requirements also apply to high pressure hydrogen piping systems. High pressure hydrogen piping systems shall comply with the requirements of CGA G-5.4 unless a more stringent requirement is included in this publication.*	• Tuyauterie • Installations
CGA H-1	*Service Conditions for Portable, Reversible Metal Hydride Systems*	*This publication outlines the service conditions expected for the system and various system components in a portable, reversible metal hydride system to be used for hydrogen storage. These systems do not include metal hydride battery systems.*	• Hydrures • Portable

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		This publication provides service conditions that are the basis for the design, manufacture, inspection, testing, and approval of the system and system components used with one or more chemical compounds generally described as a metal hydride.	
CGA H-2	*Guideline for Classification and Labeling of Hydrogen Storage Systems with Hydrogen Absorbed in Reversible Metal Hydrides*	*With the commercial introduction of fuel cell-based power systems and the proliferation of hydrogen as a fuel gas, non-traditional hydrogen storage systems are becoming more prevalent. Therefore, there is a need for the dissemination of information on these alternative hydrogen storage technologies.* *The scope of this publication includes hydrogen storage systems in which the hydrogen is absorbed in reversible metal hydrides and for which the system is designed to permanently contain the solid material so only hydrogen gas is introduced into or removed from the system. This publication provides guidance to regulatory authorities, manufacturers, and users for the classification and labeling of these systems.*	• Marquage • Stockage • Hydrures
CGA H-3	*Standard for Cryogenic Hydrogen Storage*	*This publication contains the suggested minimum design and performance requirements for shop-fabricated, vacuum-insulated cryogenic tanks (vertical and horizontal) intended for above ground storage of liquid hydrogen.* *This publication applies to liquid hydrogen storage tanks with maximum allowable working pressures (MAWP) up to and including 175 psi (1210 kPa). Tanks less than 1000 gal (3785 L) gross volume or greater than 25 000 gal (94 600 L) gross volume and all transportable containers are excluded. Tanks outside these pressure and volume constraints may also meet the requirements of this standard when agreed upon by the purchaser/manufacturer and the authority having jurisdiction. This standard does not include operation and installation requirements or emergency response information.*	• Hydrogène liquide • Stockage • Hydrogène liquide
CGA H-4	*Terminology Associated with Hydrogen Fuel Technologies*	*This publication provides a description of the technologies and terminology as they apply to hydrogen fuel production, storage, transport, and use.* *This publication is a single source of uniform terminology for hydrogen fuel technologies. This publication will be useful to persons involved with hydrogen production, storage, transport and use technologies, regulators, and codes and standards developers.*	• Vocabulaire

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
CGA H-5	*Standard for Bulk Hydrogen Supply Systems (an American National Standard)*	*This standard contains minimum requirements for locating/siting, selecting equipment, installing, starting up, maintaining, and removing bulk hydrogen supply systems. Two types of bulk hydrogen supply systems are covered in this standard: liquid and gaseous.* *This standard covers the entire process including site selection, regulatory compliance, equipment selection, equipment transportation and setting, equipment installation, system startup, operation and system removal. This standard also briefly discussed health hazards and safety considerations. Typical flow diagrams are also included.*	• Installation • Stockage
CGA H-10	*Combustion Safety for Steam Reformer Operation*	*This publication applies to steam reformers that are operated with natural gas, refinery off-gas, naphtha, and other light hydrocarbon streams. It specifically applies to large volume hydrogen production plants.* *This publication covers operation, maintenance, and certain design aspects of steam reformers relative to the potential safety hazards of the combustion process inherent to these units. Emphasis is placed on operational guidance and features that provide safeguards against such hazards such as furnace control philosophies, safety interlocks, and inspection routines. The publication is not intended to address the details of design, installation, and construction of steam reformers.*	• Sureté • SMR
CGA H-11	*Safe Startup and Shutdown Practices for Steam Reformers*	*This publication applies to steam reformers that are operated with natural gas, refinery off gas, naphtha, and other light hydrocarbon streams. It specifically applies to large volume hydrogen production plants, defined for this publication as a production capacity of 380 000 scfh (10 000 Nm3h) (9 MMSCFD or 240 000 Nm3D) or greater. This publication may be applied to smaller reformers depending on the technology used.* *This publication covers operational safety of steam reformer startup and shutdown. Emphasis is placed on operational guidance and features that provide safeguards against the hazards associated with the transition and infrequent nature of startups and shutdowns. The publication is not intended to address the details of design, installation, construction, and initial startup (commissioning) of steam reformers.*	• Sureté • SMR

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
CGA H-12	*Mechanical Integrity of Syngas Outlet Systems*	*This publication applies to steam reformers that are operated with natural gas, refinery off gas, naphtha, and other light hydrocarbon streams. It specifically applies to large volume hydrogen production plants, defined for this publication as a nominal production capacity of 10 000 Nm3/hr (approximately 9 MMSCFD) or greater. This publication may also be applied to smaller reformers depending on the technology used.* *This publication may also be used for similar applications such as internally insulated piping in a partial oxidation unit. Applicability for cases other than what is described in the publication is left to the reader.*	• SMR • Tuyauterie
CGA H-13	*Hydrogen Pressure Swing Adsorber (PSA) Mechanical Integrity Requirements*	*This publication is an industry-wide guideline for in-service mechanical integrity of PSA units and is intended to contribute to the operational safety and reliability of these units. This publication is not intended to address the details of design and installation of PSA vessels and piping.* *This publication applies to PSA units with reformer syngas, refinery off-gas, and other hydrogen containing off-gases. This publication is focused on the parts of the PSA that are subjected to pressure cycles, although some consideration is given to the noncyclic portions of the PSA system. This publication is limited to piping and vessels designed and constructed to a recognized code or standard.* *This publication applies to piping and vessels from the feed line isolation (i.e., flange or manual valve) to the valve skid, up to and including the surge drum outlet isolation (i.e., flange or manual valve) and the hydrogen product isolation (i.e., flange or manual valve), to downstream equipment.*	• Composantes
CGA H-14	*HYCO Plant Gas Leak Detection and Response Practices*	*This publication applies to HYCO plants. Information in this publication may also be applied to facilities, such as trailer fill stations, cylinder fill stations, electrolytic production facilities, or vehicle fueling stations.* *This publication covers methodologies for prevention of, detection of, and response to flammable and/or toxic gas leaks that occur within the fence line of these facilities. Typical leak detection technologies are discussed including personal monitoring, fixed monitoring, and specialized detectors for identifying leak location. This publication also addresses the specifics of gas leaks occurring at unmanned or remotely monitored sites.* *The leaks discussed in this publication are due to a loss of containment in process piping and equipment.*	• Détecteurs

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
CGA H-15	*Safe Catalyst Handling in HYCO Plants*	*This publication applies to HYCO plants that produce hydrogen, carbon monoxide, or mixtures thereof, with a nominal production capacity greater than 9 MMSCFD hydrogen or carbon monoxide/syngas (approximately 10 000 Nm3/hr). Many of the concepts and issues discussed may also apply to smaller HYCO plants depending on the technology used.* *This publication covers the safety aspects of all catalysts and chemisorbents such as zinc oxide used in HYCO facilities. Non-catalytic material such as physical adsorbents, for example, those used for pressure swing adsorbers; activated carbon, ion exchange resins, and inert solids (e.g., sand) are excluded from the publication. The publication scope is limited to catalyst and chemisorbent handling, loading, preparation for operation, unloading, and disposal. The publication scope excludes periods when the reactor is in operation (including startup and shutdown). Catalyst-specific instructions related to startup with new catalyst and shutdown prior to catalyst removal are included in the catalyst manufacturer's documentation, which should be consulted. This publication is not intended to replace catalyst manufacturers' operating manuals, handling manuals, or safety data sheets (SDS).*	• Production • Sureté
CGA P-6	*Standard Density Data, Atmospheric Gases and Hydrogen*	*Density data recommended in this publication were compiled by the Compressed Gas Association to provide uniform values of liquid and gas density for atmospheric gases and hydrogen for the benefit of suppliers and users of these commodities. Tables present standard density data and volumetric conversion factors.*	• Vocabulaire • Caractéristiques
CGA P-12	*Safe Handling of Cryogenic Liquids*	*This publication is intended to provide information that is required to meet OSHA PSM and EPA RMP requirements in an easy to understand form. It allows for more efficient completion of RMPs while at the same time promoting consistent responses to PSM and RMP regulatory requirements. A typical system hazard and operability study (HAZOP) as well as the hazard assessment for release scenarios typical of the standard hydrogen customer station tanks used in the gas industry are provided to assist these critical PSM and RMP responses.*	• Hydrogène liquide • Sureté
CGA P-28	*OSHA Process Safety Management and EPA Risk Management Plan*	*This publication is intended to provide information that is required to meet OSHA PSM and EPA RMP requirements in an easy to understand form. It allows for more efficient completion of RMPs while at the same time promoting consistent responses to PSM and RMP regulatory requirements. A typical system hazard*	• Gestion • Sureté

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
	Guidance Document for Bulk Liquid Hydrogen Systems	*and operability study (HAZOP) as well as the hazard assessment for release scenarios typical of the standard hydrogen customer station tanks used in the gas industry are provided to assist these critical PSM and RMP responses.*	
CGA P-37	*Good Environmental Management Practices for the Compressed Gas Industry*	*This publication provides guidance on good environmental management practices to industrial gas facility managers. It does not give specific advice on health and safety issues; however, consideration shall always be given to these issues when conducting operational risk assessments before undertaking any activity.* *Industrial gas facilities have distinct activities and associated environmental aspects that can impact the* *environment. This publication provides good environmental practices at air separation and helium production facilities, hydrogen and carbon monoxide facilities, and carbon dioxide facilities. It also provides good environmental practices for truck maintenance and distribution, acetylene and nitrous oxide manufacturing, cylinder fill operations, specialty gases operations, and customer installation (bulk tanks) activities.*	• Environnement • Gestion
CGA P-41	*Locating Bulk Liquid Storage Systems in Courts*	*This publication provides guidelines for the safe siting, installing, and operating of bulk storage systems (argon, carbon dioxide, hydrogen, nitrogen, nitrous oxide, and oxygen) in courts or enclosed courts where reduced airflow can create an oxygen-deficient or oxygen-enriched atmosphere. This publication applies to bulk cryogenic storage systems, not to gaseous compressed gas storage systems. For the purpose of this publication, a bulk liquid storage system is defined by NFPA 55, Compressed Gases and Cryogenic Fluids Code or NFPA 99, Standard for Health Care Facilities.*	• Hydrogène liquide • Stockage
CAN/CSA-B72-M	Code d'installation des paratonnerres *Installation Code for Lightning Protection Systems.*	La présente norme vise les mesures de protection contre les effets de la foudre des bâtiments résidentiels, des bâtiments publics et des bâtiments de nature principalement industrielle, y compris les bâtiments abritant des matières explosibles ou hautement inflammables. Elle ne vise pas les lignes de transport et de distribution d'électricité ni les lignes de télécommunications. Cette norme comporte une section facultative qui traite de la nature de la foudre et des principes généraux sur lesquels se base la protection contre la	• Installation • Sureté

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		foudre. Elle permet au lecteur de déterminer si une structure donnée a besoin d'être protégée contre la foudre (voir l'appendice A).	
CAN/CSA-C22.1	Code canadien de l'électricité, première partie (vingt-quatrième édition), norme de sécurité relative aux installations électriques *Canadian Electrical Code — Part I: Safety Standard for Electrical Installations.*	Ce Code s'applique à tous les travaux d'électricité et à tout appareillage électrique fonctionnant, ou destiné à fonctionner, sous toutes les tensions possibles dans les installations électriques des bâtiments, structures et propriétés, y compris les constructions préfabriquées déménageables et non déménageables, et les bateaux autopropulsés immobilisés pour des périodes dépassant cinq mois et branchés, continuellement ou de temps en temps, à une alimentation électrique côtière, à l'exception : a) des installations ou de l'appareillage utilisés par un réseau public de distribution d'électricité, de télécommunications ou de télédistribution fonctionnant en tant que tel et reconnu par les autorités de règlementation compétentes et situé à l'extérieur ou à l'intérieur des bâtiments, ou parties de bâtiments réservés à cet usage; b) de l'appareillage et des installations utilisés pour l'exploitation de chemins de fer électriques et alimentés exclusivement par les circuits alimentant la force motrice; c) des installations ou de l'appareillage utilisés par les chemins de fer à des fins de signalisation et de télécommunications et situés à l'extérieur ou à l'intérieur des bâtiments, ou parties de bâtiments réservés à cet usage; d) des aéronefs; et e) des réseaux électriques de navires sous la juridiction de Transports Canada. Voir aussi la CSA M421 en ce qui a trait aux mines et aux carrières.	• Sureté • Installation • Électrique
CAN/CSA HGV 4.1	*Hydrogen-dispensing systems*	*This Standard specifies mechanical and electrical requirements for dispensers of compressed hydrogen gas intended for fuel storage systems integral to fuel cell vehicles at pressures of 25, 35, 50, and 70 MPa.* *Dispensing systems covered by this Standard include* *a) HGV dispensers that integrate all dispensing system components in a single unit, including fuel metering and registering, flow control and safety management devices, heat exchangers, and vehicle fuel cylinder over-fill and over-pressure protection with listed hoses with nozzles (see Figure A.1); or* *b) HGV dispensers that are primarily the customer facing unit with fueling hose assembly listed hoses, nozzles, and operator interface, and where the key components of flow metering and over- pressure and over-fill protection are*	• Ravitaillement • Sureté • Véhicules

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		located in a separate unit or part of the hydrogen fuelling station system (see Figure A.2).	
CSA HGV 4.2	*Hose and Hose Assemblies for Hydrogen Vehicles and Dispensing Systems*	*This standard contains safety requirements for material, design, manufacture and testing of gaseous hydrogen hose and hose assemblies. This standard applies to newly manufactured hose and hose assemblies for:* *- connecting the dispenser to the fueling nozzle, high pressure (class A)* *- used as part of a vehicle on-board fuel storage system, high pressure (class B)* *- used as part of a vehicle low pressure fuel delivery system, (class C)* *- flexible hoses used on hydrogen fuel station equipment (class D)*	• Composantes • Matériaux • Ravitaillement • Véhicules
CSA HGV 4.3	*Test methods for hydrogen fueling parameter evaluation*	*This Standard establishes the test method, criteria, and device to evaluate a hydrogen fueling station dispensing system (hereinafter referred to as a "dispenser") as it relates to achieving the protocols specified in SAE J2601 and SAE J2799 with light duty vehicle hydrogen storage systems less than 248.6 L (10 kg H70). The testing evaluation applies to dispensers designed to fill vehicle storage systems following the prescribed protocols defined in SAE J2601 that target rapid fills, while respecting temperature, pressure, and fuel density safety limits.* *This Standard was developed for and is intended to be used with the specific version of SAE J2601 and SAE J2799 documents as referenced in Clause 2.*	• Essais • Ravaitaillement
CSA HGV 4.4	*Breakaway Devices for Hoses Used in Hydrogen Vehicle Fueling Stations*	*This Standard contains safety requirements for the design, manufacture and testing of fueling hose breakaway devices for use in hydrogen gas fueling applications , hereinafter referred to as devices. This Standard applies to newly manufactured devices. Devices covered by this standard are intended to perform the following functions when a vehicle is driven off with the nozzle attached to the vehicle's fueling receptacle: minimize the escape of gaseous hydrogen by automatically shutting off the flow of gas from the dispenser and controlling the depressurization of the hose, and minimize damage to the vehicle and dispenser.*	• Essais • Ravaitaillement
CSA HGV 4.6	*Manually Operated Valves Used in Gaseous Hydrogen Vehicle Fueling Stations*	*This Standard contains safety requirements for the material, design, manufacture and testing of manually operated valves for gaseous hydrogen vehicle fueling stations. This Standard applies to newly manufactured valves. 1.1 This Standard does not apply to: a) Fuel storage container shut-off valves connected directly to the storage container as covered by the appropriate*	• Composantes • Ravitaillement • Véhicules

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		standards (e.g., UL 1769, CGA V-9, etc.). b) Fueling nozzle valves as covered by the Standard for Compressed Hydrogen Surface Vehicle Refueling Connection Device, SAE J2600 or ISO 17268. c) Does not apply to pressure Class 150 hardware (under 2 MPa (300 psi)).	
CSA HGV 4.7	*Automatic Pressure Operated Valves for Use in Gaseous Hydrogen Vehicle Fueling Stations*	*This standard contains safety requirements for the material, design, manufacture and testing of automatic valves (see Clause 3) used in gaseous hydrogen vehicle fueling stations. This standard applies to newly manufactured* *a) Pneumatically actuated valves* *b) Check valves* *c) Excess Flow valves* *d) Electrically actuated valves.*	• Composantes • Ravitaillement • Véhicules
CSA HGV 4.8	*Hydrogen Gas Vehicle Fueling Stations Compressor*	*This standard contains safety requirements for the material, design, manufacture and testing of gaseous hydrogen hose and hose assemblies which are used as a part of the dispensing station to connect the dispenser to the refueling nozzle; used as part of a vehicle on-board fuel system; or used as vent lines which carry gas to a safe location for either vehicles or dispensing systems.*	• Ravitaillement • Sureté • Véhicules
CAN/CSA HGV 4.9	*Hydrogen fueling stations*	*This Standard specifies the design, installation, operation, and maintenance of site-built and modular gaseous hydrogen fuelling stations (HFS) intended to fuel on-road vehicles.*	• Ravitaillement • Sureté • Véhicules
CAN/CSA-Z662	Réseaux de canalisations de pétrole et de gaz *Oil and Gas Pipeline Systems*	Cette norme traite de la conception, de la construction, de l'exploitation, de l'entretien, de la mise hors service et de l'abandon des réseaux de canalisations des industries gazière et pétrolière qui transportent : a) les hydrocarbures liquides, y compris le pétrole brut, les fluides multiphasiques, les condensats, les dérivés liquides du pétrole et du gaz naturel et les gaz de pétrole liquéfiés; b) les eaux de gisement; c) la vapeur utilisée pour la mise en valeur de champs pétroliers; d) le dioxyde de carbone à l'état liquide ou en phase dense; ou e) le gaz.	• Canalisation • Sureté • Tuyauterie

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
ISO 4126-1	Dispositifs de sécurité pour protection contre les pressions excessives — Partie 1 : Soupapes de sureté *Safety devices for protection against excessive pressure — Part 1: Safety valves*	L'ISO 4126-1:2013 spécifie les exigences générales des soupapes de sureté, quel que soit le fluide pour lequel elles sont conçues. Elle est applicable aux soupapes de sureté présentant un orifice d'écoulement de diamètre supérieur ou égal à 4 mm, qui sont utilisables à des pressions de début d'ouverture de 0,1 bar effectif et au-dessus. Aucune limitation en température n'est fixée. L'ISO 4126-1:2013 est une norme de produit et elle n'est pas applicable à la mise en œuvre des soupapes de sureté.	• Sureté • Composantes
ISO 4126-2	Dispositifs de sécurité pour protection contre les pressions excessives — Partie 2: Dispositifs de sureté à disque de rupture *Safety devices for protection against excessive pressure — Part 2: Bursting disc safety devices*	Le présent document spécifie les exigences des dispositifs de sureté à disque de rupture. Elle comprend les exigences de conception, de fabrication, de contrôle, d'essai, de certification, de marquage et de conditionnement.	• Sureté • Composantes
ISO 4126-3	Dispositifs de sécurité pour protection contre les pressions excessives — Partie 3: Soupapes de sureté et dispositifs de sureté à disque de rupture en combinaison *Safety devices for protection against excessive pressure — Part 3: Safety valves and bursting disc safety devices in combination*	L'ISO 4126-3:2006 spécifie les exigences applicables aux combinaisons en série de soupapes de sureté ou de DSDCS (dispositifs de sécurité à décharge contrôlés contre les surpressions), conformément à l'ISO 4126-1, à l'ISO 4126-4 et à l'ISO 4126-5, et de dispositifs de sureté à disque de rupture conformément à l'ISO 4126-2 installée à une distance de l'orifice d'entrée de la soupape au plus égale à cinq diamètres de tuyauterie. Elle spécifie les exigences de conception, d'application et de marquage de tels produits, qui sont utilisés pour protéger des récipients, des tuyauteries ou d'autres enceintes des pressions excessives, et qui comportent le dispositif de sureté à disque de rupture, une soupape de sureté ou un DSDCS et, le cas échéant, une courte longueur de tuyauterie ou une manchette de raccordement. Elle donne, en outre, la méthode permettant d'établir le coefficient de débit de la combinaison utilisé pour le dimensionnement des combinaisons.	• Sureté • Composantes

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
ISO 4126-4	Dispositifs de sécurité pour protection contre les pressions excessives — Partie 4: Soupapes de sureté pilotées *Safety devices for protection against excessive pressure — Part 4: Pilot operated safety valves*	L'ISO 4126-4:2013 spécifie les exigences générales des soupapes de sureté pilotées, quel que soit le fluide pour lequel elles sont conçues. Dans tous les cas, le fonctionnement est assuré par le fluide contenu dans le système à protéger. Elle est applicable aux soupapes de sureté pilotées présentant un orifice d'écoulement de diamètre supérieur ou égal à 4 mm, qui sont utilisables à des pressions de début d'ouverture de 0,1 bar effectif et au-dessus. Aucune limitation en température n'est fixée. L'ISO 4126-4:2013 est une norme de produit et elle n'est pas applicable à la mise en œuvre des soupapes de sureté pilotées.	• Sureté • Composantes
ISO 4126-5	Dispositifs de sécurité pour protection contre les pressions excessives — Partie 5: Dispositifs de sécurité asservis (CSPRS) *Safety devices for protection against excessive pressure — Part 5: Controlled safety pressure relief systems (CSPRS)*	L'ISO 4126-5:2013 spécifie les exigences des dispositifs de sécurité pilotés contre les surpressions (CSPRS), quel que soit le fluide pour lequel ils sont conçus. Elle est applicable aux appareils de robinetterie principaux ayant un diamètre d'écoulement de 4 mm au moins qui sont utilisés à des pressions de 0,1 bar manométrique et au-dessus. Aucune limitation en température n'est spécifiée. L'ISO 4126-5:2013 est une norme de produit et elle n'est pas applicable à la mise en œuvre des CSPRS.	• Sureté • Composantes
ISO 4126-6	Dispositifs de sécurité pour protection contre les pressions excessives — Partie 6: Application, sélection et installation des dispositifs de sureté à disque de rupture *Safety devices for protection against excessive pressure — Part 6: Application, selection and installation of bursting disc safety devices*	L'ISO 4126-6:2014 donne des lignes directrices pour l'application, la sélection et l'installation de dispositifs de sureté à disque de rupture utilisés pour protéger les équipements sous pression contre des pressions excessives et/ou des dépressions excessives.	• Sureté • Composantes

Norme	**Titre**	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
ISO/TR 15916:2015	Considérations fondamentales pour la sécurité des systèmes à l'hydrogène *Basic considerations for the safety of hydrogen systems*	*ISO/TR 15916:2015 provides guidelines for the use of hydrogen in its gaseous and liquid forms as well as its storage in either of these or other forms (hydrides). It identifies the basic safety concerns, hazards and risks, and describes the properties of hydrogen that are relevant to safety. Detailed safety requirements associated with specific hydrogen applications are treated in separate International Standards.*	• Sureté
ISO/TS 19883:2017	Système d'adsorption modulée en pression pour la séparation et la purification de l'hydrogène *Safety of pressure swing adsorption systems for hydrogen separation and purification*	*ISO/TS 19883:2017 identifies safety measures and applicable design features that are used in the design, commissioning, and operation of pressure swing adsorption systems for hydrogen separation and purification. It applies to hydrogen pressure swing adsorption systems that process all kinds of impure hydrogen streams as feed, including both stationary and skid-mounted pressure swing adsorption systems for hydrogen separation and purification in commercial or industrial use. This document also applies to small-scale PSA hydrogen system installed within containers, where allowed by local regulations.*	• Composantes
ISO 22734:2019	Générateurs d'hydrogène utilisant le procédé de l'électrolyse de l'eau — Applications industrielles, commerciales et résidentielles *Hydrogen generators using water electrolysis — Industrial, commercial, and residential applications*	*This document defines the construction, safety, and performance requirements of modular or factory-matched hydrogen gas generation appliances, herein referred to as hydrogen generators, using electrochemical reactions to electrolyse water to produce hydrogen.* *This document is applicable to hydrogen generators that use the following types of ion transport medium:* *— group of aqueous bases;* *— group of aqueous acids;* *— solid polymeric materials with acidic function group additions, such as acid proton exchange membrane (PEM);* *— solid polymeric materials with basic function group additions, such as anion exchange membrane (AEM).* *This document is applicable to hydrogen generators intended for industrial and commercial uses, and indoor and outdoor residential use in sheltered areas, such as car-ports, garages, utility rooms and similar areas of a residence.*	• Sureté • Essai • Électrolyseur

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		Hydrogen generators that can also be used to generate electricity, such as reversible fuel cells, are excluded from the scope of this document. *Residential hydrogen generators that also supply oxygen as a product are excluded from the scope of this document.*	
ISO 26142:2010	Détecteurs d'hydrogène — Applications fixes *Hydrogen detection apparatus — Stationary applications*	*ISO 26142:2010 defines the performance requirements and test methods of hydrogen detection apparatus that is designed to measure and monitor hydrogen concentrations in stationary applications. The provisions in ISO 26142:2010 cover the hydrogen detection apparatus used to achieve the single and/or multilevel safety operations, such as nitrogen purging or ventilation and/or system shut-off corresponding to the hydrogen concentration. The requirements applicable to the overall safety system, as well as the installation requirements of such apparatus, are excluded. ISO 26142:2010 sets out only the requirements applicable to a product standard for hydrogen detection apparatus, such as precision, response time, stability, measuring range, selectivity and poisoning.* *ISO 26142:2010 is intended to be used for certification purposes.*	• Composantes • Essais
NFPA 2	*Hydrogen Technologies Code.*	*The purpose of this code shall be to provide fundamental safeguards for the generation, installation, storage, piping, use, and handling of hydrogen in compressed gas (GH2) form or cryogenic liquid (LH2) form.*	• Installation • Sureté
NFPA 55	*Compressed Gases And Cryogenic Fluids Code*	*This code shall apply to the installation, storage, use, and handling of compressed gases and cryogenic fluids in portable and stationary cylinders, containers, equipment, and tanks in all occupancies.*	• Installation • Stockage
NFPA 70	*NFPA 70 National Electrical Code*	*This article contains only those definitions essential to the application of this Code. It is not intended to include commonly defined general terms or commonly defined technical terms from related codes and standards. In general, only those terms that are used in two or more articles are defined in Article 100. Other definitions are included in the article in which they are used but may be referenced in Article 100. Part I of this article contains definitions intended to apply wherever the terms are used throughout this Code. Part II contains*	• Code électrique

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		definitions applicable to installations and equipment operating at over 1000 volts, nominal.	
NFPA 110	*Standard For Emergency And Standby Power Systems*	*This standard contains requirements covering the performance of emergency and standby power systems providing an alternate source of electrical power to loads in buildings and facilities in the event that the primary power source fails. Power systems covered in this standard include power sources, transfer equipment, controls, supervisory equipment, and all related electrical and mechanical auxiliary and accessory equipment needed to supply electrical power to the load terminals of the transfer equipment. This standard covers installation, maintenance, operation, and testing requirements as they pertain to the performance of the emergency power supply system (EPSS). This standard does not cover the following: (1) Application of the EPSS (2) Emergency lighting unit equipment (3) Distribution wiring (4) Utility service when such service is permitted as the EPSS (5) Parameters for stored energy devices (6) The equipment of systems that are not classed as Level 1 or Level 2 systems in accordance with Chapter 4 of this standard. This standard does not establish criteria for stored energy systems. The selection of any of the following is not within the scope of this standard: (1) Specific buildings or facilities, or both, requiring an EPSS (2) Specific loads to be served by the EPSS (3)* Assignment of type, class, or level to any specific load This standard contains performance requirements for an EPSS. It is the role of other NFPA standards to specify which occupancies require an EPSS and the applicable level, type, and class. This standard does not specify where an EPSS is required. This standard also is intended to provide guidance for inspectors, designers, installers, manufacturers, and users of EPSSs and to serve as a vehicle for communication between the parties involved. It is not intended as a design manual. Compliance with this standard is not intended to exempt the parties involved from their respective responsibilities for the design, installation, maintenance, performance, or compliance with other applicable standards and codes.*	• Urgence • Système secours
NFPA 855	*Standard for the Installation of Stationary Energy Storage Systems*	*This standard provides the minimum requirements for mitigating the hazards associated with ESS.*	• Gestion de risque

3 PRODUCTION, STOCKAGE ET TRANSPORT D'HYDROGÈNE

Au Québec, les aspects de stockage et de transport sont règlementés par Transport Canada et la Régie du bâtiment du Québec. La production d'hydrogène est soumise à une règlementation en tant que produit dangereux, mais n'est pas assujettie à un quota. Les règlements entourant la production, le stockage et le transport d'hydrogène réfèrent notamment aux normes CSA B339 et CSA B340, ainsi qu'au code CAN/BNQ 1784-000. L'application du Code d'installation d'hydrogène se fait sur des installations dont l'objectif est la production d'hydrogène pour des processus autre que l'utilisation à l'intérieur d'un circuit chimique (par exemple, la production d'hydrogène dans le cadre de l'homogénéisation d'un hydrocarbure dans une raffinerie rend caduc l'application du code, à moins que le surplus ne quitte l'installation de ladite raffinerie pour une application autre). Il est important de noter également des efforts binationaux (américains et canadiens) d'homogénéiser les normes pour faciliter l'interopérabilité entre les deux pays.

Nous identifions ici les documents en utilisation sur le territoire canadien ou américain, ainsi que certaines normes internationales pertinentes sur le sujet. Pour les exportateurs, il convient d'effectuer leur propre vérification des normes, lois ou règlements sur ces sujets afin d'en déterminer l'application et l'interopérabilité. Il est important de considérer que certaines caractéristiques physiques de l'hydrogène, notamment son inflammabilité, l'ignition de la substance, ainsi que la nature fine de la molécule sont au cœur de plusieurs considérations techniques qui distinguent les normes applicables à l'hydrogène des normes pour les autres gaz.

Nous aimerions faire les remarques supplémentaires suivantes sur ce volet :

- Un suivi rigoureux des normes ne permet pas de se soustraire aux lois et règlements, notamment ceux de Transport Canada.
- Seule la norme **CAN/BNQ 1784-000** *Code canadien d'installation de l'hydrogène* (le « *Code* ») est une norme reconnue par le Conseil Canadien des Normes comme ayant été développée selon les exigences canadiennes des normes nationales (« CAN »). La norme américaine **NFPA 2** *Hydrogen Technologies Code* est le principal document analogue au *Code* applicable sur le territoire américain.
- La conception, la construction, et les essais de vaisseaux sous pression sont typiquement faits selon les documents **ASME BPVC** ou **CSA B339** ou **CSA B340, selon le type de vaisseau, ou de conception**. La règlementation est claire sur l'importance de faire certifier les vaisseaux sous-pression (en lots ou individuels selon le cas).
- Les pipelines d'hydrogène sont considérés dans le volet transport et la construction d'un pipeline entre un site de production et un site d'utilisation autre qu'à l'intérieur d'un circuit chimique interne n'exempte pas l'application de normes et de règlements.
- En date d'écriture, les projets d'ajout d'hydrogène au gaz naturel en proportion inférieure à 10% sont en développement. Malgré l'intérêt de renchérir cette proportion, peu de normes sur le sujet existent. Les recherches sont d'actualité.
- Plusieurs normes internationales avec comme intérêt la structure des bouteilles à gaz et leurs composantes existent, notamment par le biais d'**ISO/TC 58** *Bouteilles à Gaz*, **ISO/TC 58/SC 2** *Accessoires de bouteilles*, **ISO/TC 58/SC 3** *Construction des bouteilles*, **ISO/TC 58/SC 4** *Contraintes de*

service des bouteilles à gaz. Ces comités ont d'ailleurs publié plus de 110 normes sur ces sujets, mais celles-ci ne sont pas toutes cataloguées ici vu leur application très spécifique.

- L'hydrogène peut être transporté sous différentes formes, mais chacune des 5 formes suivantes a des propriétés qui rendent les formes dangereuses et nécessitent une identification par un numéro international unique (UN). Toutes les formes de transport d'hydrogène sont de la classe 2. Des considérations spéciales sont à prévoir pour le stockage, le transport ou la production d'une ou l'autre de ces formes identifiées ici-bas. Pour faciliter la recherche d'information, les numéros UN sont donnés, ainsi que leurs descriptions, pour faciliter le référencement.

Numéro UN	**Classe de matériel**	**Description (fr / *an*)**
UN 1049	2.1	Hydrogène comprimé / *Hydrogen, compressed*
UN 1966	2	Hydrogène liquide réfrigéré / *Liquid hydrogen, refrigerated liquid (cryogenic liquid)*
UN 2034	2	Hydrogène et méthane en mélange comprimé / *Hydrogen and Methane mixtures, compressed*
UN 3468	2.1	Hydrogène dans un dispositif de stockage à hydrure métallique ou hydrogène dans un dispositif de stockage à hydrure métallique contenu dans un équipement ou hydrogène dans un dispositif de stockage à hydrure métallique emballé avec un équipement / *Hydrogen in metal hydride storage system*
UN 3479	2.1	Cartouches pour pile à combustible ou cartouches pour pile à combustible contenues dans un équipement ou cartouches pour pile à combustible emballées avec un équipement, contenant de l'hydrogène dans un hydrure métallique / *Fuel cell cartridges or Fuel cell cartridges contained in equipment or Fuel cell cartridges packed with equipment, containing hydrogen in metal hydride*

Il convient de signaler que pour la production d'hydrogène, la norme ISO 22734 est le seul document normatif qui est applicable en lien avec la production spécifiquement en utilisant des électrolyseurs.

Puisque le stockage et le transport sont intimement liés (typiquement, le stockage requiert des vaisseaux sous-pression ayant les caractéristiques équivalentes à celles pour le transport), l'ensemble de ces documents sont présentés en un tableau continu.

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
ASME BPVC Section II	*Materials*	*Part A)* *This Section is a "Service Section" to the other BPVC Sections, providing material specifications for ferrous materials adequate for safety in the field of pressure equipment. These specifications contain requirements for chemical and mechanical properties, heat treatment, manufacture, heat and product analyses, and methods of testing. They are designated by SA numbers and are identical with or similar to those of specifications published by ASTM and other recognized national or international organizations.* *Part B)* *This Section is a "Service Section" to the other BPVC Sections, providing material specifications for ferrous materials adequate for safety in the field of pressure equipment. These specifications contain requirements for chemical and mechanical properties, heat treatment, manufacture, heat and product analyses, and methods of testing. They are designated by SB numbers and are identical with or similar to those of specifications published by ASTM and other recognized national or international organizations.* *Part C)* *This Section is a "Service Section" to the other BPVC Sections providing material specifications for the manufacture, acceptability, chemical composition, mechanical usability, surfacing, testing requirements and procedures, operating characteristics, and intended uses for welding rods, electrodes and filler metals. These specifications are designated by SFA numbers and are derived from AWS specifications.* *Part D)* *This Section is a "Service Section" for reference by the BPVC construction Sections providing tables of material properties including allowable, design, tensile and yield stress values, physical properties and external pressure charts and tables. Part D facilitates ready identification of materials to specific Sections of the Boiler and Pressure Vessel Code. Part D contains appendices which contain criteria for establishing allowable stress, the bases for establishing external pressure charts, and information required for approval of new materials. Access*	• Matériaux • Stockage

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		to the online version of the stress tables is included with purchase of this hard copy.	
ASME BPVC Section V	*Nondestructive examination*	*This Section contains requirements and methods for nondestructive examination which are referenced and required by other BPVC Sections. It also includes manufacturer's examination responsibilities, duties of authorized inspectors and requirements for qualification of personnel, inspection and examination. Examination methods are intended to detect surface and internal discontinuities in materials, welds, and fabricated parts and components. A glossary of related terms is included.*	• Essais
ASME BPVC Section VIII	*Rules for Construction of Pressure Vessels*	*Division 1)* *This Division of Section VIII provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures exceeding 15 psig. Such pressure vessels may be fired or unfired. Specific requirements apply to several classes of material used in pressure vessel construction, and also to fabrication methods such as welding, forging and brazing. It contains mandatory and nonmandatory appendices detailing supplementary design criteria, nondestructive examination and inspection acceptance standards. Rules pertaining to the use of the U, UM and UV ASME Product Certification Marks are also included.* *Division 2)* *This Division of Section VIII provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures exceeding 15 psig. Such vessels may be fired or unfired. This pressure may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof. These rules provide an alternative to the minimum requirements for pressure vessels under Division 1 rules. In comparison the Division 1, Division 2 requirements on materials, design, and non-destructive examination are more rigorous; however, higher design stress intensify values are permitted. Division 2 rules cover only vessels to be installed in a fixed location for a specific service where operation and maintenance control is retained during the useful life of the vessel by the user who prepares or causes to be prepared the design specifications. These rules may also apply to human occupancy pressure vessels*	• Matériaux • Stockage

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		typically in the diving industry. Rules pertaining to the use of the U2 and UV ASME Product Certification Marks are also included. *Division 3)* *This Division of Section VIII provides requirements applicable to the design, fabrication, inspection, testing, and certification of pressure vessels operating at either internal or external pressures generally above 10,000 psi. Such vessels may be fired or unfired. This pressure may be obtained from an external source, a process reaction, by the application of heat from a direct or indirect source, or any combination thereof. Division 3 rules cover vessels intended for a specific service and installed in a fixed location or relocated from work site to work site between pressurizations. The operation and maintenance control is retained during the useful life of the vessel by the user who prepares or causes to be prepared the design specifications. Division 3 does not establish maximum pressure limits for either Section VIII, Divisions 1 or 2, nor minimum pressure limits for this Division. Rules pertaining to the use of the UV3 ASME Product Certification Marks are also included.*	
ASME BPVC Section IX	*Welding, Brazing, and Fusing Qualifications*	*This Section contains rules relating to the qualification of welding, brazing, and fusing procedures as required by other BPVC Sections for component manufacture. It also covers rules relating to the qualification and requalification of welders, brazers, and welding, brazing and fusing machine operators in order that they may perform welding, brazing, or plastic fusing as required by other BPVC Sections in the manufacture of components. Welding, brazing, and fusing data cover essential and nonessential variables specific to the joining process used.*	• Soudure
ASME BPVC Section X	*Fiber-Reinforced Plastic Pressure Vessels*	*This Section provides requirements for construction of an FRP pressure vessel in conformance with a manufacturer's design report. It includes production, processing, fabrication, inspection and testing methods required for the vessel. Section X includes three Classes of vessel design; Class I and Class III - qualification through the destructive test of a prototype and Class II - mandatory design rules and acceptance testing by nondestructive methods. These vessels are not permitted to store, handle or process lethal fluids. Vessel fabrication is limited to the following processes: bag-molding, centrifugal casting and filament-winding and contact molding. General specifications for the glass and*	• Matériaux • Stockage

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		resin materials and minimum physical properties for the composite materials are given.	
ASME BPVC Section XII	*Rules for Construction and Continued Service of Transport Tanks (BPVC-XII)*	*This Section covers requirements for construction and continued service of pressure vessels for the transportation of dangerous goods via highway, rail, air or water at pressures from full vacuum to 3,000 psig and volumes greater than 120 gallons. "Construction" is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and over-pressure protection. "Continued service" is an all-inclusive term referring to inspection, testing, repair, alteration, and recertification of a transport tank that has been in service. This Section contains modal appendices containing requirements for vessels used in specific transport modes and service applications. Rules pertaining to the use of the T ASME Product Certification Marks are included.*	• Matériaux • Stockage
ASME B31.12	*Hydrogen Piping and Pipelines.*	*ASME B31.12 Standard on Hydrogen Piping and Pipelines contains requirements for piping in gaseous and liquid hydrogen service and pipelines in gaseous hydrogen service. The general requirements section covers materials, brazing, welding, heat treating, forming, testing, inspection, examination, operating, and maintenance. The industrial piping section covers requirements for components, design, fabrication, assembly, erection, inspection, examination, and testing of piping.* *This Code is applicable to piping in gaseous and liquid hydrogen service and to pipelines in gaseous hydrogen service. B31.12 is applicable up to and including the joint connecting the piping to associated pressure vessels and equipment but not to the vessels and equipment themselves. It is also applicable to the location*	• Tuyauterie • Installation

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		and type of support elements, but not to the structure to which the support elements are attached. *B31.12 is presented in the following parts:* *(a) Part GR — General Requirements. This part contains definitions and requirements for materials, welding, brazing, heat treating, forming, testing, inspection, examination, operation, and maintenance.* *(b) Part IP — Industrial Piping. This part includes requirements for components, design, fabrication, assembly, erection, inspection, examination, and testing of piping.* *(c) Part PL — Pipelines. This part sets forth requirements for components, design, installation, and testing of hydrogen pipelines.* *It is required that each part be used in conjunction with the General Requirements section but independent of the other parts. It is not intended that this edition of this Code be applied retroactively to existing hydrogen systems.*	
CAN/BNQ 1784-000	Code canadien d'installation de l'hydrogène *Canadian Hydrogen Installation Code*	Ce code a pour objet de fixer les exigences quant à l'installation des équipements de production d'hydrogène, des équipements fonctionnant à l'hydrogène, des équipements de distribution d'hydrogène, des récipients de stockage d'hydrogène, de la tuyauterie d'hydrogène, ainsi que de leurs accessoires. Ce code s'applique à toutes les utilisations faisant appel à l'hydrogène gazeux ou liquide, à l'exception, entre autres, d'hydrogène dans les raffineries de pétrole et les usines chimiques comme charge d'alimentation et dans le processus de production. Il a été approuvé par le Conseil canadien des normes (CCN) et porte la désignation **CAN/BNQ.**	• Installation • Sureté
CGA G-5.4	*Standard for Hydrogen Piping Systems at User Locations*	*This standard describes the specifications and general principles recommended for piping systems for gaseous (Type I) or liquid (Type II) hydrogen. The standard applies to hydrogen piping in a supply system (to the source valve) and to customer piping from the source valve to the point of use. For the purposes of*	• Tuyauterie

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		this standard, high pressure is defined as gaseous hydrogen at service pressures equal to or greater than 3000 psi (20 680 kPa). *The information in this standard is general in nature and is intended for designers, fabricators, installers, users, and maintainers of hydrogen piping systems as well as for safety personnel, fire departments, building inspectors, and emergency personnel.*	
CGA G-5.6	*Hydrogen Pipeline Systems*	*This is a joint European Industrial Gases Association (EIGA)/CGA international harmonized standard on metallic transmission and distribution piping systems carrying pure hydrogen and hydrogen mixtures as shown in Figure 1 of Appendix A. It is limited to gaseous products with a temperature range between –40 °C and 175 °C (–40 °F and 347 °F); total pressures from 1 MPa to 21 MPa (150 psig to 3000 psig); and defined concentration criteria.*	• Tuyauterie
CGA P-12	*Safe Handling of Cryogenic Liquids*	*This publication is intended to provide information that is required to meet OSHA PSM and EPA RMP requirements in an easy to understand form. It allows for more efficient completion of RMPs while at the same time promoting consistent responses to PSM and RMP regulatory requirements. A typical system hazard and operability study (HAZOP) as well as the hazard assessment for release scenarios typical of the standard hydrogen customer station tanks used in the gas industry are provided to assist these critical PSM and RMP responses.*	• Hydrogène liquide • Sureté
CSA B339	Bouteilles et tubes utilisés pour le transport des marchandises dangereuses *Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods*	Cette norme énonce les exigences relatives à la fabrication, à l'inspection, à la mise à l'essai, au marquage, à la requalification, aux nouveaux traitements thermiques, à la réparation et à la réfection des bouteilles à gaz cylindriques et sphériques et des tubes (contenants) utilisés pour le transport des marchandises dangereuses. Elle énonce également les exigences relatives à la qualification des nouvelles conceptions et à l'inscription. Cette norme énonce les exigences générales relatives aux contenants (voir le chapitre 4) ainsi que les exigences particulières, appelées spécifications (voir les chapitres 5 à 23) concernant la fabrication de chaque type de contenant. Les exigences générales s'appliquent à tous les contenants, sauf indication contraire, ou si elles ne sont pas pertinentes aux spécifications individuelles.	• Stockage • Essai • Marquage

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		Les désignations et descriptions des spécifications des contenants visés par cette norme sont données aux tableaux 1 à 6.	
CSA B340	Sélection et utilisation de bouteilles, tubes et autres récipients utilisés pour le transport des marchandises dangereuses, classe 2 *Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2.*	Cette norme énonce les exigences en matière de sécurité pour la sélection et l'utilisation de bouteilles à gaz cylindriques et sphériques, tubes et autres contenants pour le transport des marchandises dangereuses, classe 2. Cette norme énonce les exigences relatives à la manutention et au remplissage des bouteilles à gaz cylindriques et sphériques, tubes et autres contenants pour le transport des marchandises dangereuses, classe 2.	• Stockage • Marquage
ISO 11119-1	Bouteilles à gaz — Bouteilles à gaz rechargeables en matériau composite et tubes — Conception, construction et essais — Partie 1: Bouteilles à gaz frettées en matériau composite renforcé par des fibres et tubes d'une contenance allant jusqu'à 450 l *Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 l*	*ISO 11119-1:2012 specifies requirements for composite gas cylinders and tubes between 0,5 l and 450 l water capacity, for the storage and conveyance of compressed or liquefied gases.* *ISO 11119-1:2012 applies to type 2 hoop wrapped cylinder or tube with a load-sharing metal liner and composite reinforcement on the cylindrical portion only.* *ISO 11119-1:2012 is limited to cylinders and tubes with composite reinforcement of carbon fibre, aramid fibre or glass fibre (or a mixture thereof) within a matrix or steel wire to provide circumferential reinforcement.* *Cylinders complying with ISO 11119-1:2012 have a minimum design life of 15 years.* *ISO 11119-1:2012 does not address the design, fitting, and performance of removable protective sleeves.*	• Stockage • Essais
ISO 11119-2	Bouteilles à gaz — Bouteilles à gaz rechargeables en matériau composite et tubes — Conception, construction et essais — Partie 2: Bouteilles à gaz composites entièrement bobinées	*ISO 11119-2:2012 specifies requirements for composite gas cylinders and tubes between 0,5 l and 450 l water capacity, for the storage and conveyance of compressed or liquefied gases.*	• Stockage • Essais

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
	renforcées par des fibres et tubes d'une contenance allant jusqu'à 450 l avec liners métalliques transmettant la charge *Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners*	*ISO 11119-2:2012 applies to type 3 fully wrapped cylinders or tubes with a load-sharing metal liner and composite reinforcement on both the cylindrical portion and the dome ends.* *ISO 11119-2:2012 is limited to cylinders and tubes with composite reinforcement of carbon fibre, aramid fibre or glass fibre (or a mixture thereof) within a matrix.* *Cylinders complying with ISO 11119-2:2012 have a minimum design life of 15 years.* *ISO 11119-2:2012 does not address the design, fitting, and performance of removable protective sleeves.* *ISO 11119-2:2012 does not apply to cylinders with welded liners.*	
ISO 11119-3	Bouteilles à gaz — Bouteilles à gaz rechargeables en matériau composite et tubes — Conception, construction et essais — Partie 3: Bouteilles à gaz composites entièrement bobinées renforcées par des fibres et tubes d'une contenance allant jusqu'à 450 l avec liners métalliques ou non métalliques ne transmettant pas la charge *Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450L with non-load-sharing metallic or non-metallic liners*	*ISO 11119-3:2013 specifies requirements for composite gas cylinders up to 150 l water capacity and composite tubes above 150 l water capacity and up to 450 l water capacity, for the storage and conveyance of compressed or liquefied gases.* *The cylinders and tubes in ISO 11119-3:2013 are Type 4 Fully Wrapped Cylinders or Tubes with a non-load sharing liner and composite reinforcement on both the cylindrical portion and the dome ends, and Type 5 Fully Wrapped Cylinders or Tubes without liners (including cylinders without liners manufactured from two parts joined together) and with a test pressure of less than 60 bar.* *The cylinders are constructed in the form of a disposable mandrel overwrapped with carbon fibre or aramid fibre or glass fibre (or a mixture thereof) in a resin matrix to provide longitudinal and circumferential reinforcement, and in the form of two filament wound shells joined together.* *Cylinders and tubes manufactured and tested to ISO 11119-3:2013 are not intended to contain toxic, oxidizing or corrosive gases.*	• Stockage • Essais

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		ISO 11119-3:2013 is limited to cylinders and tubes with composite reinforcement of carbon fibre or aramid fibre or glass fibre (or a mixture thereof) in a matrix. *Cylinders and tubes manufactured and tested to ISO 11119-3:2013 have a minimum design life of 15 years.* *ISO 11119-3:2013 does not address the design, fitting and performance of removable protective sleeves.*	
ISO 11119-4	Bouteilles à gaz — Bouteilles à gaz rechargeables en matériau composite et tubes — Conception, construction et essais — Partie 4: Bouteilles à gaz composites entièrement bobinées renforcées par des fibres et tubes d'une contenance allant jusqu'à 150 l avec liners métalliques transmettant la charge *Gas cylinders — Refillable composite gas cylinders — Design, construction and testing — Part 4: Fully wrapped fibre reinforced composite gas cylinders up to 150 l with load-sharing welded metallic liners*	*ISO 11119-4:2016 specifies requirements for composite gas cylinders with load-sharing welded liners between 0,5 l and 150 l water capacity and a maximum test pressure of 450 bar for the storage and conveyance of compressed or liquefied gases.* *NOTE 1 1 bar = 105Pa = 105N/m2.* *The cylinders are constructed in the form of a welded stainless steel liner or welded ferritic steel liner or welded aluminium alloy liner and overwrapped with carbon fibre or aramid fibre or glass fibre (or a mixture thereof) in a matrix to provide longitudinal and circumferential reinforcement.* *The cylinders in this part of ISO 11119 are type 3 fully wrapped cylinders with a load-sharing metal liner and composite reinforcement on both the cylindrical portion and the dome ends.* *Cylinders produced in accordance with this part of ISO 11119 have a minimum design life of 15 years. Cylinders with test pressure of up to 60 bar have an unlimited design life.* *ISO 11119-4:2016 does not address the design, fitting, and performance of removable protective sleeves.* *ISO 11119-4:2016 does not apply to cylinders with seamless liners. For seamless liners, ISO 11119-2 applies.*	• Stockage • Essais

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	Mots-Clés
		NOTE 2 ISO 11623 covers periodic inspection and re-testing of composite cylinders.	
ISO/TR 15916:2015	Considérations fondamentales pour la sécurité des systèmes à l'hydrogène *Basic considerations for the safety of hydrogen systems*	*ISO/TR 15916:2015 provides guidelines for the use of hydrogen in its gaseous and liquid forms as well as its storage in either of these or other forms (hydrides). It identifies the basic safety concerns, hazards and risks, and describes the properties of hydrogen that are relevant to safety. Detailed safety requirements associated with specific hydrogen applications are treated in separate International Standards.*	• Stockage • Sureté • Matériaux
ISO 16111	Appareils de stockage de gaz transportables — Hydrogène absorbé dans un hydrure métallique réversible *Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride*	*This document defines the requirements applicable to the material, design, construction, and testing of transportable hydrogen gas storage systems, referred to as "metal hydride assemblies" (MH assemblies) which utilize shells not exceeding 150 l internal volume and having a maximum developed pressure (MDP) not exceeding 25 MPa.* *This document is applicable to refillable storage MH assemblies where hydrogen is the only transferred media. It is not applicable to storage MH assemblies intended to be used as fixed fuel-storage onboard hydrogen fuelled vehicles.*	• Stockage • Hydrures
ISO 22734	Générateurs d'hydrogène utilisant le procédé de l'électrolyse de l'eau — Applications industrielles, commerciales et résidentielles *Hydrogen generators using water electrolysis — Industrial, commercial, and residential applications*	*This document defines the construction, safety, and performance requirements of modular or factory-matched hydrogen gas generation appliances, herein referred to as hydrogen generators, using electrochemical reactions to electrolyse water to produce hydrogen.* *This document is applicable to hydrogen generators that use the following types of ion transport medium:* *— group of aqueous bases;* *— group of aqueous acids;* *— solid polymeric materials with acidic function group additions, such as acid proton exchange membrane (PEM);* *— solid polymeric materials with basic function group additions, such as anion exchange membrane (AEM).*	• Qualité • Performance • Électrolyseurs

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		This document is applicable to hydrogen generators intended for industrial and commercial uses, and indoor and outdoor residential use in sheltered areas, such as car-ports, garages, utility rooms and similar areas of a residence. *Hydrogen generators that can also be used to generate electricity, such as reversible fuel cells, are excluded from the scope of this document.* *Residential hydrogen generators that also supply oxygen as a product are excluded from the scope of this document.*	
NFPA 2	*Hydrogen Technologies Code*	*The purpose of this code shall be to provide fundamental safeguards for the generation, installation, storage, piping, use, and handling of hydrogen in compressed gas (GH2) form or cryogenic liquid (LH2) form.*	• Installations • Sureté
NFPA 55	*Compressed Gases And Cryogenic Fluids Code*	*This code shall apply to the installation, storage, use, and handling of compressed gases and cryogenic fluids in portable and stationary cylinders, containers, equipment, and tanks in all occupancies.*	• Installations • Sureté

4 APPLICATIONS STATIONNAIRES ET PILES À COMBUSTIBLE

Au Canada, incluant au Québec, le nombre relativement limité d'applications stationnaires et l'utilisation nouvelle de piles à combustible sont reflétés par un nombre limité de normes concrètement inscrites dans la règlementation. Il est important de signaler par contre que l'utilisation de cet équipement spécialisé doit être conforme aux règlements électriques canadiens et américains.

Nous aimerions faire les remarques supplémentaires suivantes sur ce volet :

- Les normes en lien avec les applications stationnaires (par exemple, les piles à combustible stationnaires de type générateur, parfois nommées selon l'anglicisme « power pack ») sont adressées seulement par des normes internationales.
- Deux comités sont à l'avant plan du développement de ces normes : ISO/TC 197 *Technologies de l'hydrogène* et IEC/TC 105 *Fuel cell technologies*.
- Il n'existe pas de normes américaines (sauf NFPA 853) ou canadiennes spécialisées dans ce secteur : le marché demeure relativement niche et les développements sont plutôt asiatiques (Japon, Chine, Corée).

Norme	**Titre**	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
IEC 60050-485:2020	*International Electrotechnical Vocabulary (IEV) - Part 485: Fuel cell technologies*	*IEC 60050-485:2020 gives the general terminology used in fuel cell technologies, as well as general terms pertaining to specific applications and associated technologies. This terminology is consistent with the terminology developed in the other specialized parts of the IEV.* *It has the status of a horizontal standard in accordance with IEC Guide 108.*	• Vocabulaire • Pile combustible
IEC 62282-2:2012	*Fuel cell technologies - Part 2: Fuel cell modules*	*IEC 62282-2:2012 provides the minimum requirements for safety and performance of fuel cell modules; it applies to fuel cell modules with or without an enclosure which can be operated at significant pressurization levels or close to ambient pressure. Deals with conditions that can yield hazards to persons and cause damage outside the fuel cell modules. This edition includes the following significant technical changes with respect to the previous edition:* *- inclusion of definitions for hazards and hazardous locations based on the IEC 60079 series;* *- modification of the general safety strategy and of the electrical components clause to reflect the needs for different application standards.*	• Sureté • Installation • Pile combustible

Norme	**Titre**	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
IEC 62282-3-100:2019	*Fuel cell technologies - Part 3-100: Stationary fuel cell power systems - Safety*	*IEC 62282-3-100:2019 applies to stationary packaged, self-contained fuel cell power systems or fuel cell power systems comprised of factory matched packages of integrated systems which generate electricity through electrochemical reactions. This document is applicable to stationary fuel cell power systems intended for indoor and outdoor commercial, industrial and residential use in non-hazardous areas. This second edition cancels and replaces the first edition published in 2012. This edition includes the following significant technical changes with respect to the previous edition:* *a) recognition that fuel carrying components qualified to leakage standards (soundness) need not be considered as potential flammable leak sources;* *b) new annex for small power systems; and* *c) clarifications for numerous requirements and tests*	• Sureté • Installation • Pile combustible
IEC 62282-3-200:2015	*Fuel cell technologies - Part 3-200: Stationary fuel cell power systems - Performance test methods*	*IEC 62282-3-200:2015 covers operational and environmental aspects of the stationary fuel cell power systems performance. The test methods apply as follows:* *- power output under specified operating and transient conditions;* *- electrical and heat recovery efficiency under specified operating conditions;* *- environmental characteristics;* *- for example, exhaust gas emissions, noise, etc. under specified operating and transient conditions. This new edition includes the following significant technical changes with respect to the previous edition: a stabilization zone of +- 10 % for thermal output of 100 % response time is provided instead of the tests for thermal output of 90 % response time, while the tests for electric output of 90 % response time remain as an option; the calculations for the ramp rate in kW/s are deleted and only the calculations for the response time (s) remain.*	• Sureté • Installation • Pile combustible
IEC 62282-3-201:2017	*Fuel cell technologies - Part 3-201: Stationary fuel cell power systems - Performance test methods for small fuel cell power systems*	*IEC 62282-3-201:2017 provides test methods for the electrical, thermal and environmental performance of small stationary fuel cell power systems that meet the following criteria:* *- rated electric power output of less than 10 kW;* *- grid-connected/independent operation or stand-alone operation with single-phase AC output or 3-phase AC output not exceeding 1 000 V, or DC output not exceeding 1 500 V;* *- maximum allowable working pressure of less than 0,1 MPa (gauge) for the fuel and oxidant passages;*	• Essais • Sureté • Pile combustible

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		- gaseous fuel (natural gas, liquefied petroleum gas, propane, butane, hydrogen, etc.) or liquid fuel (kerosene, methanol, etc.); *- air as oxidant.* *This document describes type tests and their test methods only. This document covers fuel cell power systems whose primary purpose is the production of electric power.* *This new edition includes the following significant technical changes with respect to the previous edition: revision of test set-up, revision of measurement instruments, introduction of ramp-up test, introduction of rated operation cycle efficiency, introduction of electromagnetic compatibility (EMC) test, revision of exhaust gas test, introduction of typical durations of operation cycles.*	
IEC 62282-3-300:2012	*Fuel cell technologies - Part 3-300: Stationary fuel cell power systems - Installation*	*IEC 62282-3-300:2012 provides minimum safety requirements for the installation of indoor and outdoor stationary fuel cell power systems in compliance with IEC 62282-3-100 and applies to the installation of the following systems:* *- intended for electrical connection to mains directly or with a readily accessible, manually operable switch or circuit-breaker;* *- intended for a stand-alone power distribution system;* *- intended to provide AC or DC power;* *- with or without the ability to recover useful heat.*	• Installation • Pile combustible
IEC 62282-3-400:2016	*Fuel cell technologies - Part 3-400: Stationary fuel cell power systems - Small stationary fuel cell power system with combined heat and power output*	*IEC 62282-3-400:2016 applies to small stationary fuel cell power systems serving as a heating appliance providing both electric power and useful heat with or without a supplementary heat generator providing peak load function. This standard applies to fuel cell power systems that are intended to be permanently connected to the electrical system of the customer (end user). Direct connection to the mains (parallel operation) is also within the scope of this standard. This standard is limited to gas and liquid fuelled fuel cell CHP appliances that have a heat input based on lower heating value of less than or equal to 70 kW. This standard specifies the requirements for construction, safety, installation, fitness for purpose, rational use of energy, marking, and performance measurement of these appliances. This standard also provides regional and country specific requirements to facilitate the worldwide application of this IEC standard.*	• Installation • Sureté • Pile combustible
IEC 62282-4-101:2014	*Fuel cell technologies - Part 4-101: Fuel cell power systems for propulsion*	*IEC 62282-4-101:2014 covers safety requirements for fuel cell power systems intended to be used in electrically powered industrial trucks. This standard is*	• Véhicules

Norme	Titre	Objet et domaine d'application (Résumé au besoin)	Mots-Clés
	other than road vehicles and auxiliary power units (APU) - Safety of electrically powered industrial trucks	*limited to electrically powered industrial trucks and is applicable to material-handling equipment, e.g. forklifts. It applies to gaseous hydrogen-fuelled fuel cell power systems and direct methanol fuel cell power systems for electrically powered industrial trucks.*	• Pile combustible
IEC 62282-4-102:2017	*Fuel cell technologies - Part 4-102: Fuel cell power systems for industrial electric trucks - Performance test methods*	*IEC 62282-4-102:2017 covers performance test methods of fuel cell power systems intended to be used for electrically powered industrial trucks. The scope of this document is limited to electrically powered industrial trucks. This document applies to gaseous hydrogen-fuelled fuel cell power systems and direct methanol fuel cell power systems for electrically powered industrial trucks. This document covers fuel cell power systems whose fuel source container is permanently attached to either the industrial truck or the fuel cell power system. This document applies to DC type fuel cell power systems, with a rated output voltage not exceeding 150 V DC for indoor and outdoor use.*	• Essais • Véhicules • Pile combustible
IEC 62282-5-100:2018	*Fuel cell technologies - Part 5-100: Portable fuel cell power systems - Safety*	*IEC 62282-5-100:2018 covers construction, marking and test requirements for portable fuel cell power systems. These fuel cell systems are movable and not fastened or otherwise secured to a specific location. The purpose of the portable fuel cell power system is to produce electrical power. This document applies to AC and DC type portable fuel cell power systems, with a rated output voltage not exceeding 600 V AC, or 850 V DC for indoor and outdoor use.*	• Essais • Portable • Pile combustible
IEC 62282-6-100:2010+AMD1:2012 CSV	*Fuel cell technologies - Part 6-100: Micro fuel cell power systems - Safety*	*IEC 62282-6-100:2010+A1:2012 covers micro fuel cell power systems, micro fuel cell power units and fuel cartridges that are wearable or easily carried by hand, providing d.c. outputs that do not exceed 60 V d.c. and power outputs that do not exceed 240 VA. Establishes requirements for all micro fuel cell power systems, micro fuel cell power units and fuel cartridges to ensure a reasonable degree of safety for normal use, reasonably foreseeable misuse, and consumer transportation of such items. The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication or one that replaces an existing Publicly Available Specification (PAS) in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests. It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months from the date of*	• Essais • Portable • Pile combustible

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
		publication. In the meantime, IEC/PAS 62282-6-1 can still be ordered by contacting the local IEC member National Committee or the IEC Central Office. The contents of the corrigendum of December 2011 have been included in this copy.	
IEC PAS 62282-6-150:2011	*Fuel cell technologies - Part 6-150: Micro fuel cell power systems - Safety - Water reactive (UN Division 4.3) compounds in indirect PEM fuel cells*	*IEC/PAS 62282-6-150:2011(E) covers micro fuel cell power systems using hydrogen produced from the reaction of an aqueous solution with solid UN Division 4.3 (water-reactive) compounds in indirect PEM fuel cell systems that are wearable or easily carried by hand, providing d.c. outputs that do not exceed 60 V d.c. and power outputs that do not exceed 240 VA.*	• Essais • Portable • Pile combustible
IEC 62282-6-200:2016	*Fuel cell technologies - Part 6-200: Micro fuel cell power systems - Performance test methods*	*IEC 62282-6-200:2016 specifies test methods for the performance evaluation of micro fuel cell power systems for laptop computers, mobile phones, personal digital assistants (PDAs), cordless home appliances, TV broadcast cameras, autonomous robots, etc. This new edition includes the following significant technical changes with respect to the previous edition:* *- deletion of 5.3 (Fuel consumption test) as it was impractical to measure the actual consumption rate of some kinds of fuels;* *- addition and modification of some terms and definitions.*	• Essais • Portable • Pile combustible
IEC 62282-6-300:2012	*Fuel cell technologies - Part 6-300: Micro fuel cell power systems - Fuel cartridge interchangeability*	*IEC 62282-6-300:2012 covers interchangeability of micro fuel cell (MFC) fuel cartridges to provide the cartridge compatibility for a variety of MFC power units while maintaining the safety and performance of MFC power systems. For this purpose, the standard covers fuel cartridges and their connector designs. Fuel type, fuel concentration and fuel quality are also covered. This standard also provides for the means to avoid the miss-connection of an improper fuel cartridge. Test methods for verifying the compliance with the interchangeability requirements for fuel and fuel cartridges are also provided in this standard. The main changes with respect to the previous edition are listed below:* *- updates to Type A to D interchangeable connectors, addition of Type E;* *- updates of the procedures, criteria and figures of the type tests for interchangeable connectors to ensure accurate and consistent results.*	• Essais • Portable • Pile combustible

Norme	Titre	**Objet et domaine d'application** (Résumé au besoin)	**Mots-Clés**
IEC 62282-6-400:2019	*Fuel cell technologies - Part 6-400: Micro fuel cell power systems - Power and data interchangeability*	*IEC 62282-6-400:2019 covers the interchangeability of power and data between micro fuel cell power systems and electronic devices to provide the micro fuel cell power system compatibility for a variety of electronic devices while maintaining the safety and performance of the micro fuel cell system. For that purpose, this document covers power interfaces and their connector configuration. The power management circuitry and power sharing methodology are also provided.* *This document also covers the data communication protocol and its data specification. Operation modes and alert conditions are also provided for the means to comply with the power control requirements of the electronic device.*	• Essais • Portable • Pile combustible
IEC TS 62282-7-1:2017	*Fuel cell technologies - Part 7-1: Test methods - Single cell performance tests for polymer electrolyte fuel cells (PEFC)*	*IEC TS 62282-7-1:2017(E) covers cell assemblies, test station setup, measuring instruments and measuring methods, performance test methods, and test reports for PEFC single cells. This document is used for evaluating:* *- the performance of membrane electrode assemblies (MEAs) for PEFCs in a single cell configuration;* *- materials or structures of PEFCs in a single cell configuration; or* *- the influence of impurities in fuel and/or in air on the fuel cell performance.*	• Essais • Portable • Pile combustible
IEC TS 62282-7-2:2014	*Fuel cell technologies - Part 7-2: Test methods - Single cell and stack performance tests for solid oxide fuel cells (SOFC)*	*IEC TS 62282-7-2:2014 provides for SOFC cell/stack assembly units, testing systems, instruments and measuring methods, and test methods to test the performance of SOFC cells and stacks. This technical specification is to be used for data exchanges in commercial transactions between cell/stack manufacturers and system developers or for acquiring data on a cell or stack in order to estimate the performance of a system based on it. Users of this technical specification may selectively execute test items suitable for their purposes from those described in this technical specification.*	• Essais • Portable • Performance • Pile combustible
IEC 62282-8-101:2020	*Fuel cell technologies - Part 8-101: Energy storage systems using fuel cell modules in reverse mode - Test procedures for the performance of solid oxide single cells and stacks, including reversible operation*	*IEC 62282-8-101:2020 addresses solid oxide cell (SOC) and stack assembly unit(s). It provides for testing systems, instruments and measuring methods to test the performance of SOC cell/stack assembly units for energy storage purposes. It assesses performance in fuel cell mode, in electrolysis mode and/or in reversible operation.* *This document is intended for data exchanges in commercial transactions between cell/stack manufacturers and system developers or for acquiring data on a cell or stack in order to estimate the performance of a system based on it. Users of this document may selectively execute test items suitable for their*	• Essais • Portable • Performance • Pile combustible

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		purposes from those described in this document. Users can also substitute selected test methods of this document with equivalent test methods of IEC TS 62282-7-2 for SOC operation in fuel cell mode only.	
IEC 62282-8-102:2019	*Fuel cell technologies - Part 8-102: Energy storage systems using fuel cell modules in reverse mode - Test procedures for the performance of single cells and stacks with proton exchange membrane, including reversible operation*	*IEC 62282-8-102:2019 deals with PEM cell/stack assembly units, testing systems, instruments and measuring methods, and test methods to test the performance of PEM cells and stacks in fuel cell mode, electrolysis and/or reversible mode.*	• Essais • Portable • Performance • Pile combustible
IEC 62282-8-201:2020	*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*	*IEC 62282-8-201:2020 defines the evaluation methods of typical performances for electric energy storage systems using hydrogen. This is applicable to the systems that use electrochemical reaction devices for both power charge and discharge. This document applies to systems that are designed and used for service and operation in stationary locations (indoor and outdoor).* *The conceptual configurations of the electric energy storage systems using hydrogen are shown in Figure 1 and Figure 2. Figure 1 shows the system independently equipped with an electrolyser module and a fuel cell module. Figure 2 shows the system equipped with a reversible cell module. There are an electrolyser, a hydrogen storage and a fuel cell, or a reversible cell, a hydrogen storage and an overall management system (which may include a pressure management) as indispensable components. There may be a battery, an oxygen storage, a heat management system (which may include a heat storage) and a water management system (which may include a water storage) as optional components. The performance measurement is executed in the area surrounded by the outside thick solid line square (system boundary).*	• Essais • Portable • Performance • Pile combustible
ISO 16110-1:2007	Générateurs·d'hydrogène·faisant appel·aux·technologies·du·traitement·du·carburant — Partie 1: Sécurité	L'ISO 16110-1:2007 s'applique aux systèmes de génération d'hydrogène conditionnés, autonomes ou adaptables en sortie-usine, d'une capacité inférieure à 400 m3/h à 0 °C et 101,325 kPa, appelés ci-après générateurs d'hydrogène, permettant de convertir un carburant d'entrée en gaz riche en hydrogène, de composition et de conditions adaptées aux dispositifs fonctionnant à l'hydrogène (systèmes d'alimentation à pile à combustible ou	• Carburant • Qualité

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	Hydrogen generators using fuel processing technologies — Part 1: Safety	systèmes de compression, de stockage et de distribution d'hydrogène, par exemple). Elle s'applique aux générateurs d'hydrogène utilisant un ou une combinaison des carburants d'entrée ci-dessous : le gaz naturel et autres gaz riches en méthane dérivés de sources d'énergie renouvelable (biomasses) ou fossile (gaz de décharge, gaz de digestion, gaz houiller, par exemple); les carburants issus du raffinage du pétrole (le diésel, l'essence, le kérosène, les gaz de pétrole liquéfié comme le propane et le butane, par exemple); les alcools, les esters, les éthers, les aldéhydes, les cétones, les liquides Fischer-Tropsch et autres composés organiques riches en hydrogène adaptés, dérivés de sources d'énergie renouvelable (biomasses) ou fossile (méthanol, éthanol, diméthyléther, biodiesel, par exemple); les mélanges de gaz contenant de l'hydrogène (gaz de synthèse, gaz de ville, par exemple). L'ISO 16110-1:2007 s'applique aux générateurs d'hydrogène stationnaires destinés à une utilisation commerciale, industrielle, semi-industrielle ou domestique, intérieure ou extérieure. Elle a pour objet de couvrir tous les phénomènes dangereux, situations et événements dangereux significatifs liés aux générateurs d'hydrogène, à l'exception de ceux liés à la compatibilité environnementale (conditions d'installation), lorsqu'ils sont utilisés normalement et dans les conditions prévues par le fabricant.	
ISO 16110-2:2010	Générateurs d'hydrogène faisant appel aux technologies du traitement	*ISO 16110-2:2010 provides test procedures for determining the performance of packaged, self-contained or factory matched hydrogen generation systems with a capacity less than 400 m3/h at 0 °C and 101,325 kPa, referred to as hydrogen generators, that convert a fuel to a hydrogen-rich stream of composition and*	• Essais • Carburant

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	du carburant — Partie 2: Méthodes d'essai de rendement *Hydrogen generators using fuel processing technologies — Part 2: Test methods for performance*	*conditions suitable for the type of device using the hydrogen (e.g. a fuel cell power system, or a hydrogen compression, storage and delivery system).*	
NFPA 853	*Standard For The Installation Of Stationary Fuel Cell Power Systems*	*This standard provides fire prevention and fire protection requirements for safeguarding life and physical property associated with buildings or facilities that employ stationary fuel cell systems of all sizes.*	• Sureté • Pile combustible